Improving Care Delivery Through Lean: Implementation Case Studies

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  Other Environmental Context
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  Initiation of Lean at the Organization
  Conceptualization of and Goals for Lean
  Alignment of Lean and Quality Improvement Efforts
Process for Implementing Lean
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Introduction to the Case Studies

Project Background

Lean is an organizational redesign approach that is increasingly being used in health care. The term “Lean Production” was coined by an MIT research team studying leading automotive manufacturers around the world.¹ At its core, Lean focuses on the elimination of waste, with waste defined as any activity that consumes resources (staff, time, money, space) without adding value to those being served by the process. Lean can be implemented in many ways. The world’s leading example of Lean production is the Toyota Production System (TPS). Toyota, more than any other company in any industry, has established both the cultural and operational elements required to continuously drive waste out of its production processes. Some argue that Lean’s focus on processes makes it especially appropriate for solving complex health care issues. Others argue that Lean’s use in manufacturing as opposed to a service industry, and its focus on standardization and defining value from the customer perspective, renders it inappropriate for health care because patients have unique needs, and there are multiple customers (e.g., employers, insurers, patients).²

Rationale and Purpose

As Lean increases in popularity, the Agency for Healthcare Research and Quality (AHRQ) wanted to better understand if and how Lean works in health care, and, if it does work, what specific mechanisms make the redesign technique successful. To do so, AHRQ awarded a contract to the American Institutes for Research (AIR), a nonprofit research organization headquartered in Washington, DC, to study the application of Lean to health care. As part of this work, AIR conducted five case studies of individual health care organizations that implemented Lean.

Prior to the case studies, the AIR research team conducted a review of the literature to determine whether an evidence base exists for using Lean in health care. We found that the majority of studies about Lean lack data on key areas and domains important for understanding quality improvement, organizational behavior, and organizational change. In addition, the literature is largely anecdotal and devoid of theoretical frameworks, not comparative, authored by the individuals who have implemented the projects rather than independent investigators, and limited to those projects that were successful.³

Four major findings stemmed from the literature review:

- **Information about Lean implementation in health care is unreliable and anecdotal.** Peer-reviewed articles are relatively scarce, although there is a large volume of grey literature. Reports from peer-reviewed and grey literature were single case studies of limited validity. In addition, nearly all of the documents focused on one organization, department, and project, making it very difficult to determine what factors or features of organizations and the external environments in which they operate are important for successful

³ An executive summary of the literature review is available separately at http://www.ahrq.gov/research/findings/final-reports/leanprocess.html.
implementation and maintenance of Lean. Finally, studies generally failed to use more rigorous quasiexperimental designs or comparative and longitudinal case study designs.

- **Data are inconsistent or absent in many domains that research in other fields (e.g., quality improvement) suggests are important.** There is little rigorous reporting about external impetus or context for Lean (e.g., market factors and conditions), key organizational factors (e.g., how culture affects who implements Lean), impact (e.g., economic, quality of care, outcomes of care), and sustainability. The outcomes measured were primarily efficiency and quality and, less frequently, safety and patient satisfaction.

- **Lean studies are atheoretical.** Few papers provided clear theoretical backgrounds or frameworks for reported findings.

- **There is a positive publication bias in Lean literature.** Nearly all documents included in our review reported positive outcomes and results from implementing Lean, and many were authored by consultants or individuals in the organizations implementing Lean.

In short, considerable gaps remain in the existing literature about Lean. These gaps make it very difficult, if not impossible, to discern which organizational characteristics and/or environmental conditions are critical for successful implementation and sustainability of Lean and its impacts on efficiency, quality/safety, and other important outcomes (e.g., patient satisfaction). This lack of research warrants additional investigation of the implementation of and outcomes related to Lean.

**Conceptual Framework**

AIR developed a conceptual framework to guide the case study research, drawing on the results of the systematic literature review and, specifically, on the literature about health care quality improvement (including such related topics as implementation and diffusions of innovations) and on the literature about organizational learning, innovation, and change (Exhibit 1). This framework builds on and integrates theoretical/conceptual literature on organizational learning, innovation, and change and related work in health care, such as quality improvement. At the most basic level, hospitals, medical groups, and other health care organizations that attempt to use Lean are seeking to improve or fundamentally reconceptualize core administrative and/or clinical processes.
As shown in Exhibit 1, our theoretical/conceptual framework comprises five major elements, as follows:

1. **The local environment in which the health care organization is operating.** According to the literature, the local environment is likely to be an important factor affecting the ability of health care organizations to successfully implement, disseminate, and integrate Lean. Specific aspects of the external context or local environment that previous research suggest are particularly important include: a) the extent to which health care purchasers are organized and able to put pressure on health care organizations to reduce spending or total costs and improve quality; b) the extent to which purchasers use any new, non-fee-for-service (FFS) payment methods (e.g., pay for performance, partial capitation) designed to provide a greater incentive to reduce spending or costs or improve quality; c) the competitiveness of the market, including whether other providers are using Lean; and d) sources of expertise in Lean, for example, universities, corporations outside the health care sector that have used Lean, or consultants.

Some schools of organizational theory point out that all organizations are dependent on their environment, because no organization possesses or can produce all the resources (e.g., inputs, distribution channels) required to fulfill their aims (see Scott and Davis, 2006, for an overview of resource dependency theory). In the case of Lean, one key resource is Lean knowledge and skills. Currently, most health care organizations lack this expertise in-house, so typically they are in the position of looking for this expertise from external individuals or groups that have experience in other industries. In addition, health care organizations often seek out this expertise locally, via linkages to university departments (e.g., engineering programs that use the technique with manufacturing firms) or local manufacturing firms or consultants. Therefore, the availability and capability of these entities with expertise in Lean, and the nature of the relationships they establish (e.g., frequent, positive interaction, “ownership” of the project taken by the organization versus remaining with the outside organization), may influence the ability of health care organizations to successfully implement, sustain, and disseminate Lean.

2. **The organization adopting Lean, particularly structures and processes (internal context) for implementing Lean.** Building on the work of Donabedian and others, such as the Institute of Medicine’s (IOM’s) Crossing the Quality Chasm, it has long been understood that organizational structure has an impact on processes, and ultimately organizational (e.g., efficiency, effectiveness) and patient outcomes (e.g., mortality, morbidity, patient experience). In this study, the health care organizations’ general structures and processes comprise the organizational context in which Lean is being implemented.

Several aspects of structure are likely to have an impact on the ability of health care organizations to successfully implement, disseminate, and sustain quality improvement initiatives such as Lean. At the most basic level, there are a variety of structural characteristics that have been shown to influence both positively and negatively a hospitals’ desire to undertake and sustain initiatives like Lean (e.g., size, medical staff organization, such as employed or private practice physicians, profit and teaching status).

In addition to general structural characteristics noted above, four other aspects of structure have been found to be important for learning, innovation, and change and quality
improvement. These include: culture, existing knowledge and skills, information infrastructure, and slack resources. With respect to culture, Schein defines organizational culture as “a set of basic tacit assumptions about how the world is and ought to be that is shared by a set of people and determines their perceptions, thoughts, and feelings and, to some degree, their behavior.” It involves the norms, values, beliefs, and behaviors of an organization reflecting how things are done within the organization. A culture conducive to quality improvement will encourage questioning and risk-taking at all levels, if not require double-loop learning and “meta-learning” in which an organization evaluates its basic operating assumptions, how it learns best, and makes efforts to improve its learning practices. Conversely, a very hierarchical culture emphasizing rules, regulations, and reporting relationships is negatively associated with implementation of quality improvement and related practices.

As noted, existing knowledge and skills about quality improvement more generally and the use of Lean by the Toyota Production System (TPS) more specifically, are also important factors influencing implementation. Health care organizations have varying degrees of knowledge and skills, as well as experience, in quality improvement more broadly. Those with greater expertise and experience with quality improvement can build upon them when beginning to use process redesign techniques like Lean. When it comes to expertise in Lean more specifically, many health care organizations have to seek out knowledge and skills from outside organizations, since the technique has historically been used in manufacturing. Therefore, an important concept related to existing knowledge and skills is an organization’s absorptive capacity, which Greenhalgh and colleagues define as the ability to identify, capture, interpret, share, reframe, and re-codify new knowledge; to link it with its own knowledge base; and to put it to appropriate use. Precursors of absorptive capacity include the knowledge and skills of key staff and the organization overall, as well as some of the structures and processes described in this section.

Health care organizations also may vary considerably in terms of their information capability, including information technology (such as electronic health records) and the information they routinely have available or can readily produce. Without timely information that is not overly burdensome to collect, it is difficult to assess problems or assess what works to overcome them.

Finally, related to other general structural characteristics (e.g., profit status), health care organizations that have more slack resources (e.g., better profit margins, higher staffing levels) often are more likely to succeed in quality improvement. Individuals and teams need the time and other resources (such as education and training, ongoing assistance, information) to fundamentally re-examine and redesign processes, rather than creating temporary fixes. All of this requires at least an initial investment of resources before a return can be realized.

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*b* Culture is often considered a process, instead of a structure, as it must continually be reinforced, and it can change. However, culture is relatively stable and changes slowly. In addition, some see Lean as a way of altering culture. So, we included culture in this model as part of the organizations’ structure.
3. **The content or nature of the Lean Initiative and the degree to which it fits with existing organizational structures and processes.** In addition to these general organizational features, several issues related to the approach to and uses of Lean at the organization-wide and specific project level are important. Increasingly, research on health care quality improvement highlights the need to: a) recognize the “nested” nature of health care organizations (e.g., individuals working in teams, teams in specific units, specific units in departments, and departments in organizations), and b) understand the relationship among these levels.\(^5\)\(^,\)\(^10\)\(^–\)\(^12\) For example, a lack of “alignment” of purpose, priorities, and incentives among these levels can hinder efforts to innovate and change.\(^13\)

At the organizational level, this includes the vision for and goals of Lean. Different organizations have different visions of and goals for Lean.\(^6\) For example, one key difference appears to be whether the health care organization views Lean as a specific “tool” and set of techniques to “refine” or improve existing processes in smaller, discrete organizational areas, or whether it views Lean as a mechanism for fundamentally transforming care delivery processes and the entire organization, including potentially its culture.

Other aspects of the Lean initiatives of importance at the organizational level are: scope and pace of Lean activity, locus of lean activity, and coordination of Lean activities and resources. A major decision that organizations must make is in how many areas and how quickly to try to implement Lean. Regardless of whether multiple areas of the inpatient or outpatient setting are being addressed or a single area and related value stream—that is, whether the locus of lean activity is broad or narrow—coordination of Lean activities is required.

At both the organizational and Lean project levels, a variety of other factors are important. These include: leadership, education/training, communication about Lean, Lean team composition, resources, and routinization. For example, the composition and size of the Lean team itself may be shaped by several organization wide sub-domains (vision of and goals for Lean, locus of Lean activity, resources); team size and resources also reflect the content of the specific Lean project. These team features, in turn, have a significant impact on the teams’ overall effectiveness. A team is a type of formal group or collection of individuals who see themselves, and are seen by others, as a socially intact entity; share responsibility for tasks and outcomes; and operate within a broader organizational context, interacting with the larger organization or specific organizational subunits.\(^14\)

A health care organization’s ability to successfully implement, disseminate, and integrate Lean may also be affected by the content or nature of Lean, particularly the “fit” or “match” between the characteristics of the organization’s social structure and the nature of Lean. Work on the diffusion and dissemination of innovations, including organizational innovations like Lean, suggest that some innovations are a better “fit” or “match” with existing organizational structures and networks, and that successful dissemination and

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\(^{13}\) Some may also consider the vision for, and goals of, Lean as part of the organizational process rather than a structural feature of the organization. However, in more rational organizational theories, visions of and goals for something like Lean are viewed as occurring first and shaping the organization of the Lean work. So, we include this sub-domain here and also consider how the vision for and goals of Lean may be reinforced, refined, or changed through the implementation process.
integration is more likely when the degree of “fit” or “match” is greater. Aspects of Lean that are important for “fit” or “match” include: the perceived advantages relative to current practice (e.g., Lean results in superior efficiency and/or quality); compatibility with values, beliefs, and mission/vision; complexity (e.g., whether Lean is relatively easy to understand and use); trialability (i.e., the ability to experiment with Lean, on a limited basis, as opposed to an all-or-nothing approach); and observability (i.e., the extent to which the results are observable to key groups and stakeholders).\textsuperscript{13} For example, alignment between Lean and the organizational culture is likely to be poor when there is limited experience with or trust of multidisciplinary teamwork. Similarly, in organizations where physicians are used to high levels of autonomy, there may be resistance to Lean’s stress on standardization of care processes.

4. **Outcomes, both intermediate and ultimate.** The next element of our conceptual framework is the outcomes associated with Lean implementation. The intermediate outcomes include employee satisfaction, culture change, increased knowledge of Lean, and routinization and diffusions of Lean methods and skills. For example, in the near or intermediate term, Lean can positively or negatively impact satisfaction among physicians and other clinicians and staff. The final outcomes include aspects of efficiency, quality, safety, and satisfaction. Further, in order for organizations to sustain Lean, there has to be a business and/or strategic case resulting from the initiative.

5. **Integration of Lean into organizational routines.** The final element of our conceptual framework is a feedback loop from the intermediate and ultimate outcomes to the internal context or organization. If organizations perceive and experience positive outcomes from their Lean efforts, they will be more willing and able to sustain their Lean efforts. In addition, as the organizations gain more experience with Lean, they will continue to learn about when and how to use it and how best to integrate it into their organizational structures and processes generally and, more specifically, with respect to quality improvement and Lean.

**Purpose of Case Studies**

The purpose of the individual case studies, as part of the larger project, was to examine the ways in which each organization has implemented Lean and identify the factors that influenced progress within individual Lean projects and on the ultimate outcomes. At a practical level, these individual case study reports are designed to provide potential Lean users with information that will enable them to make informed decisions about implementing Lean, based on experiences that are relevant to their own situation.

The individual case studies contributed to goals of the project overall by providing evidence to answer study questions corresponding to each of the aims described here.

**Aim 1.** Assess whether Lean positively affects primary outcomes of interest to the participating hospitals. From the organization’s perspective, does Lean improve quality, efficiency, costs, employee satisfaction, and organizational culture?
Aim 2. Identify internal and external factors that are associated with variations in outcomes and processes, so that potential users can understand which experiences are relevant to their own situation.

Aim 3. Identify challenges to implementing Lean, potential solutions to the challenges, and lessons learned.

To meet these aims, AHRQ and AIR conducted five case studies. The next section describes the methods of the case study approach.

Methods
Definition of the Sample
Organizations

To address the gaps in the Lean literature and examine the domains included in the conceptual framework, it was critical for our purposive sample of organizations to be diverse in nature and that it would expand the evidence base regarding the Lean method. These organizations – from single hospitals to entire systems composed of multiple hospitals and clinics – were considered to be the “cases” for this study. To qualify as a case, the organization must have implemented Lean in two or more projects (e.g., kaizens, rapid cycle improvements, gembas, and rapid improvement events).

Five diverse health care organizations were selected for the study:

- Critical access hospital.
- Academic medical center.
- Public safety net hospital.
- Tertiary care hospital.
- Organized delivery system (ODS).

Exhibit 2 presents factors considered in the selection of case study organizations.

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\[d\] A kaizen is a rapid improvement process that focuses on eliminating waste, improving productivity, and achieving sustained continual improvement in targeted activities and processes of an organization.

\[e\] Gemba is a Japanese word that literally means “the place where the real action takes place.”
Using the criteria described above, five diverse organizations were purposively selected for inclusion in our project. Exhibit 3 describes each organization, based on the selection factors for organizational selection, and indicates a pseudonym for each organization.
Exhibit 3. Case Selection Factors for Included Organizations

<table>
<thead>
<tr>
<th>Name</th>
<th>Suntown Hospital</th>
<th>Grand Hospital Center</th>
<th>Heights Hospital</th>
<th>Central Hospital</th>
<th>Lakeview Healthcare (LHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational experience with Lean</td>
<td>Experienced</td>
<td>Mid-point</td>
<td>Recent</td>
<td>Recent</td>
<td>Mid-point</td>
</tr>
<tr>
<td>Geographic location</td>
<td>West</td>
<td>South</td>
<td>East</td>
<td>Midwest</td>
<td>East</td>
</tr>
<tr>
<td>Region density</td>
<td>Rural</td>
<td>Large urban</td>
<td>Large urban</td>
<td>Large urban</td>
<td>Small urban</td>
</tr>
<tr>
<td>Special organization designation</td>
<td>Critical access hospital</td>
<td>Academic medical center (Tertiary care)</td>
<td>Public hospital</td>
<td>Tertiary care center</td>
<td>Integrated delivery system with tertiary care centers</td>
</tr>
<tr>
<td>Hospital beds</td>
<td>45</td>
<td>214</td>
<td>341</td>
<td>738</td>
<td>1240</td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Physician employment model</td>
<td>Mixed</td>
<td>Staff</td>
<td>Staff</td>
<td>Mixed</td>
<td>Mixed</td>
</tr>
<tr>
<td>Consultant use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Projects*

After determining the participating organizations, projects from each organization were selected for specific examination. “Projects” are defined by the organization but usually refer to specific Lean events in a department, unit, or segment of the value stream. The focus on specific projects allowed us to better understand how Lean works practically speaking at each organization, and how variation in the project target area may affect Lean success. This information allowed for a second level of detailed analysis to examine these factors and their influence on Lean implementation, sustainability, and success.

In sum, 13 distinct projects were studied across the five case study organizations. Nine of the projects were studied from a prospective analytic perspective, and data were collected at the beginning and during the course of the project. Four projects were studied from a retrospective analytic perspective, and data were collected after the conclusion of the project. Further, 10 projects focused on Lean implementation for a single department or operating unit within a health care organization. Three projects focused more broadly on the entire hospital’s operations, including the construction of an entire hospital using Lean principles. The breakdown of projects based on the additional selection criteria are presented in Exhibit 4.
<table>
<thead>
<tr>
<th>Factors</th>
<th>Categories</th>
<th>Total projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic perspective</td>
<td>(a) Prospective – a project beginning within 1 month of the first site visit</td>
<td>(a) N = 9</td>
</tr>
<tr>
<td></td>
<td>(b) Retrospective – a project that has been completed in the last 1 year, preferably within the last 6-8 months</td>
<td>(b) N = 4</td>
</tr>
<tr>
<td>Target (unit/department)</td>
<td>None</td>
<td>Inpatient unit: N = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cardiology: N = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outpatient clinic: N = 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency department: N = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System-wide: N = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery: N = 3</td>
</tr>
<tr>
<td>Clinical</td>
<td>(a) Administrative (e.g., billing, scheduling)</td>
<td>(a) N = 2</td>
</tr>
<tr>
<td></td>
<td>(b) Clinical (e.g., inpatient, cardiology, surgery)</td>
<td>(b) N = 8</td>
</tr>
<tr>
<td></td>
<td>(c) Clinical support services (e.g., lab services, radiology, pharmacy)</td>
<td>(c) N = 3</td>
</tr>
<tr>
<td>Level of complexity and uncertainty in work</td>
<td>(a) Low = involving a single dimension of the organization with activities following in an established, unchanging sequence with minimal degree of professional autonomy and judgment required to complete the work</td>
<td>(a) N = 4</td>
</tr>
<tr>
<td></td>
<td>(b) High = activities that do not follow a consistent sequence and may involve multiple dimensions of the organization with a high degree of professional autonomy and judgment required to complete the work</td>
<td>(b) N = 9</td>
</tr>
<tr>
<td>Lean implementation focus</td>
<td>(a) Targeted quality improvement</td>
<td>(a) N = 7</td>
</tr>
<tr>
<td></td>
<td>(b) Diffusion across organization or entities</td>
<td>(b) N = 5</td>
</tr>
<tr>
<td></td>
<td>(c) Transformative</td>
<td>(c) N = 1</td>
</tr>
<tr>
<td>Primary care setting roll-out</td>
<td>(a) Yes = implementation of Lean in the primary care setting</td>
<td>(a) N = 3</td>
</tr>
<tr>
<td></td>
<td>(b) No = implementation of Lean is not being conducted in the primary care setting</td>
<td>(b) N = 10</td>
</tr>
<tr>
<td>Timing</td>
<td>(a) Able to be studied within the scope and timeline of this study</td>
<td>(a) N = 13</td>
</tr>
<tr>
<td></td>
<td>(b) Not able to be studied within scope and timeline of this study</td>
<td>(b) N = 0</td>
</tr>
</tbody>
</table>

*Note one project is still to be determined.
Exhibit 5 depicts the research design of the overall project.

**Exhibit 5. Research Design**

![Research Design Diagram]

**Data Collection Activities**

Data collection activities included site visits with in-person interviews, digital diaries, collection of documentation, and telephone interviews. Data collection methods varied by analytic perspective (i.e., prospective and retrospective) and the stage of implementation of the Lean project (i.e., pre-implementation, implementation, post-implementation). Exhibit 6 shows the breakdown of data collection activities by both analytic perspective and stage of implementation.

**Exhibit 6. Data Collection Activities by Point in Time with Respect to Implementation and Type of Case**

<table>
<thead>
<tr>
<th>Data Collection Activity</th>
<th>PRE-IMPLEMENTATION</th>
<th>IMPLEMENTATION</th>
<th>POST-IMPLEMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data collection activity</td>
<td>Site visit, in-person interviews</td>
<td>Digital diaries</td>
<td>Site visit, in-person interviews</td>
</tr>
<tr>
<td></td>
<td>Document collection for data abstraction</td>
<td>Telephone interviews</td>
<td>Document collection for data abstraction</td>
</tr>
</tbody>
</table>

*Prospective Case Studies*
Pre- and Post-implementation Data Collection Activities

Data collection methods during pre- and post-implementation were included in site visits with in-person interviews and collection of documentation.¹

Site visits with in-person interviews. AIR collected qualitative data via site visits by conducting in-person interviews. The purpose of these interviews was to:

- Determine the organizational culture surrounding Lean.
- Assess the organizations’ views of Lean and quality improvement in general.
- Gain a better understanding of the specific implementation strategies used by each organization and gather data about the local environment, structures, and processes with specific application to Lean implementation.

AIR visited each site twice. The first visit was to gain baseline information for prospective projects and to collect all of the information on retrospective projects. The second visit was to follow-up on the status and outcomes of all prospective case projects. The first visits occurred between November 2009 and May 2010, while the second visits occurred between September and December 2010.⁸

Each site visit lasted between 2 and 4our days and consisted of a series of individual and small group interviews. Each interview took 30-60 minutes. Interviews were conducted with the administrative and clinical personnel from each of the participating health care facilities as described in Exhibits 7 and 8.

### Exhibit 7. Interviews by Position in Organization

<table>
<thead>
<tr>
<th>Position in organization</th>
<th>Example</th>
<th>Organizational interviewees (n=163)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td>C-suite (e.g., CEO, CFO, COO)</td>
<td>n= 35</td>
</tr>
<tr>
<td></td>
<td>Vice President Corporate level staff (if applicable)</td>
<td></td>
</tr>
<tr>
<td>Department-level manager</td>
<td>Administrative lead Clinical lead</td>
<td>n= 24</td>
</tr>
<tr>
<td>Frontline</td>
<td>Physician Nurse Process improvement staff Mid-level management (e.g., floor manager, nurse manager)</td>
<td>n= 99</td>
</tr>
<tr>
<td>External participant</td>
<td>Consultant</td>
<td>n= 3</td>
</tr>
<tr>
<td>Other stakeholders</td>
<td>Board of directors Community members</td>
<td>n= 2</td>
</tr>
</tbody>
</table>

¹ This activity solicited materials and data collected by the sites on Lean implementation and impact: internal reports/memos, materials promoting Lean adoption, tools used in Lean implementation (see Lean Healthcare Exchange at [http://www.leanhealthcareexchange.com/?page_id=300](http://www.leanhealthcareexchange.com/?page_id=300)), press releases, and data on process evaluation.

⁸ Note, as of January 27, 2011, one of the prospective projects had not begun data collection, and the second site visits had not occurred for two other prospective projects. The Lean hospital (LHC Horizon) is an ongoing prospective project on a different project schedule. Data for the Lean hospital are collected at every visit; an additional visit will occur after the hospital is opened.
Exhibit 8. Interviews by Clinical Role

<table>
<thead>
<tr>
<th>Clinical type</th>
<th>Organizational interviewees (n= 163)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians (including surgeons)</td>
<td>n= 12</td>
</tr>
<tr>
<td>Other clinical staff</td>
<td>n= 71</td>
</tr>
<tr>
<td>Non-clinical staff</td>
<td>n= 80</td>
</tr>
</tbody>
</table>

Collection of documentation. The purpose of this activity was to solicit materials and data directly collected by the sites on the implementation and impact of Lean including:

- Internal reports or memos on Lean implementation or decisions surrounding Lean implementation.
- Materials promoting the adoption of Lean in the organization.
- Tools used when implementing Lean (e.g. value stream maps, checklists, guides, etc.).
- Press releases or other news media regarding the use of Lean in the organization.
- Data on the process evaluation for Lean (satisfaction surveys on Lean, use of Lean versus other methods).
- Materials disseminating information about Lean and its impact to others outside of the organization (speeches, presentations, posters, etc.).

Documentation from the organization also included quantitative data (e.g., Lean project metrics, patient satisfaction scores, cost savings, etc.) for review relevant to:

- Business case for Lean.
- Processes and outcomes of Lean projects.

Organizations provided data on indicators of quality, patient safety, customer service, efficiency (including costs), workforce development, and/or changes in the physical environment based on the type of Lean project(s) they implemented and the information they collected. The type of indicators and amount of data provided varied by organization. The most common indicators provided include quality/patient safety, customer service, efficiency, workforce development (including physician development), and architecture/physical environment.

- Quality/patient safety. Particularly for projects of a clinical nature, organizations provided documentation that they used to help measure outcomes for both quality and safety metrics. For example, a tracking sheet with monthly metrics on door-to-balloon\(^h\) times was shared with the research team.\(^{16}\) On an organizational level, scorecards with results from all Lean projects were shared. These scorecards always included quality and/or safety metrics.

- Customer service. Documentation showing improvements in customer service were submitted by several organizations. Customer service documentation includes any information that affects the patient experience at the organization. For example, one organization sent documentation to show the reduction in wait time for an appointment.

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\(^{16}\) Door-to-balloon (D2B) is a cardiac care time measurement for treatment of myocardial infarctions, specifically defined as the time from patient arrival at the hospital to the time of percutaneous coronary intervention.\(^{16}\)
Others shared documentation with metrics related to the continuity of care between patients and their primary care providers.

- **Efficiency.** Documentation of efficiency was provided to illustrate the reduction of work for staff and the effects on specific processes. For example, one organization provided documentation regarding the reduction in preference cards (used by surgeons to specify equipment and supplies needed for an operation), a change that allowed for the surgical process to be more efficient. Additionally, documentation was submitted illustrating a reduction in the number of steps in a process for clinical staff to improve their efficiency and reduce the physical burden.

- **Workforce development, including physician development.** While Lean may have had impacts on employee satisfaction or culture, no documentation was collected or provided on these aspects.

- **Architecture/physical environment.** Many organizations combined spatial and organizational improvement with their Lean project. For example, we collected pictures from one organization on a 6S activity completed on a filing space that was part of a larger continuity of care case.

*Implementation Phase Data Collection Activities*

Data collection activities during the implementation phase were mainly qualitative, including recording of digital diaries, telephone interviews, and collection of documentation.

**Digital diary.** For prospective projects, the participating establishment assigned an onsite quality specialist or coordinator who worked closely with each department and Lean project. This onsite person kept a “digital diary,” using a diary entry guide and a hand-held digital voice recorder to describe key aspects of the implementation process. The onsite coordinator dictated his or her answers to these questions into the digital recorder and sent the MP3 files to AIR researchers via email. The onsite coordinator made diary entries one to two times each month. In some situations, the individuals completing the digital diaries were uncomfortable completing these entries into the recorder. In these cases, we substituted short telephone interviews once or twice each month, in addition to those scheduled for all sites. This alternate method yielded similar information to the traditional digital diaries.

**Telephone interviews.** For each prospective project, we conducted telephone interviews with 1-3 individuals per department. The types of interviewees depended on the specific department and projects but largely included Lean champions, team leaders, or Lean process owners. The telephone interviews lasted approximately 30 minutes and were completed two to three times during the project implementation.

**Collection of documentation.** AIR collected qualitative documentation from each participating facility as described previously. The purpose of this collection of documentation was to assemble ongoing documents as they were being developed, used, and distributed. As available, quantitative data related to the cases in terms of process and outcome variables being collected by each organization for their Lean project were collected during this process.
**Institutional Review Board (IRB) and Office of Management and Budget (OMB) Approvals**

AIR received OMB approval to conduct the research presented in this document. AIR’s IRB approved all protocols, recruitment, and interview procedures before any contacts were made or any data were collected.

**Data Analysis**

All qualitative data from site visit in-person interviews, telephone interviews, and digital diaries were managed and analyzed using NVivo, a qualitative data analysis software program. NVivo can accommodate diverse types of qualitative data including text, audio, and video. All interviews and digital diaries were transcribed before uploading to NVivo. Print documents were also scanned and uploaded into NVivo.

We developed a coding system for the interviews and digital diaries based on an earlier but very similar version of the conceptual framework shown in Exhibit 1. To ensure a consistent application of the coding system across three coders, inter-coder reliability was tested after every 20 interviews. The average reliability for all coding was 92.8 percent.

After coding was complete, we analyzed the data for each individual case. We employed a variety of qualitative techniques to draw conclusions from the data (e.g., noting patterns and themes, plausibility, relationships between variables, and finding intervening variables). Other data provided by each organization were summarized as appropriate, for example, using descriptive statistics for quantitative indicators and integrating qualitative information from materials into the cases as needed.

**Limitations**

The use of primarily qualitative data collection techniques presents some limitations. The freedom to tailor questions and probes to each respondent is the hallmark of the qualitative interviewing methodology. Because the interviewer does not adhere inflexibly to the written questions – by asking every question, using the exact written language, in the exact sequence – the study findings are limited by two potential sources of bias. First, if the language and sequence of the questions are associated with the responses, our conclusions might also vary in an unknown way. Second, because there are no rigid categories, aggregating responses requires interpretation by the analyst, and it is possible that one analyst’s interpretation may differ from another’s. However, the reliability of the coding noted above suggests that this was not a serious source of bias.

**References**


Case 1. Lakeview Healthcare

Organizational Background

This report presents the results of the study of Lakeview Healthcare (LHC) and its experiences implementing Lean. Five projects—Bed Flow Value Stream, Lean Hospital (LHC Horizon), Outpatient Medical Records and Patient Flow, Outpatient Electronic Health Records, and Surgeons’ Preference Cards—were selected for study. In addition, we studied two specific process changes implemented at the LHC Horizon to enrich our findings. The case study methods, including the criteria for selection of the projects for analysis, are described in the Introduction to the Case Studies.

To develop this case study, we conducted 67 interviews with a total of 65 individuals. Their roles at the hospital varied, as described in Exhibit 1.1.

| Exhibit 1.1. Interviewees by Type of Participant and Clinical Role (As of September 1, 2011) |
|-------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
|                                                 | Corporate       | Hospital        | Department-    | Other           | Frontline      |
|                                                 | executives       | executives      | level leaders | support         | staff          |
| Physicians                                      | 1               | 3              | 1             | 0              | 1              |
| Mid-level providers                             | 0               | 0              | 0             | 0              | 1              |
| Other clinical staff (including nurses)         | 1               | 4              | 12            | 0              | 7              |
| Nonclinical staff                               | 3               | 6              | 9             | 8              | 8              |
| Total                                          | 5               | 13             | 22            | 8              | 17             |

Description of the Health Care System

An overview of LHC appears in Exhibit 1.2. LHC is a nonprofit, comprehensive health care system. It comprises four hospitals, an ambulatory care center, physician offices, rehabilitation services, long-term care centers, home care services, physical therapy services, and mobile intensive care units. LHC was established in 1998 when four hospitals merged. In the same year, a new chief executive officer (CEO) was appointed and maintained the position through 2011. In 2003, a new executive vice president for health services (now subsumed under the title of president and chief operating officer (COO) was hired and is credited by several other executives and managers with encouraging the addition of Lean to LHC’s quality improvement toolbox.

LHC offers numerous specialty services, with a strong focus on obstetrics. LHC provides neonatal intensive care as well as a wide range of pediatric specialty care through relationships with a children’s hospital in a nearby city. In addition, a cancer program provides cancer patients with access to comprehensive treatment. LHC also has five emergency centers.

LHC has roughly 8,400 clinical and administrative employees and is one of the area’s largest employers. Approximately 2,000 physicians serve as medical staff members, both as employed physicians and community-based physicians with privileges. LHC has been recognized 3 years in a row as the “#1 Best Employer” by a business journal. Staff turnover was only mentioned by one interviewee, a staff person from the Management Engineering Department, who indicated some degree of turnover in the nursing staff and Management Engineering Department. It is
interesting to note that nearly all individuals interviewed had been with LHC for 5 years or longer.

**Exhibit 1.2. Lakeview Healthcare**

Lakeview Healthcare (LHC) is a nonprofit, comprehensive health care system on the Eastern seaboard. It consists of four hospitals (over 1,000 beds), an ambulatory care center, physician offices, rehabilitation services, long-term care centers, home care services, physical therapy services, and mobile intensive care units. Lean has been implemented as part of a larger set of tools and initiatives to ensure quality and outstanding patient experience. It is viewed as an organization-wide initiative and part of a larger quality improvement strategy that predates Lean.

A new chief operating officer (COO) was a driving force in LHC’s adoption of Lean as a means to reduce waste. LHC tasked its internal management engineers to launch and implement Lean. The management engineers began to implement projects (or “Kaizen events”) within different areas of the organization. A Kaizen event brings employees together from various departments to examine a problem, propose solutions, and implement changes.

To implement Lean, the leadership first assessed what tools were missing from their toolbox to be able to achieve their goals in terms of people, process, and strategy. Lean was selected as a complement to Six Sigma to address an identified gap in tools targeting process goals. Senior leaders worked with an external process improvement consultant and LHC’s management engineers to identify potential projects and collect initial data for those projects.

As part of a multisite study of Lean implementation, we conducted a rigorous comparative case study of LHC and several other delivery systems. At LHC, we selected five Lean projects for analysis. Two projects—(1) Bed Flow Value Stream and (2) Outpatient Medical Records and Patient Flow—were studied retrospectively after the work on the projects was completed, which allowed for longer term outcomes and sustainability issues to be studied. Three projects were studied prospectively as the work on the project was being completed to better understand specific project implementation strategies. Two of the prospective projects were not fully implemented or completed during the study period—Outpatient Electronic Health Records and Surgeons’ Preference Cards. The third prospective project was a study of the construction of a hospital using Lean principles. In addition, we studied two specific process changes implemented at LHC’s new Horizon Hospital to enrich our findings. A total of 67 interviews were conducted with 65 staff members at various levels in the organization between December 2009 and September 2011. Data were collected during three site visits through digital diaries recorded by Lean project participants and through phone interviews.

As part of Lean implementation and related efforts, interviewees reported that LHC has experienced improvements in organizational culture, employee satisfaction, and efficiency. Executives report a $29 million return on investment since 2000 when use of the external consultant’s process improvement toolkit began. A portion of that return on investment can be attributed to Lean, which was introduced in 2003.

The LHC case highlights the importance of aligning Lean with the organization, having supportive and visible leadership, and including a multidisciplinary team in Lean projects. This case also points to the need for resources—specifically staff time, data, information technology, and Lean expertise—to implement and sustain Lean.
In 2009, LHC acquired a series of physician practices and consolidated them into a medical group (called in this study “LHC Medical Group”), which employs approximately 200 physicians from various specialties, including family medicine, surgery, and oncology. In addition, LHC’s hospitals employ 130 hospitalists (physicians who specialize in treating inpatients) across the four locations. An additional 1,670 community-based physicians who are not employed by LHC receive privileges to practice at its hospitals and other care facilities (see Exhibit 1.3).

Despite its large size, executives and other interviewees indicated that the structure of LHC was relatively “flat.” Although leadership staff for the hospital, LHC Medical Group, and ambulatory care center report directly to the COO of the organization, individuals at all levels have access to senior staff.

LHC employs an extensive rewards system for staff performance. Hospital leadership bestows “Wow” Awards on individual staff members who go above and beyond the call of duty. When an individual receives five “Wow” Awards, he or she can turn them in for a $25 gift card. Individuals and teams are nominated and awarded “STAR Awards,” which are likened to the Grammy Awards. LHC also offers monetary awards and end-of-year bonuses to staff, including management, directly tied to performance according to the five points of the star. Executives and management can receive a 10 to 40% incentive based on the five points of a cultural transformation initiative, which are the basis for setting management goals and objectives.

### Exhibit 1.3. Characteristics of LHC (All Hospitals)

<table>
<thead>
<tr>
<th>Factors</th>
<th>LHC Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational experience with Lean at initiation of study</td>
<td>Some experience</td>
</tr>
<tr>
<td>Geographic location</td>
<td>East</td>
</tr>
<tr>
<td>Region density</td>
<td>Small urban</td>
</tr>
<tr>
<td>Special organization designation</td>
<td>N/A</td>
</tr>
<tr>
<td>Hospital beds (in each location)</td>
<td>Hospital 1: 188</td>
</tr>
<tr>
<td></td>
<td>Hospital 2: 433</td>
</tr>
<tr>
<td></td>
<td>Hospital 3: 368</td>
</tr>
<tr>
<td></td>
<td>Hospital 4: 95</td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>No</td>
</tr>
<tr>
<td>Physician employment model</td>
<td>Mixed (staff/employed and community-based with privileges)</td>
</tr>
<tr>
<td>Use of an external Lean consultant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Description of the Health Care Organization

Case 1 study included projects implemented at several hospitals, an ambulatory care center, and the physicians’ offices as described in Exhibit 1.4.
Exhibit 1.4. Description of Hospitals Studied in LHC

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Number of beds</th>
<th>Specialty services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 4</td>
<td>95</td>
<td>Emergency services, surgical services, acute care for elders (ACE), palliative care, wound care, stroke care, diagnostic and treatment advanced technologies (CT/MRI, hyperbarics, teleneurology), gastroenterology, fracture center, rehabilitation care</td>
</tr>
<tr>
<td>Hospital 1</td>
<td>188</td>
<td>Spine care, joint replacement surgery, stroke care, surgical services, cardiovascular care, interventional radiology, orthopedics, total joint replacement, oncology, emergency care, chest pain center, and intensive care</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>433</td>
<td>Stroke care, oncology, radiation oncology, orthopedics, surgical services, total joint replacement, spine care, emergency care, cardiac care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognized by Centers for Medicare &amp; Medicaid Services (CMS) as a National Best Practice Hospital for the treatment of pneumonia patients and for excellence in the prevention of surgical infections</td>
</tr>
<tr>
<td>Hospital 3,* pre-May 2011</td>
<td>295</td>
<td>Family-centered labor, delivery, and postpartum care; Level III neonatal intensive care unit; pediatric intensive care unit (PICU); stroke care through primary stroke Center; Children and Adolescent Rapid Evaluation Service (CARES) unit</td>
</tr>
<tr>
<td>Hospital 3, post-May 2011</td>
<td>368</td>
<td></td>
</tr>
</tbody>
</table>

*This hospital was replaced by a new facility in May 2011.

Also included in our study was a comprehensive LHC Outpatient Medical Facility serving a different city and surrounding communities. The Outpatient Medical Facility offers primary care, dental care, and a variety of specialized care. All physicians there are community-based and not employed by LHC.

Finally, we also studied LHC Medical Group, which includes both primary and specialty care physicians’ offices. Physicians who are part of the growing LHC Medical Group are employed physicians of LHC. As of May 2011, there were 32 medical groups, employing about 200 physicians.

Other Environmental Context

Local Competition

LHC operates in a very competitive market. However, one corporate executive noted that about one-half of competing hospitals show a negative profit margin; for example, a previous competitor shut down in March, which added business to the Emergency Department at Hospital 4. Many interviewees noted that LHC needs to remain competitive, and that competition increases the need for high patient satisfaction scores and efficient processes, both of which are targets of the Lean projects.

Funding and Payers

Executive-level interviewees noted that outside stakeholders (e.g., payers—including insurance companies, vendors, etc.) understand LHC’s quality improvement initiative, which includes Lean
and Six Sigma, and noted that it is a positive direction for the organization, but these stakeholders play no other role. Blue Cross Blue Shield attended a report-out of quality improvement (QI) activities (including Lean and Six Sigma) at LHC, and LHC has involved payers in projects related to denials and claims issues. It does not receive incentives from its payers for their involvement with Lean. Nearly 50 percent of its revenue comes from commercial payers, followed closely by Medicare at roughly 46 percent. Medicaid makes up the remaining 4 percent of revenue. One executive noted that the payer mix has remained stable over time.

**Lean and Quality Improvement at the Organization**

In this section, we discuss the history of both Lean and quality improvement at LHC. Exhibit 1.5 outlines the overall timeline. The specific activities noted in the timeline will be discussed throughout this report.

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1 Six Sigma is a process-improvement technique that seeks to improve the quality of process outputs by identifying and removing errors and minimizing variability.
### Exhibit 1.5. Chronology of Quality Improvement and Lean at LHC

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp up</th>
<th>Implementation</th>
<th>Study period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarters</td>
<td>'00</td>
<td>'01</td>
<td>'02</td>
</tr>
<tr>
<td>Case study data collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of QI &amp; concurrent QI activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural Transformation Initiative commenced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consulting firm partnership forged</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consulting firm toolkit introduced, Six Sigma launched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction of Lean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative operating margin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New chief operating officer hired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean initiated, added to quality improvement toolkit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean training &amp; projects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 1: Bed flow value stream</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 2: Outpatient electronic health records</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 3: Surgeons’ preference cards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 4: Horizon -- Lean Hospital and related processes*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 5: Outpatient medical records and patient flow</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This project was studied as part of the case study, and findings have been included throughout this report. The project is not described in detail within the text.
History of Quality and Efficiency Improvement Efforts at the Organization

LHC prides itself on having an organization-wide focus on quality and performance improvement. It launched a new initiative in 2000, a blueprint for achieving patient satisfaction that represents the cornerstones of its culture. The cultural transformation initiative came out of a decision made by executives and the Board of Directors to move LHC from being a mediocre performing organization that was formed with the merger of two provider organizations to becoming a high performing system. LHC had been in the 50th percentile in quality, safety, patient satisfaction, employee satisfaction, and financial performance. The cultural transformation initiative was launched to shift its culture to one where patient care became the sole center of everything that was done.

The initiative has five points: excellent service, best people, clinical quality and safety, resource stewardship, a caring culture, and at the center, outstanding patient satisfaction. The initiatives’ goals and accomplishments include transforming the culture to one that promotes trust and openness to encourage conversations about performance and removes bureaucratic barriers for employees and physicians in order to create an outstanding patient experience. To implement the cultural transformation initiative, LHC made several practice changes: standardized business practices, revamped hiring practices, improved departmental team building and ownership, implemented proactive communication around information systems, and leveraged technology to communicate more effectively. As LHC worked towards becoming a high performing organization, they worked with the consulting firm to develop measurable goals and a roadmap for achieving them, which included the use of Six Sigma.

In 2000, the organization began working with the consulting firm on process improvement through Six Sigma projects. The consulting firm, having developed deep expertise in process improvement based on work to improve manufacturing processes, began offering consulting services in process improvement, particularly Six Sigma. As of 2002, LHC observed gains and attributed them, at least in part, to the use of Six Sigma. Based on those initial results, the organization continued to adopt additional process improvement methods from the consulting firm’s Toolbox for quality improvement, including Workout, Change Acceleration Process (CAP), and Lean. All of the process improvement approaches, referred to by staff as “tools,” are centered on the DMAIC principles (define, measure, analyze, improve, and control).

The collective impact of the cultural transformation initiative on the patient experience at LHC has been externally recognized. The organization has been honored twice with the governor's award for clinical excellence and recognized with a leadership award from a national hospital association. LHC is the recipient of multiple awards made by a firm that showcases hospitals chosen by health care consumers for having the highest quality and best image.

Initiation of Lean at the Organization

Corporate executives reported that Lean was initiated in 2003 and, according to a few hospital executives and managers, did not ramp up significantly until 2006–2007 when a large educational program was launched to inform staff about Lean. In 2006, LHC and the consulting

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\(^{j}\) Workout is a gathering of organization stakeholders designed to discuss and take action on major issues.
\(^{k}\) CAP is a technique comprising best practices in organizational change management.
firm cosponsored a week-long International Lean Healthcare Seminar. During that week, five projects were implemented with health care professionals from 18 hospitals and health systems and four countries in conjunction with LHC and other process improvement leaders.

Interviewees noted four factors that influenced the decision to implement Lean in 2003: Lean was viewed as the right tool for the problem, an organizational culture shift had taken place, there were new staff, and operating margins were negative.

**Lean was viewed as the right tool for the problem.** Many staff at the management and executive levels stated the importance of finding the right tool for the problem at hand. Six Sigma was the only process improvement technique (as opposed to general management tools) in use until the consultant group introduced Lean to management at LHC. Many executives and management engineers noted that Lean is a tool for eliminating waste, whereas Six Sigma is a tool for reducing defects and variations in processes. The introduction of Lean allowed LHC to focus attention on reducing waste at an opportune moment, consistent with changes in the organizational culture and financial imperatives (described below).

**An organizational culture shift had taken place.** In 2003, the CEO set organizational goals of becoming a leader in quality, safety, patient satisfaction, and employee satisfaction. These goals motivated staff to strive for excellence in these areas and reinforced the cultural change stemming from the cultural transformation initiative introduced in 2000. Respondents felt the cultural transformation initiative provided a coherent approach for organizing LHC’s approach to Lean—each Lean project must fit into one of the five points of the cultural transformation initiative (best people, caring culture, excellent service, highest clinical quality and safety, and resource stewardship).

"At [LHC]...we have five points to the cultural transformation initiative. Every point of the cultural transformation initiative has a strategic imperative. The engineers know they better get in touch with the executive that will be responsible for the strategic imperatives to make sure that that’s [the project’s] scoped out in terms of how it’s going to be measured and how it’s going to be reported."

"It's not always the hammer that's gonna fix the problem. Sometimes it's a screwdriver, sometimes the wrench, and sometimes you gotta use all three, because that's what the problem dictates."

**There were new staff.** In 2003, a new executive vice president for health services (now subsumed under the title of president and COO) was hired and is credited by several other executives and managers with encouraging the addition of Lean to LHC’s quality improvement toolbox. The new vice president had been exposed to process management techniques in previous positions and through education and promoted the use of additional tools, including Lean. Shortly thereafter, in 2003, the COO hired management engineers to support the Lean work.

**Operating margins were negative.** In 2003, LHC had a negative operating margin for the first time in its history. This development focused the organization’s attention on taking steps to reduce costs, including reducing waste and employing Lean as a tool toward that end.

Motivated by these factors, LHC engaged the consulting firm in a consulting capacity to guide the organization in reviewing what was missing from its toolbox in terms of people, process, and
strategy. The result was the adoption of new tools, including Lean as an organization-wide initiative.

**Conceptualization of and Goals for Lean**

To meet its organizational needs and goals, LHC uses Lean as a mechanism to improve efficiencies and patient experience, according to statements by nearly all interviewees.

Interviewees mentioned at least one of the following goals for Lean: improve efficiency and reduce process time (n=19), improve patient experience (n=7), integrate process improvement into the culture (n=4), and increase clinician time at the bedside (n=2). The organizational goals of Lean varied by type of interviewee as shown in Exhibit 1.6. A handful of frontline staff described the goals of Lean only in terms of the specific Lean projects in which they participated; these goals are discussed later in this case study.

**Exhibit 1.6. Organizational Goals of Lean**

<table>
<thead>
<tr>
<th>Type of interviewee</th>
<th>Aims of Lean (in order of most frequently mentioned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>Cultural integration: process improvement</td>
</tr>
<tr>
<td></td>
<td>Improved efficiency/elimination of waste</td>
</tr>
<tr>
<td></td>
<td>More clinician time at the bedside</td>
</tr>
<tr>
<td>Providers (physicians and mid-level, non-department leaders)</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td>Nurses and other frontline staff</td>
<td>Improved efficiency and reduced process time</td>
</tr>
<tr>
<td>Management engineers and Six Sigma staff</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>Improved efficiency and reduced process time</td>
</tr>
<tr>
<td></td>
<td>Cultural integration: process improvement, transparency</td>
</tr>
<tr>
<td></td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>More clinician time at the bedside</td>
</tr>
</tbody>
</table>

**Improve efficiency, reduce process time, and eliminate waste.** Nearly all staff across all levels of the organization indicated some form of waste reduction as an organizational goal for Lean. However, this was a more prominent goal for the process improvement and frontline staff than it was for executives and physicians. Efficiencies included a better organized space, reduced travel time for staff and patients, efficient patient and staff flow, and reduced process cycle times (e.g., bed turnaround). Notably, none of the participants directly stated that a goal of Lean was to reduce costs or save money but assumed that improved efficiency would lead to that outcome.

**Improve patient experience.** Many interviewees across all levels of staff described improvement in quality of patient satisfaction and experience as a core goal of Lean. Several executives and process improvement staff linked the importance of patient satisfaction and experience to the cultural transformation initiative at the organization.

**Integrate process improvement into the culture.** Two executives and two process improvement staff members noted that organizationally, they hoped the process improvement activities across the organization—including Lean and Six Sigma—would become

“We don’t typically set an ROI [Return on Investment] target and work the other way [to identify changes to meet the ROI]. We say, ‘How can we build the best mousetrap?’ [sic] and we know that the best mousetrap will produce a good or better ROI return. So we work from the operations [target] back[wards].”

—Corporate Executive
a natural part of how the organization does business. As a result, employees facing day-to-day challenges in their work could raise awareness for the need to bring in functional experts in process improvement to help. One hospital executive explained that in this way, staff would participate in and own the changes at the organization. In addition, one process improvement staff member mentioned that awareness of the tools would generate a culture of transparency and reduce blame and judgment.

**Increase clinician time at the bedside.** Finally, two interviewees stated that there is hope that the improved efficiencies could increase clinician time at the bedside, ultimately improving the quality of care provided.

**Alignment of Lean and Quality Improvement Efforts**

At LHC, process improvement and quality improvement are housed in three different corporate departments (Management Engineering/Lean, Six Sigma, and Quality Improvement). The Quality Improvement Department is responsible for the clinical quality outcomes and abstracts and submits the data required by the Centers for Medicare & Medicaid Services (CMS) and by the Joint Commission. Data include clinical process and outcomes data, patient safety data, patient satisfaction data, and other data. The Management Engineering/Lean and Six Sigma departments are largely in charge of process improvement and related training and technical assistance.

The two process improvement departments, Six Sigma and Management Engineering/Lean, are corporate departments that report directly to the president and COO. Management Engineering/Lean began in 2003. The leaders of both departments, together with staff, work in tandem to collect data and identify solutions. Depending on the circumstances, they might also work together to apply a set of tools toward a joint solution. Staff in the Six Sigma Department have varied backgrounds. They spend 3 years in the department and earn a “Black Belt” before moving on to more senior management and executive roles in the organization. Staff in the Management Engineering Department must have specialized engineering education and/or experience. The CEO stated that staff in this department are also considered for leadership roles in the organization.

LHC has overall objectives for Lean, referred to as “Global Golden Objectives,” that are reviewed by the corporate executives on a quarterly basis. The objectives serve as global metrics for monitoring and tracking the success of Lean activities both on a micro level (for project-specific indicators) and on a macro level. The Global Golden Objectives comprise positive financial returns, reduced space utilization, optimization of clinicians’ time to see patients, and reduction of travel distance. The objectives are derived from the cultural transformation initiative’s points. For example, one of the objectives is to reduce travel distance for both staff and patients. By better organizing the location of materials and services and planning the flow of patients and staff, a number of unnecessary steps and walking can be reduced.

Several interviewees reported that the Lean approach was well suited for use in clinical processes (as compared to administrative processes) because it could reduce waste, offer quick results, and involve frontline staff in finding solutions. Other tools, such as Six Sigma, were described as being more rigorous solutions to reducing variation across the organization but taking 4–9 months to achieve returns.
Process for Implementing Lean

Exhibit 1.7 displays the key steps involved in LHC’s Lean implementation process, including project selection, planning, training, project implementation (including how the project and team are structured), monitoring and control, and sustainment of project results. Each of these steps is described in more detail in this section.

**Exhibit 1.7. Overall Lean Implementation Model at LHC**

- **Lean project selection**
  - Hospital staff raise potential projects ideas
  - Corporate executives & mgmt. engineers pick projects

- **Planning**
  - Study department/area to be implemented

- **Training**
  - Lean-Six Sigma curriculum
  - New managers’ training
  - Team training through participation in projects

- **Project implementation**
  - Kaizen event week

- **Monitoring, control, and sustainment**
  - Management engineers work with the project team for 30 days to rollout to department
  - Corporate report out to all of the senior leaders at end of 30 days
  - Team presents the project and outcomes to the senior leaders, 90 days
  - Process owner continues to monitor the project
Lean Project Selection Process

LHC decided to implement Lean using a Kaizen approach. Projects are identified in multiple ways. Hospital executives, managers, physicians, and other frontline staff can raise an issue to be reviewed by the process improvement departments (Six Sigma and Management Engineering). A weekly financial, patient satisfaction, and quality briefing brings together the leadership of all of the hospitals and the management engineers. During those meetings, issues are raised and corporate leadership refers staff to the management engineers and Six Sigma Black Belts to help them with any areas in which they are struggling.

Staff in the Management Engineering Department work directly with the executive vice president of health services (now subsumed under the title of president and COO) to consider how to prioritize projects. To help with this process, the executive vice president and engineers consider the impact that the project would have on the five points of the cultural transformation initiative. It is interesting that none of the interviewees mentioned a project that had been rejected. This might be because of the extensive amount of prework and scoping done to understand the root cause of the problem before beginning a project.

Planning Implementation of Lean

Once a possible project is raised for consideration, management engineering or Six Sigma Black Belt staff might spend 3 to 5 weeks studying the problem to understand the underlying issues. Prework often involves reviewing data and/or observing processes within an area. A few members of the departmental staff are identified by the departmental leadership to support data collection and the planning process. From this information, an assessment template—a tool created by the organization to track the findings from observation—is completed. Included within the assessment template are:

- Vision/goal statement.
- Potential process owner.
- Stakeholder departments.
- Alignment with strategic imperatives or points of the cultural transformation initiative.
- Problem statement.
- Data available.
- Scope/boundaries.
- Key performance indicators.
- Consequences of doing nothing.

Notably, there is no analysis of cost-benefit estimates included within the assessment template: management assumed that improved efficiency would naturally lead to financial benefits. Based on the results of prework and information in the assessment, targeted interventions are proposed to solve the problem. Tools may include CAP, Workout, Lean Kaizen, or Six Sigma. Or the process change might simply be implemented without using a formal project to do so. A meeting is held with the hospital leadership to discuss the recommended approach.
Lean Training

General Lean Training

LHC demonstrates commitment to introducing staff to Lean principles and other process improvement tools. For example, orientation training for new staff includes information about process improvement. In addition, new staff members are made aware of the combined Lean-Six Sigma curriculum and training available to all staff.

New managers—both those new to the organization and those promoted from within—are provided with training called Great Beginnings. As part of the training, management engineers and Six Sigma Black Belts teach a segment on the process improvement toolkit. Managers are expected to earn a Six Sigma yellow belt at a minimum.

Project Team Training

Training at LHC is conducted by internal staff in the Management Engineering Department, sometimes with support from Black Belts in the Six Sigma Department. Training on Lean principles and initiation of Lean projects is fully intertwined.

A new project begins after project planning is completed. Senior leaders at each hospital, including the hospital CEO and vice president of operations, work with department managers to select the team for the Kaizen event. Management engineers and Six Sigma Black Belts can make recommendations about the type of staff to include on the team based on their observations and assessments during the project scoping process. The project team of 5–10 people convenes for a Kaizen event that begins with training. The first few hours of the event are spent on Lean education and introducing staff to Lean and how the Kaizen is going to be run. The rest of the Kaizen event is customized based on the scope of the project, the type of staff participating, and the level of exposure to Lean that the project team has had. The tools to be used are identified in the assessment that is completed as part of planning and prework. Training on the tools is provided as needed while the Kaizen is taking place; in other words, it is “just-in-time” training.

Other Training

In addition to Lean, there is also training available for staff to become certified in Six Sigma at different levels identified with green, yellow, and black belts. Senior managers must become certified in Six Sigma. The Process Improvement Department managers provide the management engineers and Black Belts with advanced training on optimizing Lean techniques and combining techniques on a single project.

Lean Project Implementation

Event Week

At LHC, the Kaizen approach is used to implement Lean when focusing on the work systems or processes that need to be improved. The Kaizen event is, in essence, the Lean project kickoff.

At the Kaizen event, the management engineer introduces applicable tools and concepts to help achieve a successful project; sample tools and activities are shown in Exhibit 1.8.
**Visual display of the many potential causes for a problem or effect.**

**Visual aid or device that promotes safer, more efficient, and less wasteful processes and creates a "status at a glance."**

The length of a Kaizen at LHC ranges from 1 to 3.5 days, and it can be broken into smaller portions, such as 2 hours per day over 5 days. The duration of the event varies depending on the scope of the project and availability of team members. For example, in a small outpatient clinic, the number of staff involved on the project team would require that the clinic shut down. Thus, 2-hour sessions each day for 5 days ensure that patient care services are not interrupted. One or two management engineers and/or Six Sigma Black Belts lead the Kaizen week. At the end of each day, the team reports to the local hospital leadership (e.g., hospital CEO, operations manager, department chiefs) to share the results of the event, including information on initial outcomes and how the project has affected process.

Immediately following the Kaizen, the project team process owner is responsible for implementing the action plan, communicating changes to other staff members in the department who are on the project, and overseeing the changes.

**Lean Teams**

LHC has identified several formal roles for projects, as described here (and depicted in Exhibit 1.9).

**Executive sponsor.** An executive sponsor is assigned to each project team. Generally, the executive sponsor is the CEO of the hospital or the vice president of operations. The sponsor’s major responsibilities include reviewing progress, removing barriers (e.g., getting approvals and resources), introducing the project at report-outs, helping select project team members, and keeping the team focused.

**Management Engineer/Lean leader.** Staff from the Management Engineering Department serve as project team facilitators and trainers. In addition, they conduct the pre-work for the

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### Exhibit 1.8. Kaizen Activities

<table>
<thead>
<tr>
<th><strong>Collect information on the voice of the customer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use tracer methodology to track how a patient moves through the process and aid in the development of value stream mapping</td>
</tr>
<tr>
<td>• Map out the future state of the process</td>
</tr>
<tr>
<td>• Remove non-value-added steps from the future-state process</td>
</tr>
<tr>
<td>• Create spaghetti diagrams to show the pathways staff and patients take to move through the process</td>
</tr>
<tr>
<td>• Prepare a fishbone diagram to examine cause and effect*</td>
</tr>
<tr>
<td>• Use the workout concept to brainstorm problems, and discuss and vote on solutions</td>
</tr>
<tr>
<td>• Implement visual management techniques**</td>
</tr>
<tr>
<td>• Apply the concept of push versus pull (level loading)</td>
</tr>
<tr>
<td>• Learn data-collection techniques and statistical analysis</td>
</tr>
<tr>
<td>• Visit the units where the process will be implemented</td>
</tr>
<tr>
<td>• Create project-specific tools such as Excel spreadsheets to track bed availability or color-coded systems to indicate patient load</td>
</tr>
<tr>
<td>• Make an action plan for implementing in the department</td>
</tr>
<tr>
<td>• Report the results of the project at 30 days</td>
</tr>
<tr>
<td>• Report the sustainment of the project at 90 days</td>
</tr>
</tbody>
</table>

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* Visual display of the many potential causes for a problem or effect.

** Visual aid or device that promotes safer, more efficient, and less wasteful processes and creates a "status at a glance."
project—collecting data and developing an assessment which includes: project goal statement, potential process owner, stakeholder departments, alignment with strategic imperatives or points of the cultural transformation initiative, problem statement, any data available from observation or records, scope/boundaries of the project, key performance indicators, and consequences of doing nothing. They educate team members on Lean tools and measures and on monitoring. Further, they follow up with team progress in the initial months of implementation and may also assist with monitoring activities.

**Process owner.** The process owner is responsible for managing the day-to-day aspects of their Lean project, including overseeing implementation of the action plan, managing data collection, reporting on outcomes to the team, and ongoing monitoring.

**Team members.** In addition to the sponsor, Lean leader, and process owner, each team has approximately two to seven members. Staff at every level, including both clinical and administrative, may participate in a Lean project. In particular, representatives from all departments affected by a project are included on the project team. Further, a few interviewees noted the importance of including proponents and skeptics on the project team for balance. Notably, LHC does not prioritize participation by physicians. The majority of physicians who provide patient care at the organization’s hospitals are affiliated through a contractual rather than an employment relationship, and LHC does not compensate them for the time that would be required to participate. As a result, relatively few physicians are on Lean project teams; instead, physicians are consulted at critical points in the project.

### Monitoring, Control, and Sustainment

After the Kaizen event, including training and project implementation, the management engineers work with the project team for 30 days. Over this period, the team rolls out the change to the department and implements the action plan. The action plan serves to keep the team accountable; the process owner is responsible for ensuring that the items in the action plan are completed. Many project teams continue the Kaizen-week routine of reporting progress to local hospital leadership at the end of each day. Adjustments may be made during this time as part of continuous improvement. At the end of the 30-day period, a corporate report is sent to all senior leaders across the system.

Monitoring activities vary widely by project, but the most successful include ongoing daily meetings or communication about the project. For example, for a project tracking bed flow, an email to all of the nursing floor, housekeeping, and emergency department managers goes out every morning and afternoon announcing the “state of the house” or number of open beds.

After the 30-day report, the project enters what LHC terms the “control” phase, the goal of which is to sustain the changes brought about through the Kaizen. Then, 90 days after the Kaizen week,

<table>
<thead>
<tr>
<th>Lean project role</th>
<th>Typical job title/role(s)</th>
<th>Number staff interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive sponsor (1-2)</td>
<td>Hospital COO, VP of operations, or VP of patient care</td>
<td>n = 14</td>
</tr>
<tr>
<td>Management engineer/Lean leader (1-2)</td>
<td>Management engineer, Six Sigma Black Belt</td>
<td>n = 7</td>
</tr>
<tr>
<td>Process owner (1)</td>
<td>Director or manager of operations in the department</td>
<td>n = 6</td>
</tr>
<tr>
<td>Team members (5-7)</td>
<td>Department managers, nurses, physicians, housekeeping, IT personnel, administrative support staff</td>
<td>n = 22</td>
</tr>
</tbody>
</table>
the team presents the project and outcomes to the senior leaders across the corporation. At this point, the project is officially completed; but some projects will continue to be reported on for as long as 6 months to provide information on how outcomes have been sustained. To allow Six Sigma and Management Engineering staff to support ongoing implementation of new Lean projects, there is a clear handoff to the process owner who must continue to monitor progress. Several interviewees at all levels noted that projects incorporating physical changes, technological changes, and changes to the communication process that require daily meetings and/or emails are more likely to be sustained than are projects that do not employ any of these changes as part of their process. To help keep staff motivated after the formal project process has ended, some project team members planned to hold a 1-year anniversary party.

**Dissemination and Spread of Findings**

*Spread of Knowledge and Findings Across the Organization*

To implement new processes on a particular unit, the Lean project teams shared with their fellow staff members what they had experienced. The Bed Flow Value Stream projects started in one unit, initially on one floor. The project teams used PowerPoint presentations to communicate the process and outcomes of the project to the unit staff. The project team answered questions from the unit staff, and then the process was rolled out on that unit. Every 3 to 5 days over the course of a month, the project team rolled out the process to new units. At Hospital 2, staff worked to break down silos that existed within the hospital by sharing information about the patient census on each floor every morning and evening. One corporate executive noted that not all projects can be replicated and standardized for critical nodes (i.e., a point at which pathways in the process intersect) if the solutions across units, floors, or hospitals are not congruent. Identifying those critical nodes is vital to encouraging standardization and to seeing where compromises can be made.

Although it was not linked to Lean, the new electronic health record (EHR) was introduced to staff in the outpatient physicians’ offices through group trainings. Some physicians were given one-on-one training. One physician executive explained that until staff actually begins using the new technology or process, they might not be able to identify all of the problems or concerns and instead might “learn as you go.” However, this was not the case for the Lean projects that we implemented and studied as part of this research, since the processes were tested in advance of wider dissemination and rollout.

More than 40 Kaizens have occurred since 2006. Given the level of Lean spread within the organization, executive staff and process improvement staff noted that they have seen Lean and other process improvement activities occurring in a more organic fashion across the hospital. LHC disseminates and promotes findings from Lean projects across the organization by sending monthly reports of process improvement activities and projects to corporate and hospital executives. Process improvement staff also share what they learned from similar projects or activities when a process is being replicated, furthered, or customized at a new location.

“I think you just have to be very, very clear, otherwise what will happen to you is you’ve got managers that will say, ‘I’m different. Everybody else is the same. See, you gotta treat me differently.’ So you’ve gotta really focus on what are the nodes of the critical pathway that is truly critical to the optimization of the process.”

—Corporate Executive
External Dissemination

The executive leadership of the organization, particularly the CEO, stated that they felt an obligation to share their findings and experiences widely, not only so others can learn from their experiences but also so they can get different viewpoints. A number of avenues have been used to share findings externally:

- A 2006 week-long International Lean health Care seminar implementing five projects with health care professionals from 18 hospitals and health systems and four countries.
- Meetings for outside organizations to hear reports from executives on different process improvement projects.
- Travel by executives to Scotland to share Lean activities with the National Health System.
- Promotion by the architecture firm that worked on Lean to disseminate how the firm uses the Lean tool.
- Presentation by a management engineer and two frontline staff (at the suggestion and with the support of executive hospital sponsors) on the Bed Flow Value Stream at the Institute for Healthcare Improvement (IHI) and the GetWellNetwork Users Conference.

Lean Projects Studied

At LHC, we selected five Lean projects for study as shown in Exhibit 1.10.

<table>
<thead>
<tr>
<th>Project</th>
<th>Facility</th>
<th>Data collection design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Flow Value Stream</td>
<td>All four inpatient hospitals</td>
<td>Retrospective</td>
</tr>
<tr>
<td>Outpatient Medical Records and Patient Flow</td>
<td>LHC Outpatient Medical Facility</td>
<td>Retrospective</td>
</tr>
<tr>
<td>Surgeons’ Preference Cards</td>
<td>Operating rooms of all four inpatient hospitals</td>
<td>Prospective</td>
</tr>
<tr>
<td>Outpatient Electronic Health Records</td>
<td>Initially Family Medicine Practice, later some of LHC Medical Group primary and specialty care offices</td>
<td>Prospective</td>
</tr>
<tr>
<td>Lean Hospital- Horizon*</td>
<td>New facility for one of LHC’s hospitals</td>
<td>Prospective</td>
</tr>
</tbody>
</table>

*This project is discussed in a separate case study.

Two projects—Bed Flow Value Stream and Horizon (the Lean Hospital)—were large-scale projects that required resources from across an entire hospital and, in the case of the Bed Flow Value Stream project, across the health system. As the work on the project was being completed, three projects were studied to better understand how the team approached project implementation and what factors lead to implementation successes and challenges. Two of the prospective projects, however, were not completed during the study period—Outpatient Electronic Health Records and Surgeons’ Preference Cards. The third prospective project, Lean Hospital, was a study of designing a hospital, here called Horizon, using Lean principles; this project is presented in a separate case study. We studied two specific process changes implemented at Horizon to enrich our findings.

This report of Lean projects is organized by the scope of the project (large-scale projects or department-specific projects) and the stage of the project.
Cross-Cutting Project

One cross-cutting project was studied. Information on the retrospective study of the Bed Flow Value Stream projects is presented.

Bed Flow Value Stream Projects

Brief description of the project and project goal. The goal of the projects that made up the Bed Flow Value Stream was to reduce bed turnaround time so that a bed is ready for a new patient as soon as possible after an inpatient is discharged. As a frontline interviewee put it, the goal was to “simply shorten the amount of time that a bed is out of service” and reduce the time patients spend waiting for a bed. The projects from part of this value stream were implemented during December 2007–July 2009.

Description of department/unit where implemented. The Bed Flow projects took place at all four hospitals in the system. They were implemented independently at each hospital, with different staff at each location, rather than as a single system-wide project. Hospital 1 began implementing the project in December 2007, followed by Hospital 2 in mid-2008, Hospital 3 in March 2009, and Hospital 4 in June 2009. Hospital 1 repeated the project in July 2009.

- Hospital 1 has 188 beds with a concentration in surgical specialties and invasive cardiology.
- Hospital 2 has 433 beds and is a full-service community hospital. Its Emergency Department (ED) sees about 77,000 patients per year.
- Hospital 3 is a community hospital that, at the time, had 295 beds with a primary focus of serving mothers and babies and a great deal of medical–surgical work. Hospital 3’s medical–surgery occupancy rates ranged from 99 to 102 percent.
- Hospital 4 has 95 beds and is the smallest hospital in the system. About 95 percent of its admissions come through the Emergency Department rather than direct referrals from physicians. The hospital is home to the one of the first acute care units for the elderly in the region and considers geriatrics a niche market for the hospital.

Project selection. The management engineer noted that discharge planning is a major issue in most hospitals that needs to be addressed; another engineer noted that as part of the daily work, it is a clear opportunity for improved efficiency. Hospital staff at Hospital 1 recognized inefficiencies in their processes for bed turnover and the capacity issues that resulted. At Hospital 3, all admissions are through the ED, yielding a high average daily census and creating the need for faster transfer of patients from the ED to an inpatient bed. At Hospital 4, when another area hospital closed, it experienced increased volume, particularly in the ED. A frontline staff person and a hospital executive suggested that the focus on this issue likely came about as the result of frontline staff recommendations and followup by the leadership to bring in process-improvement staff.

Once the overarching issue was raised, leadership called on the process-improvement staff to conduct an assessment to determine where breakdowns in the process were occurring and what potential next steps might be taken; in this case, a Kaizen event was proposed.

Project staffing. The staffing of the Lean project teams for the Bed Flow projects at each hospital was similar but not exactly the same. As with all projects, each hospital’s project
included an executive sponsor, management engineer, and process owner. The process owner in each hospital was a medical–surgical unit administrative director. At least one hospital included three directors as process owners to engage nursing staff on multiple floors. Staff from different floors and departments were selected for multidisciplinary project teams by the executive leadership and department managers, as shown in Exhibit 1.11. In particular, staff from the ED, environmental services, and a few of the medical–surgical units were included on project teams. Only staff involved in the bed flow and discharge process were asked to participate. Thus, at Hospital 4, for example, transportation services staff did not participate because they did not have a role in transferring patients between units.

**Planning and implementation.**
Management engineers’ assessment identified delays in the bed flow process at key points and elucidated opportunities to change the current system from one where patients were being pushed out to the floors from the ED to one where the inpatient units were pulling patients from the ED. At Hospital 1 (first to implement), the Kaizen event lasted 1 week; however, subsequent hospital Kaizens lasted only 3 days. To identify the best process for communicating across so many staff, several tools were used, as shown in Exhibit 1.12.

To improve the communication and speed of inpatient transfer in and out of acute care bed units, the hospitals turned to the patient room closed circuit television system, the GetWellNetwork (GWN). The GWN includes a utility for use by the housekeeping department, called “Click to Clean (CTC).” When a patient is about to be discharged, a unit nurse clicks the option,¹ which informs environmental services that they will soon need to clean the room. The nurse strips the bed and ensures that the patient has all of his/her belongings and does not leave anything behind. At Hospital 3, transport staff were responsible for discharging patients or escorting them out of the hospital, but during peak times, they could not meet the needs in the ED and the inpatient floors. To improve the time it takes to discharge patients, Hospital 3 shifted the responsibility for discharging patients back to the unit

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¹ This is an example of a Lean technique called Kanban, a visual system to trigger action and thereby improve flow.
staff. Once the patient is ready to leave, the nurse clicks another option to tell the environmental services staff that the room is ready to be cleaned. When the room is cleaned and ready for a new patient, an environmental services staff member clicks the option that shows that the room is available for a new patient. Then the nurses can assign the bed and call the ER or operating room (OR) to let staff know the bed is available. Previously, communication about the need for environmental services and bed availability was done by phone, which caused delays. Further, the ER staff or patient flow coordinator had to call around to find beds instead of having patients pulled from the ER onto the floors in a more automated fashion.

The “Click to Clean” system was working effectively immediately after the Kaizen event, but staff wanted more information about what to expect. So the project team developed a new tool: a morning and afternoon “state of the house” that showed the current census in the ED, OR, and on each of the floors. This tool was distributed across all departments. At one hospital, staff would meet to discuss the status of the house, but at another hospital, the information was simply emailed. This information allowed ED staff to know where beds were available so they could admit patients who had been waiting for a bed since the beginning of the day. Staff used this information to help prioritize their work, pointing physicians to where they should focus their time, which was to discharge patients from the inpatient units so that the beds could be opened up for those patients who were waiting for inpatient admission.

Implementing the new process developed in the Kaizen event in all units took 3 to 6 months. The Lean project teams met with the staff of each affected unit to describe the new procedure. The Bed Flow Value Stream projects started initially as a pilot in one unit on one floor. After the process was refined, it was rolled out to other inpatient units. In preparation for implementation on the subsequent unit, the project teams presented to the unit staff the process and outcomes of the project using PowerPoint presentations. The project team answered questions from the unit staff, and then the process was rolled out on that unit. Every 3 to 5 days over the course of a month, the project team rolled out the process to new units and departments using meetings and huddles as learning and training opportunities.

**Monitoring, control, and sustainment.** To create awareness, leaders at Hospitals 1 and 2 continue to use the “state of the house” report to show what is going on in each unit every morning and afternoon. Data on bed turnaround cycle time (i.e., duration from the time the patient leaves the room to the time it becomes available for the next patient) is automatically captured using the Click to Clean system. Leaders of the environmental and transportation service departments monitor the cycle time and, as necessary, provide reminders to their staff or followup on any issues or delays in the bed turnaround time. At Hospital 3, the team created a “what’s working, what’s not working” poster where staff could write feedback.

After the Kaizen event, the project teams continued to meet weekly to roll out the project across the hospital. During this meeting, weekly reports on project status were given. After 30 days had passed, the project team reported to the leadership on the outcomes as part of the regular report-outs to executives.

One management engineer noted that the management engineers were less involved in followup after the 30-day report-out. The process owners continued to monitor how the process was working and to address issues as they came up, but no mention was made that anyone looked at specific data on a regular basis as part of ongoing monitoring. The Environmental Service
Department leaders continued to monitor the time between discharge and bed turnaround and report on progress to their staff.

**Project outcomes.** LHC staff reported that the Bed Flow Value Stream projects affected organizational culture, employee satisfaction, efficiency, clinical process assessment, patient experience, and dissemination of findings. The project outcomes are discussed in greater detail in Outcomes of Lean section of this report.

**Organizational culture.** The frontline staff from the Bed Flow Value Stream projects all agreed that having a multidisciplinary team with staff from several departments was vital to the success of the project. Further, they believed that this created improved communication and understanding across the units.

**Employee satisfaction.** A few frontline staff stated that they liked being able to control and contribute to their workplace environment by introducing improved processes. For example, on the Bed Flow Value Stream project, nurses began identifying trends in patient flow through their unit and responding to them, reducing anxiety about not being in control of patient flow. The frontline staff members on the Bed Flow Value Stream project at Hospital 2 reported how exciting it was to receive recognition from other departments and from the corporate office for their cultural transformation initiative.

**Efficiency.** Nearly half of interviewees reported on efficiency gains on the Bed Flow Value Stream project. At Hospital 4, frontline staff and hospital executives reported that the average time a patient had to wait in the ED after the order for admission was written until he/she was transferred to an available bed decreased by 28 minutes, down from 194 minutes. Further, at Hospital 4, beds are now required to be cleaned within 30 minutes. At Hospital 1, with the exception of a few cases (e.g., isolation rooms), beds were cleaned within 45 minutes. Hospital 3 reported that they initially had a patient cycle time of 278 minutes. The team saved 46 minutes discharging inpatients; time from discharge instruction to patient departure is now 10 minutes instead of 56 minutes. Hospital 3 saved 32 minutes (from 87 minutes to 55 minutes) by reducing the time between bed assignments and getting a new patient into the room. An additional 25 minutes was saved (from 45 to 20 minutes) by reducing delays in assigning patients to available beds. At Hospitals 2 and 4, two frontline staff and two hospital executives reported fewer calls being made to nurses about the availability of rooms; staff at Hospital 4 quantified the reduction at 50 percent. Finally, one environmental staff person noted that the automated system allowed for faster response times and identification of delays and other issues.

**Clinical process assessments.** Little information on clinical process assessments was available; however, one frontline staff member stated that patients were less likely to be left unattended in the ED because of the improved patient flow. A negative outcome of the faster transfer of patients from the ED to the inpatient floors became apparent over time at Hospital 3. Because of the format and length of the written report from the ED, inpatient nurses weren’t able to find and read the clinical information describing the patient’s status before the patient was transferred to the inpatient unit. A new process was implemented to share vital information about the patient sooner, using oral reports. In addition, the nurses worked to streamline the written report.

**Patient experience.** The improved discharge process as a result of the Bed Flow Value Stream projects had a direct impact on patient experience scores. The Press Ganey patient satisfaction
survey asks specifically about how the inpatient discharge process went. At Hospital 3, patient satisfaction for this measure was around the 16th percentile before the Bed Flow project, and after the project, it was around the 97th percentile. At Hospital 1, a management engineer noted that although the patient volume is ever-increasing, they are able to maintain the patient satisfaction score at 95 percent.

**Dissemination.** A management engineer and two frontline staff attended and gave a presentation on the Bed Flow Value Stream at the Institute for Healthcare Improvement (IHI) and the GetWellNetwork Users Conference.

**Department-Specific Projects**

In addition to the two cross-cutting projects, we also studied an outpatient clinic project.

**Outpatient Medical Records and Patient Flow**

The outpatient medical records and patient flow project took place at an outpatient medical facility where providers see 80 to 100 patients each day. The practice directly employs three doctors and two nurse practitioners. The goal of this project was to create a new process for medical records flow to ensure that (1) patient charts could be easily located before a patient visit and promptly filed after the visit, (2) lab results would be inserted into the charts in advance of patient visits, and (3) the space in a small medical records room would be used more efficiently.

A nurse at the clinic nominated this project for consideration based on her assessment of inefficiency in the record-keeping system. After a physician saw a patient, the patient’s record would be placed in a pile that was not organized, resulting in a backlog of over 1,000 unfiled records. Further, files were not signed in or out, so no one knew where a file was or who had last taken it out. Over time, it became ever more challenging to find files.

The project was staffed by members of the clinic staff as shown in Exhibit 1.13.

The process owner was the nurse who recommended the project, and an individual from the Management Engineering Department was the Lean leader. Additional clinic staff—including the physician leader—were also on the project. Other physicians were not formal members of the team but were kept up to date, and they were asked for their input on the process.

The management engineer began gathering initial data as part of project planning and preparation in December 2007. The 3.5-day Kaizen event was held in February 2008 and began with training on Lean tools and concepts. The steps or activities implemented by the project team and the Lean tools used are described in Exhibit 1.14.

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As a result of the project, the team made several infrastructure changes to assure that medical records staff and frontline staff could better communicate and keep the files sorted properly. For example, front desk staff were responsible for pulling and/or requesting charts as patients arrived for their visits, but they were unable to find charts and keep the patient appointments running on time while managing their other duties, particularly responding to and triaging phone calls. To address this problem, the phone systems were changed to allow medical records and front desk staff to work together more effectively and prevent the front desk staff from being overwhelmed by phone calls. The automated phone message tree was adjusted to route calls more effectively throughout the practice without requiring staff to pick up the phone and transfer callers to the requested department or extension. A new cart was built to allow clinical staff to file patient charts near the exam rooms in alphabetical order once the patient had been seen. This further facilitated accurate filing in the records room.

Several positive outcomes resulted from the project. There was a significant reduction in transferred phone calls. The team expected to see a 40 percent increase in patient satisfaction; however, they did not have an adequate sample size to detect differences in patient satisfaction scores. The management engineer who facilitated the project reported that the in-house survey, unlike the Press-Ganey survey that is used at the hospitals, was not mailed to patients and likely resulted in lower survey completion rates. As a process measure, staff calculated the time it took to locate five charts and reduced search time from 50 minutes to 3 minutes over the course of the project. With the new cart and filing process, the time it took to file charts after patients were seen was reduced from 90 to 20 minutes. A physician noted that the improved handling of charts meant that information like lab reports was available in the chart when he entered the examination room, and he no longer had to step out to obtain the results. This reduced the patient’s wait time. Frontline staff reported that these efficiency gains led to increased physician productivity and patient volume, but they did not provide data to support these observations. In addition, interviewees reported greater unity among the clinic staff.

Some additional changes to the process were made as issues arose. For example, a year after completing this Patient Flow project, an unfavorable shift in patient satisfaction scores led to a followup project to adjust the phone tree. Staff realized that they were receiving and having to triage more calls to the appropriate line. Ultimately, they came to understand that patients were pressing the option to be sent straight to the operator before listening to all of the options in the phone tree. The subsequent process improvement to address this issue offered patients fewer choices, in hopes that it would encourage more patients to listen to their options rather than
asking to be transferred to an operator, once again reducing calls to the front desk staff. No formal monitoring process was mentioned by the project team. However, frontline staff noted that the process is still in place and working effectively.

**Projects Started But Not Fully Implemented**

Two prospective projects were scoped, and prework on the projects had begun; however, they were not fully implemented during the 1-year study period. As such, there is nothing to report on the monitoring, control, and sustainment processes, and there are relatively few outcomes for these two projects.

**Outpatient Electronic Health Records**

This project was intended to improve patient flow and processes in an ambulatory care practice by effectively implementing an electronic health record (EHR). Staff expected that the project would result in more efficiently organized physical space and more efficient use of the time clinicians spent with patients during office visits. Initially, the project was to take place at a family medicine practice and then be replicated in other LHC Medical Group practices. The family medicine practice is one of 32 primary and specialty care practices that make up the LHC Medical Group. Physicians are employed by LHC. As of May 2011, the 32 groups employed about 200 physicians. The family medicine practice had three physicians on staff and was selected as the initial site because of inherent structural issues in the clinic and room layout, as well as the small size of the practice.

The senior leadership, including executives of LHC Medical Group, wanted to implement this project to make sure that the practice’s processes were as efficient as possible before introducing the new EHR technology. A management engineer stated that leadership wanted to focus on the physicians’ offices because not much process improvement work had been done, and there were recently acquired offices that would benefit from the expertise available through LHC.

A management engineer and a Six Sigma Black Belt worked together to implement this project and collected observational data at the family medicine practice as part of the initial assessment to prepare for the Kaizen event. The process improvement staff worked with the practice manager and administrator to identify staff to participate in the Kaizen event. In addition, they included participants from other LHC Medical Group medical practices to increase the chances that the solution would generalize to other offices. Process improvement staff suggested using a Design Kaizen tool to plan for the changes and adjust the necessary processes. Design Kaizen differs from Kaizen because staff cannot implement the planned process, in this case the EMR, but can plan the process. In this way, staff would adjust to the new process before the EHR was implemented as part of a fuller Kaizen event and Lean project to come later.

Other offices began implementing the EHR before the family medicine practice project began, and these other offices ran into some challenges. Thus, the family medicine practice project was re-scoped to encourage participation of staff from practices that had already implemented the EHR and could provide feedback and insights on potential solutions. Several delays in implementation of the Lean project caused it to remain on hold, although the EHRs were still being rolled out to other LHC Medical Group physicians’ offices.
The Surgeons’ Preference Card project was part of a larger process transformation of the operating rooms’ information systems. Surgeons’ Preference Cards are used to draw equipment and supplies before surgery, check for lost objects before closing out surgery, and charge after surgery. At each hospital, there were between 1,200 and 2,800 preference cards, each with an average of 40 items. The goal of this project was to update the surgeons’ preference cards and define a standard process for managing surgeons’ preference cards through their life cycle. The project focused on the surgical departments at all four hospitals and was also intended to facilitate better communication between the hospitals and the surgical practices that schedule surgeries and conduct followup appointments with patients.

LHC bought its first operating room (or surgical) information system (IS), in 1995; there were plans to replace it in 1999. However, the system was never replaced as it was considered a stable system. Notably, three of the four hospitals worked on this system, and a fourth worked on a different system. This was because the hospitals merged in 1998 to become LHC. In 2008, the corporate leadership decided to purchase information systems for all LHC hospitals from the same vendor in order to streamline vendors and make all information systems compatible systemwide.

The new IS, however, did not meet the needs of the surgical staff, even though it performed well in other areas. Hospital and corporate leadership agreed to let the surgical departments at the four hospitals pick a new system, with the understanding that a software interface would be necessary to ensure that it could communicate with other LHC ISs. From 10 to 20 of the clinical and management staff—including anesthesiologists, information technology (IT) staff, administrative support, and nursing leaders—came together as stakeholders. Although anesthesiologists participated, the surgeons did not. The process owner explained that only anesthesiologists would need to work in the new system, and other surgeons would not need to access the system and thus did not need to be included in the selection or process redesign.

The participating stakeholders brainstormed what they wanted from a system and how they would evaluate the options. They narrowed the options to three systems for pilot testing. A Hierarchy Task Analysis (HTA) was used to specify all of the tasks performed in the surgical suites. The candidate surgical ISs were evaluated with respect to their ability to support these tasks. Then, the management engineers created a Space Relation Diagram that plots the movement of each person during an activity. This tool helps to identify the frequency with which a person doing a specific task within the process goes to a specified location and when and where there are crowds or traffic during the process. Changes to the physical layout or location of tools and technology can then be identified to reduce crowding.

Once the new system was selected, the process improvement team began implementing a process transformation approach to identify key areas for change. The approach employed stakeholder meetings, 15–16 focus groups with diverse staff for brainstorming, failure mode effect analyses, prioritization of opportunities (based on the analyses), a focused assessment of processes, and finally, implementation of process improvement. Surgeons’ Preference Cards was one of eight key areas assessed. Many were not being used or were out of date because surgeons had left or new technology had replaced the specified equipment and supplies on the card. Of the other key activities assessed, several activities related to scheduling and preadmission testing were
prioritized over and above supply and inventory management under which the Surgeons’ Preference Card project fell. Ultimately, this meant that the Surgeons’ Preference Cards project was not a focus of the staff because of the priorities for completing process improvements around scheduling and preadmission.

In May 2010, a small group including process improvement staff, an assistant nurse manager, a system administrator, and a clerical coordinator (see Exhibit 1.15) gathered to develop a design. The purpose of the Design Kaizen was to define the standard process for managing surgeons’ preference cards through their life cycle to keep up with surgeons’ evolving preferences. Because staff were unable to test ideas and make in-time changes to the yet-unimplemented technology, a followup Kaizen implementing the planned process with the technology in place was the next step in the process.

Barriers to the Lean project implementation (discussed in greater detail in the next section, Factors that Influence Success of Lean Implementation) were related to prioritization of other key issues, including scheduling, which were felt to yield greater, higher priority returns. As issues continued to come up with the surgeons’ preference cards, the management engineer on the project reported that the process would eventually be revisited, and a Kaizen would be done to implement the proposed process; however, the timeline for implementation was uncertain. Thus, this project was not fully implemented during the 1-year study period, and there is nothing to report on the monitoring, control, and sustainment processes and only minimal information related to project outcomes. As part of the larger value stream of projects that included the Surgeons’ Preference Cards, the management engineer reported improved patient safety as a result of building checklists into the computer system, which could be used as a communication and debriefing tool.

### Outcomes of Lean

In this section, we discuss the outcomes of the Lean initiative at LHC based on interviews with staff and materials provided by the organization. Overall, respondents experienced gains in efficiency, cultural change, and patient experience and moderate improvements in routinization of Lean, employee satisfaction (including from an ongoing staff survey), and patient safety.

Executives, managers, and frontline staff reported that they experienced significant benefits in terms of culture change and were able to provide statistics indicating improved efficiency as the result of the Bed Flow Value Stream project. Executives reported that specific gains occurred in the patient and employee satisfaction surveys, which they attributed to Lean. LHC did not analyze return on investment from Lean projects or the overall initiative.

The discussion of Lean outcomes in this report is organized into two major categories based on our conceptual framework: intermediate outcomes and ultimate outcomes (see Exhibit 1.16).
Intermediate outcomes include culture change, employee satisfaction, change in Lean knowledge and skills and Lean routinization. Ultimate outcomes include impact on efficiency, patient satisfaction and experience, clinical process and outcomes assessments, and patient safety.

**Intermediate Outcomes**

In our conceptual framework, intermediate outcomes refer to organizational culture, employee satisfaction, increased Lean knowledge and skills, routinization of Lean, and dissemination of Lean, both within the organization and externally. These intermediate outcomes are, in turn, linked to ultimate outcomes—efficiency, value, and quality—as defined in the conceptual framework and discussed in the next section.

**Organizational Culture Change**

About a third of interviewees noted significant changes in organizational culture. Interviewees at all levels of the organization indicated that Lean had improved teamwork and camaraderie and encouraged and mobilized staff to achieve better outcomes.

**Improved teamwork and camaraderie.** Ten interviewees—from all levels of the organization—described the culture of LHC as one of transparency, honesty and trust, and teamwork. Several interviewees noted that LHC leadership creates opportunities to discuss issues in an open forum and asks for advice on improvements. One department manager explained that there is a strong commitment to creating a no-blame culture, which is carried out by adjusting processes to ensure positive outcomes. It is important to staff that the processes are ingrained to improve patient care. Transparency is carried through to outside the system by frequently allowing other health care organizations to visit LHC and observe the cutting-edge work there. Lean has produced a sense of global awareness across hospital departments and an intradepartmental camaraderie. Two hospital executives noted that Lean had improved the relationships of staff across different floors and roles, resulting in mutual appreciation of the work each department does and improved patient care. A few hospital executives applauded the growth in relationships across different floors and the positive effect on patient care and employee satisfaction.

Frontline staff reported improved teamwork as the greatest gain from Lean training and participation. Many staff

*Exhibit 1.16. Outcomes by Category*

<table>
<thead>
<tr>
<th>Intermediate Outcomes</th>
<th>Ultimate Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Culture change</td>
<td>• Clinical process or outcomes assessment</td>
</tr>
<tr>
<td>• Employee satisfaction</td>
<td>• Efficiency</td>
</tr>
<tr>
<td>• Lean knowledge and skills</td>
<td>• Patient experience</td>
</tr>
<tr>
<td>• Lean routinization</td>
<td>• Patient Safety</td>
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“And, you know, that’s one of the things that I like, you know, how people get educated and they, they gain a better appreciation for the interactions between departments or between functions, when they’re involved in these Kaizen projects or Workouts or whatever, so that they can understand how, when you adjust this lever, it doesn’t just impact here, it impacts over there. So they do gain that education and appreciation.”

—Hospital Executive

“I may work in the ED, you may work up in the telemetry floor, and it’s different if I don’t really know who you are, and you’re just a voice on the phone; but when I [make] eye contact, and I just spent 3 days with you and we’re informally talking about what you did last weekend and what you like to eat and...That relationship building, you can’t buy that...It starts getting people to think more globally, so I think that’s very positive.”

—Hospital Executive
reported how bringing together employees from “all walks” of the organization’s operations in teams to work on a Kaizen event positively affected interactions among staff as well as operations. The frontline staff from the Bed Flow Value Stream projects all voiced their appreciation for information-sharing across departments and commented on the sense of respect and understanding of the overall hospital operations.

Two management engineers explained that, in order to anticipate changes that might affect other departments, one of the first steps in the process is identifying and pulling together all of the stakeholders to promote communication and partnership among the different departments. On the Bed Flow Value Stream projects, communication across units about the bed occupancy rates by department eliminated waste and frustration over why certain patients were routed to certain departments. Staff no longer felt the need to horde beds and did not feel targeted by an influx of new patients because they could see how their work impacted the hospital census at large.

Quick success begets engagement and further success. Three corporate executives and two hospital executives reported that a fundamental change in the culture at LHC has come about because of the quick turnaround of results on Lean projects. They went on to say how the quick results leading to immediate gratification makes staff more apt to volunteer for Lean projects. A few frontline staff agreed with the executives, affirming that staff felt able to control and contribute to their environment. For example, on the Bed Flow Value Stream project, nurses began identifying trends in patient flow through their unit and responding to them, reducing their anxiety about not being in control of patient flow. At Hospital 3, the frontline staff identified an opportunity to improve reports by the ED nurses to the inpatient staff on patients that were being admitted. Nurses independently began testing approaches to more efficiently convey critical information orally and by using a new form. Although this wasn’t a formal Lean project, they continued trying new ideas and drew upon their experience with rapid tests of change as part of Kaizen events. A management engineer stated that the organizational culture was affected because the process improvements require frontline staff intimately familiar with day-to-day operations to think critically and develop a solution in a short period of time.

The three corporate executives noted above commented that the cultural transformation initiative and the shared mission to produce results has also led to organizational culture change because staff are excited and engaged in doing their part to achieve better outcomes. Lean has provided a path for staff to carry out the cultural transformation initiative that includes resource stewardship as one of the major points. Interviewees reported that hospital-wide awareness among employees about the success of Lean projects excited those that participated and encouraged them to volunteer to participate again in the future. The frontline staff members on the Bed Flow Value Stream project at Hospital 2 expressed how exciting it was to receive recognition from other departments and the corporation through the organization’s cultural transformation initiative award for high-performing teams or projects.

Employee Satisfaction

Staff reported that Lean improved employee satisfaction as evidenced by an increase in reported satisfaction, a low nursing vacancy rate, and employees’ willingness to participate in Lean.
LHC has experienced high employee satisfaction and low vacancy. A hospital executive reported an increase in employee satisfaction of nearly 20 percentage points over 5 years, as measured by LHC’s annual employee surveys. Further, two hospital executives reported that there are no vacant nursing positions; even in a competitive market for nursing staff, all the organization’s positions are filled. Corporate and hospital executives alike attribute this both to the rise in employee control and engagement brought about through Lean and Kaizen events and a new sense of teamwork. One hospital executive was careful to state that employee engagement and satisfaction improvements are “not solely a hundred percent because of Lean,” but might stem from other efforts within the organization that ensure staff have input on their work environment.

**Lean Knowledge and Skills**

Since 2006, more than 40 Kaizen events have occurred throughout LHC. Although a number of tools, concepts, and techniques are introduced to the staff through Lean training, only a few interviewees mentioned increased knowledge or skills as an outcome. Two management engineers and a hospital executive reported that employees have become more resourceful and now apply process improvement concepts and tools to problems as part of their everyday work.

This study of Lean at LHC included two IS implementation projects. A few corporate executives, two hospital executives, and two management engineers agreed that it was important to be proactive and implement process changes in advance of the technical change because additional issues might arise. Redesigning processes prior to IS implementation was not consistently done for all projects, as noted by a management engineer. Although LHC attempted to isolate the two major changes in the projects we studied to allow mastery of process changes before it brought in technology, scheduling issues made this difficult to carry out for at least one of the projects.

**Lean Routinization**

The Bed Flow Value Stream project provides an example of how new processes were embedded into the system at four hospitals using technology, reporting, and new-employee training to create the desired results. Staff reported that the use of new electronic communication systems facilitated the flow of information, freeing nursing time previously used to search for unoccupied beds and improving patient throughput in the ER. Because of the technology, a few frontline staff reported, the hospital’s census has become more transparent and staff have become more aware of the need to turn over beds efficiently to meet incoming-patient demand. The environmental and transportation staff track how quickly beds are cleaned when patients depart and how long it takes to transport patients to the floor. This information has inspired healthy competition among the staff. A frontline employee described how the new Bed Flow Value Stream process has been added to the new employee orientation checklist to assure these redesigned processes are followed consistently by new employees across the hospitals.

“We didn’t appreciate and monitor how dramatically the workload would change with the new information system because of the connectivity issues and didn’t appreciate that we should have redesigned the process before we rolled out, not after.”

—Management Engineer
Ultimate Outcomes

Efficiency

Improving efficiency is at the core of Lean. One of LHC’s key goals was to eliminate waste. Corporate executives discussed how several projects optimized hospital processes to facilitate cost and efficiency savings. The organization was able to report outcomes on a project-by-project basis but could not attribute overall, organization-wide findings directly to Lean, given that several other activities, (e.g., new leadership, a cultural shift with the cultural transformation initiative, and Six Sigma projects) occurred concurrently with the Lean initiative.

Efficiency and quality outcomes are closely tracked at the organization in several ways but not necessarily in dollars saved. Several interviewees at all levels of the organization stated that efficiency gains are reflected in such measurable outcomes as employee and patient satisfaction scores. Below are project-specific Lean outcomes showing improved efficiencies. No efficiency outcomes were reported related to the Surgeons’ Preference Cards project.

Bed Flow Value Stream. Nearly half of interviewees reported that the Bed Flow Value Stream project resulted in efficiency gains in the time needed to discharge patients. At Hospital 4, frontline staff and hospital executives reported reducing by 28 minutes the time between when the ED doctor decides to admit a patient and when the patient leaves the ED for an inpatient bed. Hospital 3 reported substantial reductions in the time required to turnover an inpatient bed:

- 46 minutes saved in the time from discharge instruction until an inpatient leaves the room.
- 32 minutes saved in the time from inpatient departure from the room to reassignment to a new patient.

At Hospital 2, two frontline staff reported that floor nurses received fewer calls from the ED about the availability of rooms. This was also true at Hospital 4, and two hospital executives reported that bed assignment calls were reduced by 50 percent. One environmental staff member at Hospital 3 noted that if a problem in the process occurs, it can be addressed immediately because the system is automated and uses new technology to gather feedback on every step in the process.

Outpatient Electronic Health Records. LHC’s leaders expected and saw a reduction in productivity, especially for clinicians, as a result of implementing the EHR. This is primarily due to the learning curve
associated with implementation of new technology, time to train staff, difficulties in exchanging records with other facilities that have not yet been upgraded to the EHR, and managing older patient records within the new system. To eliminate some of these challenges, a hospital executive reported that they quickened the pace of conversion from hard copy records to electronic records, forgoing the use of Lean to redesign processes.

**Outpatient Medical Records and Patient Flow.** On the Outpatient Medical Records and Patient Flow project at the Outpatient Medical Facility, a management engineer announced that the chart filing time was reduced by 70 minutes after the project was completed, partly because the charts were organized and alphabetized in a cart right after the patients were seen. Further, the time spent looking for charts decreased from 50 minutes for five charts to 3 minutes for five charts. A physician noted that the improved chart-management process meant that information, such as lab reports, was in the charts when doctors went into rooms, and that they no longer had to step out to obtain results. This ultimately reduces the patients’ wait times.

**Patient Safety**

Process changes sometimes, but not always, improved patient safety. A direct outcome of the Bed Flow Value Stream projects at the four hospitals was shorter patient wait times in the ED. One frontline staff member stated that patients were seen faster, and patient risk from being unattended had been greatly reduced. As part of the Bed Flow project at Hospital 3, patients were getting to the inpatient floors so quickly that the inpatient nursing staff couldn’t obtain the patient information they needed (i.e., history, clinical condition) from the ED before the patient arrived. The project team instituted a new practice of getting verbal patient reports and streamlining the written report.

The use of technology meant integrated and improved patient safety processes. The management engineer reported that, as part of the larger value stream of projects that included the Surgeons’ Preference Cards, patient safety improved as a result of checklists that were built into the computer system that could be used as a communication and debriefing tool.

**Patient Experience**

Improved wait times have a positive impact on patient satisfaction and experience. The frontline staff expected this would be the case with the outpatient medical records and patient flow projects. However, because the outpatient offices don’t implement a patient satisfaction survey, as is done in the hospitals, improvements to satisfaction could not be objectively reported. The improved discharge process as a result of the Bed Flow Value Stream projects had a direct impact on the patient experience scores. The Press-Ganey patient satisfaction survey asks specifically how the discharge process went. At Hospital 3, patient satisfaction for this measure was around the 16th percentile before the Bed Flow project and around the 97th percentile after. At Hospital 1, a management engineer noted that, although the patient volume is ever increasing, they are able to maintain the patient satisfaction score at 95 percent.

“When I pulled patient satisfaction scores by discharge date, right away, starting in [sic] April, I saw a significant jump [sic]. It had always been like the 15th percentile and lower, so I thought, ‘Alright, I’ll wait and it’s only 1 month.’ And then May came, and it was still like 80s, 90s, and then high 90s, and it has stayed that way the whole year.”

—Frontline Staff
Business or Strategic Case

Senior and department-level staff were asked about the business case for Lean. Nearly all respondents stated that there was a positive business case for Lean because it yielded greater efficiency through reduced waste, avoidance of additional costs or staff, and greater patient volume, as well as improved patient satisfaction.

A few staff—a management engineer, a corporate executive, and a hospital executive—believed there was a business case for Lean because of positive financial gains or savings. Other interviewees discussed finances and costs of Lean but did not say that the business case for Lean should be based on cost. They felt that other factors, such as patient satisfaction, were more important.

Factors that Influenced the Success of Lean Implementation

The findings reported in this section are based on responses to questions about facilitators, barriers, and lessons learned related to Lean, and on a limited interpretation of findings overall by the research team. During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to success, as well as the problems or challenges they had witnessed or personally faced in implementing Lean at LHC. Insights about lessons learned were gathered by asking interviewees whether and how they would change what they had done if they were to do it over again. As expected, lessons learned were closely aligned with the facilitators and barriers (Exhibit 1.17).

Executives provided information on a wide range of facilitators and barriers to the organization and implementation of Lean, whereas staff addressed the culture of the organization as a key facilitator to the success of Lean. Lessons learned referred most often to the scope, pace, and coordination of Lean activities; Lean team composition and size; alignment with existing structures and networks; and staff engagement.

We have organized this section by first providing a summary table of Major Factors that Facilitate Lean success (Exhibit 1.18), followed by Major Factors that Inhibit Lean Success (Exhibit 1.19).
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<thead>
<tr>
<th><strong>Factor</strong></th>
<th><strong>Lessons learned</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment</td>
<td>- Executive commitment to Lean and the process improvement framework for the long term was evident by the resources allocated to process improvement, promotion of process improvement experts into management, and the development of a reward system to engage staff.</td>
</tr>
<tr>
<td>Leadership</td>
<td>- Leadership sets the expectations for results for Lean, monitors progress, and removes barriers to progress, as possible.</td>
</tr>
</tbody>
</table>
| Engagement              | - Quick visible outcomes from Lean, such as application of 5S* help to engage staff further in using Lean.  
                           - Staff are more engaged if they can identify the solution to a problem.  
                           - Sharing information across sites working on similar projects can increase buy-in. |
| Resources               | - Management engineers with Lean expertise are an important resource to Lean project teams because they provide a different perspective, make data available, disseminate knowledge and tools, and keep the project within scope.  
                           - Information technology can be an effective tool for improving process flow. |
| Scope, coordination, and pace of Lean activities | - Narrowly scoped projects tend to be more successful. Narrowing the scope is facilitated by baseline data collection, evaluation of the current state, and team agreement on the definition of project success.  
                           - Controlling the rate of change and taking the additional time needed during a Lean event yields better success.  
                           - The schedule of a Lean event may need to be adapted to meet the demands of patient care. |
| Lean team composition and size | - The Lean team should be diverse and include executives, managers, Lean experts, and frontline staff representing the various departments that contribute directly and indirectly to the process.  
                           - Include skeptics on the team to help develop a solution and to gain buy-in. |
| Routinization           | - Hardwire the process change and remove any work-arounds so staff don’t revert to the old process.  
                           - Use quick meetings to reinforce process changes and to identify any problems.  
                           - Provide data to monitor the process change. |

*5S is a tool used to standardize and organize workspaces. The five “S’s” are sorting, straightening, systematic cleaning, standardizing, and sustaining.*
## Exhibit 1.19. Major Factors that Inhibit Lean Success at LHC

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of resources</td>
<td>• Lean events are time consuming for staff.</td>
</tr>
<tr>
<td></td>
<td>• Staff turnover may make it difficult to maintain continuity on larger projects.</td>
</tr>
<tr>
<td>Resources</td>
<td>• Lean is not being effectively used in the transformation to electronic health records and other electronic tools.</td>
</tr>
<tr>
<td>Engagement</td>
<td>• If managers are not trained in Lean, it is difficult to get their support for a Lean project.</td>
</tr>
<tr>
<td></td>
<td>• If staff do not see the applicability of Lean to the improvement project, it is difficult to engage them.</td>
</tr>
<tr>
<td></td>
<td>• Except for salaried hospitalists and emergency room physicians, most other physicians—who are overwhelmingly community based—are hard to engage in Lean events.</td>
</tr>
<tr>
<td>Scope, coordination, and pace of Lean activities</td>
<td>• Competing priorities and the need to address related issues can delay Lean projects.</td>
</tr>
<tr>
<td></td>
<td>• Implementing an EHR prior to redesigning processes results in failure to realize the benefits of this electronic tool.</td>
</tr>
</tbody>
</table>

### Organizing the Lean Initiative

The conceptual framework lays out a number of factors to consider when preparing to implement Lean. Of these factors, alignment of Lean to the organization was most frequently identified by interviewees as a facilitator and barrier to organization of the Kaizen initiative. Notably, few comments were made about the applicability of Lean to health care processes.

### Local Environment and External Context

**Economy.** The lagging economy during the period when the new hospital was being planned and built turned out to provide an advantage to LHC. Construction firms were competing for business.

**Competition.** A management engineer noted how important it was to be responsive to the surgeons who have privileges at LHC. If surgeons are not satisfied practicing at LHC, they can choose to move their surgeries to other hospitals in the community, including relocating to other hospitals within LHC. Three of LHC’s hospitals are located within just a 7-mile radius of one another. As the new Hospital 3 opened, a hospital executive expressed concern about drawing patients away from the system’s other hospitals.

**Health care reform and trends.** Looking to the future, two executives, a management engineer, and a frontline staff person noted how health care reform and trends will require changes to be made to the current system. They offered that more technology will be needed to meet the increased demand for health care services that is projected. They recognize there could be exponential growth in the number of LHC physicians’ offices and saw this as offering physicians the security of a larger entity and improved access to both colleagues and technology.
**Alignment of the Lean Initiative with the Organization**

Process improvement is at the core of LHC’s culture. The process improvement toolkit initiated by the consulting firm was established in 2001. Three corporate executives stated that they were committed to these tools and the process improvement framework for the long term. Thus, the introduction of new quality improvement tools, such as Lean in 2003, was not foreign to the staff. Two process improvement department leads reported that frontline staff view Lean in a limited way—as only Kaizen events—rather than a cultural transformation to a waste-reduction mindset. They commented that frontline staff don’t understand how Lean is integrated into the larger quality improvement toolkit at LHC and how to achieve the organization’s overall strategic goals. Three interviewees—an executive, management engineer, and frontline staff—noted that LHC is committed to and values the work and expertise of its process improvement professionals and the work done in this area by frontline staff.

One corporate executive noted that process improvement is integrated with leadership development. Management engineers and Black Belts are often promoted to executive and management positions within the organization. Three executives—one at the corporate and two at the hospital level—noted that aligning the goals of Lean with the organizational culture caused growing pains, particularly for leaders coming from outside the organization. Two hospital executives noted that trying to find the balance between process improvement (i.e., learning new tools, implementing initiatives) and managing patient care services can be overwhelming for clinical leadership. One corporate executive noted that there were chiefs of service who were replaced because they did not apply Lean tools in their work. Two management engineers noted that it was virtually impossible to step down from a Lean project and that this had only happened when staff left the organization.

**Scope, Coordination, and Pace of Lean Activities**

**Coordinating the timing of projects.** As observed on two projects—Outpatient Electronic Health Records and Surgeons’ Preference Cards—competing priorities delayed Lean projects. Upcoming building renovations that would change the layout of the clinic and thus the flow of activities were cited by two management engineers for the delays on the Outpatient Electronic Health Records project. The Surgeons’ Preference Cards project was part of a larger value stream to change the IS for operating rooms. According to a management engineer, the project was delayed because of two competing priorities: a desire to focus on projects within the value stream yielding better financial returns and a need to address related issues first. One hospital executive stated that with limited resources, leaders must focus on the highest priority areas—usually those that reap the greatest cost savings—and other things must fall to the wayside. In practice, this means that the acute care setting receives the most attention and resources for process improvement before ambulatory care: but, the executive did not give any specifics related to the projects in this study.

“It's a very different organization to come in to. Because [if] you come in from the outside when you haven’t been exposed to the tools, it can be overwhelming. There’s many additional things that now they are required to know about and encouraged to use, and you have to be careful not to get sucked into the quagmire, saying, 'I'm now gonna focus 90 percent of my time on these things,’ and lose sight of what my fundamental role is right for the customers and the patients we take care of. So, I think in our organization, it’s about finding that balance. Coming in from the outside, that can be overwhelming.”

—Hospital Executive
Although several leaders agreed on the importance of addressing process before implementing an IT solution, on the Outpatient EHR project, the EHR rollout plan and timeline were developed separately from the plans for Lean. Two management engineers stated that the EHR rollout was stalled, in part, because of a need for Lean. However, a hospital executive adamantly expressed that the rollout plan forged ahead at an accelerated rate without support from Lean.

Getting buy-in from leadership and managers was also critical to the success of scheduling and implementing projects. One management engineer stated that there was not a manager or leader within the clinic to champion the Outpatient EHR project and, as a result, staff did not understand the need for a Lean project. However, another management engineer noted that senior leaders were more engaged after implementing the EHR at a few clinic locations and facing challenges that they believed required additional support from management engineers.

**Pacing activities and allowing time necessary.** A process improvement department head stated how important it is to control the rate of change by carefully planning Lean activities during the design, construction, and transition to the Horizon – the Lean Hospital. Otherwise, according to the department lead, staff might feel overwhelmed and ultimately reject Lean. Two senior leaders and a process improvement department lead agreed that cultural change using Lean and process improvement requires patience and time. Similarly, two frontline staff discussed the importance of taking the time needed to be successful. Specifically, staff mentioned the benefit of taking more time as a team during the Kaizen event; taking additional time, as necessary, to roll out the process within a department; and delaying the start of a pilot or rapid test of change to a time that is appropriate and will yield better success. A process improvement department lead noted that Horizon has been subtly embedded within the culture because it was applied through projects and other activities (e.g., design, observation, simulation) over an extended period of time.

A Kaizen event’s very compressed schedule of day-long events over consecutive days might not be possible in a clinic setting, as was observed on the Outpatient Medical Record and Patient Flow project. Two management engineers noted that outpatient clinic staff were eventually willing to commit to participating in a Kaizen event on the EHRs, but managers insisted that the event vary from the typical schedule. Selecting team members for the Kaizen event is particularly difficult when there are only a few clinic staff to draw from because the office still has to

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**You’ve gotta really commit that this toolkit will help you provide a better, outstanding patient experience. We’re gonna tell you to use it. We’re gonna educate you as to how to use it. And it’s not going away. It’s the way we’re gonna do business to fix things in the hospital.**

—Corporate Executive

**And I think, also, it’s that you have the support and buy-in from the management, administrative level. ‘Cause I’ve been involved in some workouts where we’ve come up with these beautiful policies and nobody wants to enforce it because we’re not getting the support from the administration and management.”**

—Frontline Staff

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“We didn’t want to implement the technology without evaluating our processes. Because if we didn’t, we would just basically–some of our processes aren’t ideal either. We’re using our engineers and our Black Belts to help us really optimize our current processes before we overlay any technology on to it.”

—Executive

“Technology is gonna be a part of our life. We’ve learned, when we’ve brought on technology solutions, and put it on top of processes that are broken, it causes really a collapse of the system.”

—Executive
provide patient care. As such, clinic managers could not commit to a Kaizen event where all stakeholders were together in a room at the same time for a series of days.

**Project scope.** Four interviewees—one senior leader, two frontline staff, and one management engineer—stated that narrowly scoped projects were most successful. Key characteristics of a narrowly scoped project as mentioned by interviewees included:

- Data collection by management engineers in advance of the Kaizen event that informed selection of the right Lean tools to use.
- Team agreement on the definition of project success early on.
- Careful evaluation of the current state to determine what is feasible to accomplish as part of the project.

**Applicability of Lean to Processes and Loci of Activities**

**Lean and information technology.** Two executives and three management engineers agreed that IT solutions are valuable, but it’s important to use Lean to plan out the related processes before implementing new technology. One executive went on to say that a new tool or technology is not helpful unless it is used correctly. In another area of the health care delivery system, a process improvement lead reported that the EHR did not yield any benefits or efficiencies as promised by the technology’s vendor because the overall process remained the same.

**Implementing the Kaizen Initiative**

**Leadership Activities and Qualities**

Several corporate and hospital executives reported that Lean starts at the top of the organization. It must be supported by executives in order to engage staff, enforce long-term commitment, and change culture. A few executives reported that leadership for the project, within the department and at the organization, will often define the success of the project, and that it is also this group that is held accountable for the success and sustainment of the project outcomes. A management engineer noted that because process owners and unit or department leaders are responsible for carrying the project forward to the frontline, they must be very engaged.

One of the ways that senior leaders show their engagement is by participating in process improvement report-outs. Research staff observed and five executives reported that a large group of executives from across the four hospitals gather to hear report-outs and are engaged and attentive during the meetings. The corporate executives will often engage the project team in discussions about the project after their presentation.

Several frontline staff from two of the Bed Flow projects cited leadership support and buy-in of management as being critical to the success of the project. One frontline staff and a management engineer described ways in which senior leaders’ involvement was critical to moving things along at a faster pace. For example, getting IT to move equipment or facilities or to install or move outlets as part of the Lean event week could require support from senior leaders.

Notably, at LHC, all of the senior leaders and many of the frontline managers have training in process improvement. Namely, they are Six-Sigma belted to at least yellow level. Two
executives noted that the Six Sigma Black Belt program is used as a training ground and as a source of professional development for future leaders.

**Staff Engagement**

Two executives explained that staff at LHC are highly engaged in providing high-quality patient care. Thus, as reported by five frontline staff and a physician, when staff are made aware of an opportunity to improve patient care and staff processes, they work towards it. One example of this is the Bed Flow project where staff requested that more information be shared twice per day on the hospital’s census (via a meeting or an email with the “state of the house”). Nurses used this information to help prioritize their work, pointing physicians to where they should first focus their time to discharge patients and indicating to ED staff which inpatient units to transfer patients to so that patient load would be equalized.

One hospital executive stated that the initiative and the project teams must be as inclusive as possible and engage staff at all levels of the organization. Many staff—several hospital executives, a physician, five frontline staff, and two management engineers—stated that staff are more engaged when they are able to define the solution to a problem. A management engineer explained, however, that it is important for staff to understand why they are completing the project and what benefits will come out of their participation. On a Bed Flow project, four frontline staff explained how staff engagement lagged when the project team did not invest enough time in gathering stakeholders’ input. When the team returned to the unit, staff not on the project team were hesitant and reserved about the new process.

Quick, visible outcomes from Lean also help to engage staff further in using Lean. Several staff—including a few executives, two management engineers, and a few frontline staff—all agreed that positive outcomes further engage staff in Lean. These outcomes can be from projects the staff members worked on directly or from other sites or units. During a report-out, frontline staff spoke about how changes to their work area after using 5S (sorting, straightening, systematic cleaning, standardizing, and sustaining) particularly engaged staff on the unit. A couple of management engineers reported how they too felt more confident in their work after completing the first Bed Flow project and using those lessons learned to improve on the next Bed Flow project.

There can be challenges in trying to bring a multidisciplinary group together for a Lean project. On the outpatient EHR project, the Lean team eventually tried to put together a team from multiple offices across the system but found that many of the new offices joining LHC had different organizational cultures, were unfamiliar with Lean, and were anxious about the new
technology. Bringing together individuals unfamiliar with the organization’s culture for a Lean project proved very challenging and did not occur during the timeframe of this case study.

Physicians are also a difficult group to engage according to many staff, including several executives, a management engineer, and a couple of frontline staff. This is particularly true of community physicians who may not have the time to participate on a Lean project without reducing their billable patient hours. One corporate executive reported that hospitalists and ER doctors seem to be more engaged with Lean because of its team-based approach. In fact, a Six Sigma project showed how a hospitalist model can achieve good outcomes using QI methods.

Several staff, including two hospital executives and a few frontline staff, discussed how rewards can be used to encourage and engage staff in Lean. Staff rewards include “Wow,” which are certificates for good work that can be converted into gift cards; funds for parties or celebrations on the unit; and plaques.

LHC also offers monetary awards and end-of-year bonuses to staff. The Hospital 2 Bed Flow project team won a Super Star Award for being a high-performing team.

**Education and Training**

Two executives recommended that training on the Lean tools be done with leaders in the organization before trying to implement the process. Currently, a management engineer said, new managers attend a training called Great Beginnings that includes information on Lean and process improvement. Another executive noted that providing this training early on to leaders helps erode skepticism about the tool: “Better buy-in from leaders might have been had if we’d done training on the tools before trying to implement the process.”

In contrast, one frontline staff noted the “just-in-time” training provided at the Kaizen event was preferred because the entire multidisciplinary team was learning at the same time. A few staff—two management engineers and two frontline staff—stated that Lean terminology (i.e., names of tools and concepts) is challenging for staff not on the project team; however, staff might be familiar with the name of a specific project. As part of the monitoring and sustainment processes, two management engineers mentioned that staff needed to be trained and coached on how to collect data because the data were unfamiliar to them. Staff training was an part important of ensuring comparability of the pre- and post-event data.

**Communication About Lean**

Communicating about Lean requires staff to be flexible in both their method and content of communication. On the Bed Flow project, two hospitals found it important to provide daily information on the current census for the entire hospital. One hospital decided to send this out

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“We just finished a project...looking at how we could utilize our hospitalists—which are employed physicians, they're not independent doctors—in terms of coordinating care of patients and improving patient satisfaction. [sic] We had the hospitalists take over ownership of the patient, and we cohorted their patients on a separate unit, and we allowed them to work out a schedule so they tried to be able to have the same hospitalists seeing the same patients day in and day out during their course of treatment. We were able to see substantial improvement, really dramatic improvement in patient satisfaction. [sic] Now, we’re looking at how do we replicate that across the system and how do we start to roll that out as a model of care.” —Corporate Executive
via email, while another hospital found that meetings were more appropriate. A hospital executive explained that this communication allowed staff to understand more about the efficiencies that Lean might bring about. The Bed Flow project also required staff to rely on the “Click to Clean” system as part of the GetWellNetwork, but they also had to learn what to do when technology went down. The daily census information helped to alleviate any issues.

Communicating with physicians, especially community physicians, to get them engaged in Lean can prove challenging. Two senior leaders noted some helpful techniques to communicate with physicians. One leader suggested finding a common goal and communicating about the benefits of Lean through that goal. To change the surgical information system during the Value Stream project, the project team reported that getting a surgeon’s buy-in on the process wouldn’t be necessary if the outcome facilitated the surgeon’s work. Another leader suggested getting a physician involved in Lean, even tangentially, would help reduce resistance because the benefit could be seen firsthand.

### Lean Team Composition and Size

A large proportion of interviewees—four executives, a manager, a physician, and eight frontline staff—declared that a diverse, multidisciplinary team of the “right people” was needed for successful projects. When describing who should serve on a diverse team, interviewees named executives, management engineers, managers, and frontline staff. In addition, several frontline staff emphasized the importance of including stakeholders from other departments. For example, on the Bed Flow project, nurses from different units, nurse managers, environmental staff, and sometimes even dietary staff were included. A diverse team ensured better teamwork and generated distinctive ideas and solutions to problems. For example, two executives and two management engineers noted the importance of having skeptics on the team to help determine the solution and increase buy-in with staff not on the project who might be skeptical. One management engineer noted that in the outpatient clinic, which had a small staff, picking who would participate on the team could be particularly difficult because the office still had to serve patients.

On the Outpatient EHR project, some offices had already implemented the EHR before the project began. A management engineer recommended including staff who had not implemented the HER, along with staff who had, because the experienced offices could provide insights on the challenges they faced and pose feasible solutions.

A frontline staff person and an executive both stated the importance of picking the right leader or process owner for the team, but they did not clarify who that person might be. New managers receive training on Lean and Six Sigma concepts as part of the “New Beginnings” training; however, managers might not fully understand how Lean is implemented or how the tools could facilitate a more efficient outcome in a specific situation. A management engineer described the challenge of engaging the right leader or process owner on the Outpatient EHR project. At the
Family Medicine Practice, two new managers leading the practice did not have much knowledge of Lean, making it difficult for a management engineer to gain their buy-in and deploy the Lean project.

As discussed in the staff engagement section, two executives noted that community physicians are difficult to engage but should be consulted on projects to get their buy-in, and a hospitalist model shows promise. No other staff recommended or believed that there was a need to include physicians in Lean projects.

**Availability of Resources**

**Management Engineers**

Far and away, the most critical resource was the management engineers. Many staff—six executives, and four frontline staff—cited the management engineers as a key resource in the implementation of Lean and recommended that other hospitals employ staff with similar skills. One leader noted that it was particularly helpful that a management engineer’s background offered a different perspective. Others agreed that management engineers help the project team carefully think through a new process and help ensure the team stays within the scope of the project. Several executives stated that they only get a small percentage of the management engineers’ time, but they are fortunate that the engineers are so committed and often go above and beyond. Frontline staff noted how management engineers made data available to help understand where to focus on solutions. In addition, several executives recognized that the management engineers are disseminating the knowledge and tools from LHC’s quality improvement toolkit, another valuable resource.

**Staff Time**

Staff time was another in-demand resource for Lean implementation. Several staff, including executives and management engineers, noted that because everyone has responsibilities beyond the Lean projects, staff time to participate on projects is limited. Further, restrictions on hiring and backfilling positions in 2009–2010 further constrained staff time. A process improvement department lead noted that on the Horizon Lean Hospital project, two management engineers who served as project managers left the organization, and their positions were not backfilled. Instead, existing staff worked to fill the void.

A few interviewees—an executive, a management engineer, and two frontline staff—noted that in some cases, additional staffing resources are made available to take on the day-to-day duties of those assigned to projects. In the ER, additional staff were brought in to make sure staff could fulfill their roles on the Bed Flow project. One hospital had staff willing to work overtime and used them to fill any gaps in coverage caused by staff attending Kaizen events.

"Most of the management engineers that we have have an engineering background. They look at things, they bring a different perspective than many of us who've been involved in health care a long time and may have, you know, grown up in health care and look at it through a certain lens. And, one of the things that I value most about our management engineers is I can pull them into something and say, 'I need you to look at this. Tell me what you see,' because what they see may be entirely different than how I'm viewing it. And, I value that. Now, that's not to say that it's right or wrong, but they'll give me a different perspective, often, and I'll be able to say, 'Okay, I didn't see that. That makes sense,' or, you know, 'If we look at it that way, we might be able to do this.'"

—Hospital Executive
Technology

Technology played an important role in several projects, but it also posed challenges to implementation. For example, a delay in equipment delivery meant that the Bed Flow project’s “Click to Clean” process had to be postponed. Two frontline staff reported that following implementation, staff weren’t sure at first what to do when the “Click to Clean” system and GetWellNetwork had problems or were unavailable. On the Surgeons’ Preference Card project, an executive and a management engineer noted how important the IT package was, but that sometimes, the IT software didn’t work correctly or didn’t fit with other information systems in the hospital. Two management engineers mentioned the importance of engaging IT in the process redesign to be successful and avoid unnecessary challenges and errors in decisionmaking.

Routinization of Lean Processes

Routinizing processes can prove challenging in disparate organizations. One management engineer noted that it was proving difficult to routinize the Lean process, given that LHC, when it came to be, was made up of four hospitals from two different health systems, and they sometimes still act like individual entities instead of one system. A hospital executive noted that this problem might continue as more physicians’ offices and ambulatory care sites join the organization.

Sharing information across sites builds on the work being done and begins to standardize processes across hospitals. Two management engineers noted that it was very helpful to share what’s gone on at other sites with similar projects to help gain buy-in with staff. Frontline staff and management engineers then used the learning from the other sites to build on their work, instead of starting at the beginning. One example of this is the Bed Flow project. Management engineers were able to build on what they had learned at each hospital, since the process was implemented sequentially.

Maintaining the changes resulting from a Lean project can be difficult. To prevent staff from reverting to old processes, frontline staff and a management engineer noted that they hardwire the process, removing any possible workarounds. As issues arise, staff are encouraged to engage a diverse group of personnel to solve the problem just as was done on the Lean projects. Two other frontline staff reported that daily 3-minute unit meetings offer an opportunity to reinforce new practices, discuss revised rules and practices, and allow the entire unit to “touch base.” To further prevent slippage, one executive reported that management engineers assist with monitoring data. Two other executives stated that having senior leaders participate in followup monitoring and project report-outs helps to sustain outcomes.

An executive and a process improvement department head reported that another way LHC ensures that the culture of Lean is integrated throughout the organization is by negotiation with outside vendors, building clauses into their contracts that requires them to work with the organization’s process improvement methodologies, in this case, Lean.

“We are very transparent, showing how things worked or didn't work, if we've been able to sustain our work. Sometimes we've spent many months or a year doing a project and when we check back and it isn't still sustained at a certain level, you know, there's explanations and refocus and we put more resources towards it, so that's something that the whole room agrees to, and we put a lot of support there.”

—Hospital Executive
Conclusions

LHC executives and management view Lean as a tool to reduce waste and as one technique in a toolbox of quality improvement tools that includes Six Sigma. Lean is used as a mechanism to improve efficiency and patient experience, while Six Sigma is applied to reduce variation. Lean was adopted during a period when the operating margin was negative. LHC’s approach to implementing Lean involves developing a management workforce with the ability to apply Lean concepts to solving problems that they encounter in the course of their work and formally training frontline staff through participation in Kaizen events.

Recommendations for Similar Organizations Implementing Lean

- **Incorporate Lean process redesign in the schedule for new IT system deployment.** It is important to revise inefficient processes before introducing IT system upgrades, so that the new IT systems are designed to support that optimal process, not the previous, inefficient process. Lean process redesign should begin soon after the decision is made to purchase a major IT system, since process redesign and testing require substantial time.

- **Continue to use management engineers to support Lean events.** The building of Horizon Hospital served as a catalyst for far-reaching cultural change throughout this facility. Staff had an opportunity to work closely with management engineers to learn how to apply Lean as they were developing new processes. Expanding the use of the management engineers to guide teams in using Lean tools and project implementation in other parts of the system might be beneficial to accelerating system-wide cultural transformation, including integration by staff of Lean tools into their day-to-day work.

- **As more clinical projects come about, seek out opportunities to involve physicians more integrally in the Lean events.** As noted by a few staff, physicians are not involved in the events. As LHC continues to work towards more clinical interventions, consider how physicians might move beyond a consultative role. It may be necessary to look for greater involvement of hospitalists to achieve the same success as the projects that primarily involved nurses and administrative staff.

- **Align process improvement with strategic initiatives.** By adopting Lean and other process improvement methods, LHC gave staff a path for carrying out the cultural transformation initiative—a blueprint for achieving patient satisfaction that includes resource stewardship as one of five major thrusts of the initiative.

- **Lean does not replace other quality improvement methods.** LHC developed a toolbox of quality improvement methods to achieve the organization’s goals. Lean is a companion to other quality improvement methods; methods should be selected based on suitability to the issue being addressed.

- **Integrate Lean and process improvement into leadership development and promotion.** LHC integrated Lean and Six Sigma into leadership development. In-house quality improvement experts were promoted to management. This strategy contributed to the development of a strong quality improvement culture. If management is to promote the use of quality improvement among their staff, they must understand it themselves.

- **Lean and process improvement implementation requires expertise.** LHC has invested in building the quality improvement capacity of the organization by developing executives’ and
managers’ expertise and by staffing departments devoted to quality improvement, which includes management engineers. A more hierarchically controlled, and expert-led approach to Lean may improve success.

- **The cost of Lean implementation can be offset.** Increased patient satisfaction, improved employee satisfaction and reduced turnover, an increased sense of teamwork, the breaking down of department silos, and increased efficiencies can make up for the outlay that is required to train staff, hire experts, and conduct Lean events.

- **Expect that not all Lean projects will be a success.** Even an organization as experienced in quality improvement as LHC can have projects that don’t yield the desired results. Less-than-optimal results build internal expertise and provide useful lessons to inform the execution of future projects.
Case 2. Central Hospital
Organizational Background

This report presents the results of the study of Central Hospital’s experience implementing Lean. Two projects, Improvement of Door-to-Balloon Process and Management of Surgical Procedure Cards, were selected for study from this organization. The case study methods, including the criteria for selection of the projects for analysis, were described earlier in this document (see Introduction). For this case, we conducted 48 interviews with 51 individuals. Their roles and positions at the hospital varied as described in Exhibit 2.1.

<table>
<thead>
<tr>
<th>Position in organization</th>
<th>Senior executive</th>
<th>Department level leaders or managers</th>
<th>Frontline</th>
<th>External individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians (Including surgeons)</td>
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<td>n = 0</td>
<td>n = 3</td>
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<tr>
<td>Mid-level providers (e.g., floor manager, nurse manager)</td>
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<td>n = 0</td>
<td>n = 0</td>
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<tr>
<td>Other clinical staff (including nurses)</td>
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<td>n = 31</td>
<td>n = 0</td>
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<tr>
<td>Non-clinical staff</td>
<td>n = 4</td>
<td>n = 6</td>
<td>n = 6</td>
<td>n = 1</td>
</tr>
</tbody>
</table>

Description of the Health System

The hospital serves the area surrounding the city it is located in and is a unit of a regional organized delivery system (ODS), known as HAU Care, which operates 20 health care organizations throughout the State. HAU Care is among those operated by a nationwide, not-for-profit health care system. The system’s mission is to serve all persons, with special attention to those who are poor and vulnerable.

Description of the Health Care Organization

Central is a 588-bed urban hospital located in a mid-western state. It includes four Centers of Excellence: Orthopedic Center; Neuroscience Institute; Heart Center; and Cancer Center. The hospital has been ranked nationally multiple times and recently was recognized as one of the Nation’s top hospitals from a respected private rating organization. Descriptive characteristics of Central reflecting the case selection criteria are shown in Exhibit 2.2.

Leadership

The national health system operates under a distributed leadership model based on the premise that knowledge and leadership are distributed across the system. The national system provides an overarching legal and financial infrastructure; within that framework, the regional health systems, such as HAU Care, to which Central belongs, have input into the national strategy. Additionally HAU Care is able to establish strategies suited to the system. Certain departments that focus on nonclinical aspects of the hospital (e.g., human resources) are located at the regional health system.
Central’s CEO is able to independently pursue strategies that are the most fitting for the local market area, in addition to funnelling input up to the regional health system. The hospital is large and profitable, and thus has the opportunity to pursue initiatives appropriate for it.

Exhibit 2.2. Central Hospital

Central is a 588-bed tertiary care hospital in a Midwestern city that is part of a national organized delivery system, which is owned by a not-for-profit health care system (HAU Care). The chief operating officer of the hospital selected Lean as the preferred methodology to address quality improvement problems and to change the hospital culture.

To examine Lean implementation at the hospital, we interviewed 51 staff members from multiple job categories at all levels of the organization between February and December 2010. Data were collected from in-person interviews conducted during two site visits, telephone interviews, and digital diaries recorded by members of Lean project teams. We studied two projects prospectively: Improvement of the “Door-to-Balloon” Process and Management of Surgical Procedure Cards. By prospective, we mean that we began data collection at the start of the project and continued to collect data until shortly after the project was completed.

The hospital hired an external consulting firm to guide its Lean journey, which included an aggressive rollout of Lean projects in four value streams. As a result of the rollout, the hospital reports that it has seen improvements in efficiency in multiple processes and a cost savings of $1.5 million over the initial projects from early 2008 through 2010.

Potential Lean adopters can learn lessons in several areas from the hospital’s experience:

- **Alignment:** Align Lean with what matters to clinicians and their patients. Carefully map out and effectively communicate how Lean will support fulfillment of the organization’s mission in a meaningful way.
- **Leadership:** Senior leaders must respond quickly when Lean implementation challenges arise. Senior executives should closely monitor the execution of Lean in the early phases by being involved in Rapid Improvement Event (RIE) teams and talking with staff, managers, and staff supporting Lean implementation.
- **Staff engagement:** Middle management support is critical for frontline staff buy-in. Particularly in the early phases of Lean implementation, the extent of middle management support should be considered as a deciding factor in selecting Lean projects. Projects that improve staff’s work directly encourage engagement. Sharing past successes and linking Lean processes to improved patient outcomes can increase engagement. Compensate physicians for their time. Physician engagement has been shown to be critical for success and a true challenge under the previous structure where physicians were not employed by the hospital.
- **Scope and pace of Lean activities.** There is a learning curve to Lean implementation. Organizations require time to collectively develop the expertise to show consistent success with RIEs. Start simple, with visible gains to staff.
**Staffing**

Medical practices in the city were physician-owned until recently, when changes to reimbursement, competition, and other market dynamics led the hospital to purchase medical groups. When the study first began in early 2010, the cardiology practices were physician-owned, but these groups are now owned and employed by HAU Care. The emergency department physicians remain under contract with the hospital as equal partners in the Emergency Medical Physicians medical group. It is noteworthy that in recent years, staff turnover rates have been less than 3 percent.

Management of information technology (IT) and information security (IS) planning and support services at the hospital and the regional ODS levels are centralized at the national system level. HAU Care, the regional ODS uses Quest Diagnostics® (Madison, NJ) or ECLIPSE® (MPN Software Systems, Inc., Saddle River, NJ) as its electronic health records (EHR) system. Surgical services uses Horizon Service Manager, which includes a strong IS support system. The on-site IT/IS support for the hospital reports to regional and national IT/IS department managers. Because the IT/IS services are used across the national health system, any upgrades or updates to the software must be done system-wide. For example, the hospital must send a request for hardware or software upgrades to the national system’s IT/IS staff.

**Other Environmental Context**

**Local Competition**

The city’s competitive market consists of a safety net hospital and four major hospital systems, including HAU Care. Historically, the four major hospital systems operated in different niches of the city and surrounding areas, but over the past 5 years they have increasingly competed with one another and with physician groups. Central is geographically located in an area with residents of relatively high socioeconomic status. Two of the other regional systems have hospitals close by, while the third is not considered a major competitor.

Historically, the city was a relatively high-utilization and high-cost market. Employers and purchasers either were less concerned about costs or were unable to work together to press providers to become more efficient and effective. The city is also home to major pharmaceutical and medical device companies. Additionally, it is the base for several major factories whose workers have union health benefits. HMOs are lightly represented in the State’s health insurance market.

**Funding and Payers**

Many factors have led purchasers in the State market to put more pressure on providers to compete and become more efficient. Some of the major factors include the presence of larger, national insurance firms such as Anthem and speculation about the impact of national health reform on payer mix and payment levels. Central’s largest payer—a private insurer—bases reimbursement on quality metrics performance.

As a result of volume and revenue decreases due to the U.S. economic recession, Central had to lay off 30 staff members in 2008. Since then, all of the regional ODS’s have been on a capital freeze. Although the hospital maintained a strong bottom line through 2010, there continues to be
a region-wide hiring freeze to support other hospitals in the system. Nevertheless, the hospital was one of the few hospitals in the city that gave incremental raises and bonuses in 2010.

**Lean and Quality Improvement at the Organization**

In this section, we discuss the history of both Lean and quality improvement at Central. Exhibit 2.3 outlines the overall timeline for Lean and quality improvement initiatives. The specific activities noted in the timeline will be discussed throughout this report.

**History of Quality and Efficiency Improvement Efforts at the Organization**

Historically, quality improvement at the hospital began at the department level, with limited organization-wide efforts. A hospital-wide quality safety committee exists; one committee member noted that the structure of the committee shifted in the last few years from focusing on quality reports to being more action oriented. Further, the committee is making an effort to use Rapid Cycle Improvement (RCI) report-outs and other quality reports across departments. These reports present the results and outcomes of the projects.

Prior to the initiation of Lean, the main quality improvement tool used by departments was Plan-Do-Study-Act (PDSA). Some staff members also mentioned participating in projects that used Find, Organize, Clarify, Understand, Select-Plan, Do, Study, Act (FOCUS-PDSA). There have been several smaller, less formal quality improvement projects throughout the hospital. For example, in the surgery department a few years ago, a physician spearheaded a quality project team for total knee and hip replacements.

The hospital participates in a coalition that provides a forum for area hospitals to share information about best practices and to collaborate to solve patient safety problems. The coalition focuses on improving high-risk processes, such as high-risk medications, surgical safety, and sepsis. Coalition hospitals agree to implement improvements generated through coalition activities.

The national health system mandates several patient safety initiatives in all hospitals as part of its overall strategic plan. Participation is required in the following priority areas: falls and fall injuries, pressure ulcers, perinatal safety, nosocomial infections, perioperative safety, Joint Commission national patient safety goals, and adverse drug events. Dissemination of procedures in these areas occurs throughout the health system. For example, in 2008 the national system launched a campaign to have zero preventable injuries or deaths within the health system. This effort and prior safety efforts have been a major focus for the system overall.
## Exhibit 2.3. Timeline of Lean and Quality Improvement Activities at Central Hospital

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp up 2007</th>
<th>Implementation 2008</th>
<th>Continuation 2009</th>
<th>Study period 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quarters</strong></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td><strong>Continuation</strong></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
<tr>
<td><strong>Study period</strong></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
</tbody>
</table>

### Case Study Data Collection

<table>
<thead>
<tr>
<th>Introduction of Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td>New CEO hired</td>
</tr>
<tr>
<td>Other quality improvement methods reviewed by CEO</td>
</tr>
<tr>
<td>Lean begins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>New organizational mission developed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>External consultant obtained to train leadership on Lean principles</td>
</tr>
<tr>
<td>Leadership trained in Lean</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lean projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door to Balloon charter developed</td>
</tr>
<tr>
<td>Door to Balloon RCI</td>
</tr>
<tr>
<td>Door to Balloon monitoring and data collection</td>
</tr>
<tr>
<td>Procedure Card charter developed</td>
</tr>
<tr>
<td>Procedure Card RCI</td>
</tr>
<tr>
<td>Procedure Card monitoring and data collection</td>
</tr>
</tbody>
</table>
Initiation of Lean at the Organization

The introduction of Lean at the hospital corresponded with the hiring of a new president in December 2007. Previously, he served as the president of a smaller hospital within HAU Care, which worked with a consulting firm to implement Lean Process Improvement. The new president sought to implement a centralized quality improvement model that would bring culture change throughout the hospital, and he was excited by the results from implementing Lean at his previous hospital.

According to staff, the first consultant was a poor fit with many staff members because she had incompatible values and little experience applying Lean in health care. The consulting firm assigned a new consultant, and numerous interviewees at various levels agreed that he was a better match for the organization and a valuable asset.

Hospital staff members are evaluated annually, and staff may receive a financial incentive for contributing to improved performance on hospital metrics. This financial bonus, known as Share the Vision, is tied to performance on a metric system established by the national system and HAU Care, the regional ODS, for the fiscal year. This metric system includes a scorecard with the BEST (budget, experience, safety, team) metrics. Participation in RCIs, an expectation for all staff, is noted in the annual evaluation process.

Because the hospital often serves as a “test site” for the regional HAU Care, there are plans to implement Lean across the regional system based on the hospital’s experience. The hospital’s experience with Lean in terms of specific projects and processes will likely be tailored to other organizations within HAU Care. One example is the “Door-to-Balloon” case, which is discussed later in this report (see Intermediate Outcomes).

Conceptualization of and Goals for Lean

How an organization understands or defines an innovation or intervention is a crucial component of its implementation process and an understanding of its goals. Knowing how Lean was defined by upper management, conveyed to staff, and interpreted and understood by members of the organization is crucial to understanding this case. Although specific questions asking interviewees to describe Lean were not used, in this section we describe how interviewees described Lean by using the most frequent descriptions across interviewees (see Exhibit 2.4).

Reducing waste and increasing efficiency. The hospital staff were unanimous in their descriptions of Lean as equating it with RCI events. Department leaders and senior staff at the hospital describe the Lean process as a way to examine hospital processes and improve them by reducing waste. These individuals noted that teams examine a process “in painstaking detail” and

<table>
<thead>
<tr>
<th>Type of Interviewee</th>
<th>Aims of Lean (in order of most frequent mention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior leaders</td>
<td>• Reduce waste and increase efficiency</td>
</tr>
<tr>
<td></td>
<td>• Culture change</td>
</tr>
<tr>
<td>Department leaders</td>
<td>• Reduce waste and increase efficiency</td>
</tr>
<tr>
<td></td>
<td>• Staff engagement</td>
</tr>
<tr>
<td>Providers</td>
<td>• Reduce waste and increase efficiency</td>
</tr>
<tr>
<td>(physicians and mid-level, non-department leaders)</td>
<td>• Staff engagement</td>
</tr>
<tr>
<td>Nurses and other frontline staff</td>
<td>• Reduce waste and increase efficiency</td>
</tr>
<tr>
<td></td>
<td>• Staff engagement</td>
</tr>
<tr>
<td>Analysts</td>
<td>• Reduce waste and increase efficiency</td>
</tr>
</tbody>
</table>
improve it. No frontline staff were this explicit in their description of waste reduction, and three noted that staff were confused about what Lean is overall.

Another way interviewees talked about Lean and waste was to talk about how efficiency, and thus cost savings, is a goal for implementing Lean. As Lean has evolved at the hospital, there has been more of a focus on projects that target cost and efficiency, according to interviewees. However, from the onset of Lean implementation, the hospital has promised that no staff members will lose their jobs because of efficiency gains from Lean. Rather, they will be transferred to another job or area within the hospital. Two frontline staff in the emergency department put forth the view that the goal of Lean was strictly financial, and that the purpose of Lean was to save money for the hospital rather than improve quality or efficiency.

**Culture change.** The conceptualization of Lean as a way to change culture appeared to differ for executive leadership and frontline staff. According to two members of the executive leadership, the goal of Lean is to transform the organization into a Lean culture. One executive described a Lean culture as one that understands the need to improve processes globally and is dedicated to doing so. Implementing Lean is not simply about reducing costs or increasing safety but rather breaking down silos and improving processes globally.

The concept of culture change in the hospital was not mentioned by any frontline staff, including physicians, as a goal of Lean. For a small number of frontline staff, it was unclear what Lean was when it was first introduced, and it was still unclear even after they had participated in Lean events.

Most frontline staff equated Lean with the RCI events. That is, Lean is primarily about the specific RCI events and the outcomes to be achieved through doing them.

**Staff engagement.** One broadly stated goal of Lean is to fully engage staff in the process. Many interviewees, including both department leaders and frontline staff, noted that they thought Lean would get staff excited about the process and build it into their everyday work. Some interviewees even noted that a successful project is one that improves staff satisfaction and motivates people to participate in another project.

**Alignment of Lean and Quality Improvement Efforts**

The hospital is continuing to use PDSA and various independent quality improvement projects while implementing Lean. Currently, PDSA is used by the quality department for unit-based and department-based quality improvement, and Lean is used for value streams, identified as high priority by the executive steering team. Although PDSA is similar to Lean, it is not formally considered a Lean tool.

Since the arrival of the new president in 2007, the hospital has had a heavy focus on organizational development around change management. The hospital offers a leadership program titled Building the Best. All current titled leaders, informal leaders, and those associates identified as candidates for future leadership positions participate in the program. This course is based on a popular leadership training program. However, this training was not formally aligned

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a Value streams are used to analyze the materials and flow of information required to bring a service to the customer.
with Lean. Many senior executives stressed the importance of a culture that focuses on excellence and leadership in implementing Lean.

Finally, the hospital is also part of a network that provides state-wide data on Door-to-Balloon (D2B) time and other measures that enable participating hospitals to assess their own performance and compare them against benchmarks.

**Process for Implementing Lean**

At the hospital, the Lean process started with the leadership and the consultant reviewing the whole organization and outlining a strategic plan for Lean implementation. This initiative began with the leadership studying the whole organization, defining priorities, identifying departments for inclusion, and selecting Lean project teams.

In this section, we describe aspects related to Lean implementation, including training on Lean, the process for selecting Lean projects, the process of Lean implementation at the project level (including how the project and team are structured), and aspects related to monitoring and sustaining project results. Lean is implemented in several waves, as is further described here and illustrated in Exhibit 2.5.

The primary Lean tool used by the hospital is the Rapid Cycle Improvement event. These RCI events are weeklong meetings where a team gathers to develop and test solutions on a single issue. RCI team members are selected from the segment of the value stream that is the object of the RCI event and from the segments that affect and are affected by that segment, including segments from other value streams (see the Planning and Implementation section of this report). Numerous interviewees at various levels viewed RCI events as essentially synonymous with Lean, which is consistent with the finding that frontline staff often do not see the larger culture change purpose of Lean.
The RCI program is under the academic affairs department at the hospital. Two executives explained that Lean is part of academic affairs because it is seen as a means of culture change. Lean might have been seen as a regulatory program if housed in the quality department or solely as a cost-control program if housed in finance. Nevertheless, both executives and frontline staff saw the overlap between quality improvement and RCI events and had difficulty distinguishing the quality improvement and efficiency-oriented aspects of the Lean events.
Lean Project Selection Process

As depicted in Exhibit 2.6, several steps led to the selection of Lean projects at the hospital:

**Exhibit 2.6. Overview of the Lean Project Selection Process**

First, the Administrative Council Level Transformational Plan of Care (TPOC) selected four key areas—surgical services, emergency department, cardiology services, and appropriate level of care—to target with Lean and planned escalation or ramp-up to eight active areas or value streams. These areas were selected on the basis of organizational-level metrics and opportunities for improvement on these metrics. The Administrative Council also looked at the readiness for Lean and the current leadership in each area. The four areas became individual value streams, or areas to target for Lean projects.

Second, after the value streams were selected, a steering committee for each was organized. The steering committee comprised departmental leadership, process improvement staff, and finance staff. Steering committee members, with assistance from the Lean consultant, met for 2.5 to 3 days and conducted a “value stream analysis (VSA).” The VSA was used to map out the current flow within an area, identify barriers or issues that affected the flow, and determine the target state flow (achievable within 12 months) based on Lean principles. As a result of this effort, opportunities for improvement were identified and then rated and ranked on their ability to affect the desired target state and level of effort (cost/resources and ease/difficulty) to implement. The result was a planned timeline of Lean projects, events, and “just do it” activities. Physician input played a large role in this selection process, and some interviewees felt that physicians were
more likely to target areas in major cost centers. Each process or event on the value stream became a Lean event, with one Lean event scheduled per month.

Third, after selecting 18 projects within the four value streams, the steering committee defined the relative order for each event. The events were prioritized within the four value streams using two methods. One method involved voting and prioritizing by steering committee members and physicians. In this method, each individual was allowed to vote on the 18 different projects. Those projects receiving the most votes were targeted first. The second method involved examining the entire flow of the value stream and how each project might have an impact on the flow of another. Interviewees reported that this process worked better because it allowed a more logical organization of Lean events than did the ranking system, which did not necessarily take into account how one event might affect others. Physician engagement was taken into account when planning and organizing the events to ensure that physicians had enough lead time to participate.

Two interviewees raised concerns in regard to the organization and prioritization of Lean projects. One executive noted that projects often overlap and that the work of a previous Lean team was sometimes undone by a newer Lean project. Another pair of interviewees raised concerns that the current status and context of departments were not always taken into account during value stream selection. For example, the presence of poor leadership and staff conflict were not considered when selecting projects.

In general, the hospital has one Lean event per month for each value stream. Several interviewees at all staff levels noted that this aggressive pace of implementation often causes team members to feel burnt out by the Lean process.

**Planning Implementation of Lean**

**Project Organizational Structure and Roles**

Staff from all levels are involved in Lean projects at the hospital (see Exhibit 2.7). Each RCI event is led by a facilitator, who is a member of the process improvement staff group. The facilitator receives formal training and is a full-time staff member who is either a formal or informal leader at the hospital and knows the organization. The executive who oversees the process improvement group and academic affairs selects the facilitators using his or her knowledge of the technical aspects of Lean and requirements of good facilitation. At the time of the first site visit, almost all the facilitators held full-time positions in line or staff departments and took on Lean facilitation as an additional function. Although they received partial dispensation from their regular jobs during RCI event weeks, they reported that they fell behind, causing some friction with their regular supervisors. To try to keep from falling too far behind during event weeks, some facilitators returned to their full-time job at the end of the day after the RCI team finished. In response to these problems, full-time Lean facilitator positions were eventually created.
Prior to the event week, the facilitator works extensively with the executive sponsor to develop the charter and select team members, including the team leader and the process owner. The executive sponsor is usually the director of the department implementing Lean and is also on the value stream steering committee.

The team leader is selected by the executive sponsor and is an individual from outside the value stream who has demonstrated leadership skills. The team leader assists the event week team in meeting its objective by organizing pre-event preparation, providing direction and guidance for the daily activities during the event, managing the team dynamics, and tracking followup items and metrics to demonstrate post-event performance. Some projects may use co-team leaders.

A process owner works with the team leader as the content expert for the team and the “go to” person for the facilitator and the team leader. The process owner works in the value stream in which the Lean project is occurring and assists with the event week preparation activities by planning and executing all event week communication and tracking followup items/metrics that demonstrate post-event performance.

The Lean team composition varies by project. All teams include individuals who are (1) managers or considered experts in the area, (2) directly involved in the process or customers of the process, and (3) not involved in the process at all (called “fresh eyes”). Generally, the hospital recommends that Lean teams do not exceed more than 10 individuals, but some teams have had as many as 16 members. Finally systems staff (e.g., IT/IS) are ad hoc members who participate as their expertise is required.

In the original implementation model, Lean teams did not include managers. However, after an initial period of implementing Lean, it became clear that without management involvement in the Lean team, staff often devised solutions that were not always feasible given resource constraints. Accordingly, departmental management staff were integrated into the Lean teams.

**Lean Training**

Two types of Lean training are offered at the hospital, each tailored to different roles in the Lean process. Facilitators, or those who manage the RCI event, receive training that includes completion of a portfolio of Lean work, classroom time with the Lean consultant, and an evaluation component. Facilitators can work toward five increasing certification levels, and training is paid for by the organization. Additionally, facilitators receive just-in-time training from the consultant during the initial RCI event. This real-time feedback occurs after each day of the event, when the facilitator meets with the consultant to problem-solve and discuss the plan for the following day.

<table>
<thead>
<tr>
<th>Exhibit 2.7. Lean Project Roles Mapped to Functional Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean project role</td>
</tr>
<tr>
<td>Facilitator</td>
</tr>
<tr>
<td>Executive sponsor</td>
</tr>
<tr>
<td>Team leader</td>
</tr>
<tr>
<td>Process owner</td>
</tr>
<tr>
<td>Team members</td>
</tr>
<tr>
<td>Consultant</td>
</tr>
<tr>
<td>Ad hoc members</td>
</tr>
</tbody>
</table>
The Lean team members receive less training, and they are trained while participating in RCI events (Exhibit 2.8). Individuals attend a meet-and-greet training session 1 to 2 weeks before the RCI event, which lasts about 1.5 hours and introduces the basic premises of Lean: eliminating waste and strain while improving the staff’s ability to care for patients. During this session, team members also learn how the RCI event will look and run. This training session was added to the Lean program after its original inception as a result of feedback from staff that more training was needed.

Lean team members also receive another 2-hour training session on the first day of the RCI event. This session focuses on the principles of Lean and further examines the types of waste that team members might encounter. Team members referred to this session as more of an introduction to Lean than training.

One interviewee noted key differences between prior quality improvement initiatives and Lean in the selection of team members and the time to complete the project. In previous non-Lean projects, staff identified the problem, gathered a team closest to the work, worked through the problem, and then implemented change. With RCIs, however, the interviewee noted that participation in teams is no longer limited to those who are closest to the work. Further, as one noted, the RCI team is designed to work through the problem in just a few days, rather than taking 3 months. Other interviewees noted that RCIs are more focused on a single problem and have more resources to meet the desired outcome.

We received conflicting information from interviewees about what Lean training, if any, management and leadership staff received. Some frontline staff believed that managers and department leadership received training during the initial Lean value stream activities; another interviewee noted that management staff received specific management training similar to the facilitator training. One other staff person noted that no formal training was given to management and departmental leadership.

In general, many interviewees, including facilitators, Lean team members, and departmental leadership, noted that more formal training on Lean is needed. Team members desired more information on Lean tools and Lean terminology, noting that those who are new to RCIs are often confused by the concepts and language. Other interviewees generally felt that the organization needed to move from just-in-time training to formal training.

**Process for Lean Projects**

Lean projects at the hospital follow similar processes that revolve around an RCI event.
**Before the Event**

Before the start of an RCI, the facilitator and the executive sponsor create a charter for the RCI event that outlines the scope of the work, the current and target states, and the current and target metrics. The event team is also listed in the charter.

The facilitator works with the team leader, the process owner, and the executive sponsor prior to the RCI event. The facilitator helps clarify the roles of all team members, helps determine which data will be collected prior to the event, and engages with staff and managers in the event area to better understand the issues and challenges that the Lean team might face in the area in which they are trying to implement changes. The team leader and the process owner work with the facilitator to collect baseline data and observe the current processes. The team leader also works with the facilitator to become more familiar with Lean tools that might be used during the event.

**Event Week**

RCIs lasting 4.5 days are scheduled for 1 week each month in each value stream. Using a process developed by the consulting firm, the RCI examines and tests solutions to the problems discussed by team members. A few interviewees described the RCI process as “too rigid” and not flexible enough to meet the individual needs of the department. The activities included in each RCI are described in Exhibit 2.9.

**Exhibit 2.9. Lean Project Activities**

<table>
<thead>
<tr>
<th>Overall:</th>
<th>Lean training and experience are gained through participation in an RCI event and Lean project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration:</td>
<td>4.5 days total</td>
</tr>
<tr>
<td>Pre-event</td>
<td>Create charter</td>
</tr>
<tr>
<td></td>
<td>Select team members</td>
</tr>
<tr>
<td></td>
<td>Observe current processes and collect baseline data</td>
</tr>
<tr>
<td></td>
<td>Prepare individuals for their roles in Lean event</td>
</tr>
<tr>
<td>Event Week</td>
<td>Monday: Give short introduction to Lean principles and tools; discuss reasons for action and “triggers” for process</td>
</tr>
<tr>
<td></td>
<td>Monday and Tuesday: Map initial state and target state; conduct gap analysis</td>
</tr>
<tr>
<td></td>
<td>Wednesday and Thursday: Discuss solution ideas; conduct rapid experiments; develop completion plan; confirm state (measuring actual impacts of event changes)</td>
</tr>
<tr>
<td></td>
<td>Thursday: Wrap up (creation of standard work, communication, and education plans based on confirmed state); hold conclusions meeting with all Lean teams participating in RCI that week</td>
</tr>
<tr>
<td></td>
<td>Friday: Report out to senior-level staff</td>
</tr>
<tr>
<td>Post-RCI Event</td>
<td>Implement all changes on Monday following the event (sometimes sooner)</td>
</tr>
<tr>
<td></td>
<td>Follow up on completion plan activities</td>
</tr>
<tr>
<td></td>
<td>Track event week metrics and post in common area</td>
</tr>
<tr>
<td></td>
<td>Send out weekly communications and updates to staff during 1st month after the event</td>
</tr>
<tr>
<td></td>
<td>Send out biweekly communications and updates to staff in 2nd and 3rd months after the event</td>
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Some staff felt that it was difficult to realistically simulate certain conditions or events (e.g., a patient having a heart attack) and to test various redesign options during the RCI event. Also, some interviewees felt that these “tests” were very optimistic guesses of what would happen and what would be done on a routine basis.

Other interviewees, including those who have participated in multiple RCIs, believed that solutions generated during the RCIs are often generated beforehand by the executive sponsor, the process owner, and the facilitator and not by the team members. However, other team members believed that the facilitator was unbiased and that they were able to generate their own solutions during the RCI.

**After the RCI Event**

Changes are implemented the Monday following the event and sometimes sooner. Staff noted that there is a lot of pressure to implement changes quickly, and process improvement staff are “dead bent” on implementing changes on Monday. Lean teams also follow a completion plan that is generated during the RCI. Immediately after the RCI event, team leaders and process owners are responsible for implementing the solutions developed during the RCI, communicating with department staff about changes, and overseeing the changes.

Two other tools are used as part of Lean at the hospital: “just do it” activities and “project” work. In just-do-it activities, a known problem exists with a known solution, and the means to implement the known solution requires only one or two people and less than 8 hours of work. A project is defined as a problem having a known solution, but the means to implement the solution requires a multidisciplinary team and anywhere from 1 week to 2 months to complete. These tools involve using Lean principles, but the key difference is in whether a known solution exists. The primary premise for using an RCI event is to determine the root causes for problems in an area because even though efforts to solve the problem have been attempted in the past, the issues persist, indicating potentially that the solution resolved a symptom but not the underlying cause.

**Monitoring, Control, and Sustainment**

At the Lean project level, the team leader and the process owner, with support from the facilitator, monitor the project after the completion plan items are implemented. Team leaders are required to report out on the project metrics 30, 60, and 90 days after the RCI event. Sustainment involves continual monitoring of metrics related to project activities and frequent communication (e.g., weekly meeting, staff huddles).

One barrier to the sustainment of individual Lean projects is that new RCIs occur each month. It requires a tremendous amount of staff time and resources to get new projects off the ground while sustaining previous projects.
Dissemination and Spread of Findings

Spread of Knowledge and Findings Across Central Hospital

Executive team reporting. The main form of disseminating findings to the executive team is through the report-out on the Friday following the weeklong event. Each team presents the problem, the process for solution, and the outcomes. The executive team has begun tying the report-out meetings to financial meetings to increase the presence of executive leadership.

Internal hospital communications. According to numerous interviewees who participated in an RCI team, communication about Lean findings seems to be organized individually by projects. For example, in the surgery department, a newsletter was published to promote findings from RCI events. Additionally, a bulletin board was installed to post results. Cardiology department staff, including individuals who were not part of the D2B team, noted that they get updates on projects every Wednesday at staff meetings. Additionally, one interviewee involved with the procedure card project noted that the surgery department maintains a SharePoint site, which all surgical staff can access to view data and progress on their department’s Lean projects.

There are few organization-wide tools for communicating about RCI projects. For example, the senior-level executive who oversees the RCI program occasionally presents outcomes from various RCIs at staff meetings. One interviewee, who served as a team member, noted that she did not think the results were shared beyond the project team. In her experience, after the conclusion of the event, even team members from outside the department did not get any further updates about the outcomes.

External Dissemination

In addition to the spread of Lean within the hospital, there has been increased involvement of HAU Care, the regional ODS. Because some departments are led and coordinated across the regional health system, employees are often included as RCI team members for these departments. For example, the D2B team included a risk manager from HAU Care. Additionally, the many supply chain projects all have a representative from HAU Care because the supply chain department is run at the regional level.

Central is being used as a test location for Lean because it is one of the largest hospitals within HAU Care. Some interviewees noted that HAU Care plans to implement Lean across the system based on the hospital’s experience. One example was described earlier in the discussion of the D2B project. This project is being implemented in another clinic within the system, accounting for lessons learned from the first clinic. Further, HAU Care is developing a Lean Steering Council for Lean process improvement to facilitate collaboration among regional health system members.

The hospital has used different collaborative groups around the State to discuss Lean implementation. Examples are the Association of periOperative Registered Nurses (AORN) meeting and the coalition for patient safety meetings where members share different Lean approaches. In addition, one value stream sponsor noted that she made a presentation for an RCI event to the national umbrella health care system. One executive sponsor mentioned that the hospital makes presentations at citywide or statewide meetings and participates in a Lean collaborative group. This collaborative group looks at Lean/Six Sigma initiatives within the city
as they relate to patient safety as part of the coalition for patient safety. Additionally, the national system created a Lean/Six Sigma working group.

**Lean Projects Studied**

We selected two Lean projects that focus on processes relevant to frontline staff: improvement of “door-to-balloon” process (retrospective) and cardiology followup appointment scheduling (prospective). Retrospective projects were studied after the project had been completed and in the sustainment phase. Prospective projects were studied as the project occurred (i.e. from the initial training and project implementation to sustainment).

**Improvement of “Door-to-Balloon” Process**

**Project Goals**

Door-to-balloon (D2B) time refers to the interval between the time an acute myocardial infarction (AMI) patient enters the emergency room and the time a percutaneous coronary intervention is completed; often, this intervention involves the insertion of a balloon into the blocked artery. The Centers for Medicare & Medicaid Services (CMS) standard for D2B is a maximum of 90 minutes. At the time D2B was selected as a Lean project, the average time reported to CMS by the hospital was 89 minutes, very close to the maximum. Thus, the goal of this project was to bring the average D2B time well under 90 minutes.

**Site of Implementation**

The emergency department (ED) was chosen as the first value stream at the hospital because of its high volume of patients and because it was struggling with space issues and throughput. The D2B project was the 11th Lean event completed in the ED value stream and the 5th event for the cardiology value stream.

Various levels of ED staff, ranging from nurses to departmental managers, commented on the culture of the ED at the onset of the Lean project. During 2009, the department lacked leadership, and morale was poor. In early 2009, the ED was understaffed with nurses and had high turnover within the contracted physician group, with 18 positions open. According to one nurse and one executive, the department had disciplinary, staff, and quality issues. Concurrent with the Lean process, the department was working toward certification as an American College of Surgeons (ACS) Level II Trauma Center. The ED successfully launched a trauma center and identified a new director in early 2010.

**Project Selection**

The emergency department steering group selected this project because of the significant opportunity to improve care of patients who may be having a heart attack and because D2B times are reported to CMS.

**Project Staffing**

The executive sponsor and the facilitator selected the team members (Exhibit 2.10). The team leaders included an individual from patient care services and another individual from training and development. Because the D2B value stream involves the ED and the cardiology department
(specifically, the cardiac catheterization lab), individuals from both departments were included in this RCI. Moreover, because D2B times are reported and monitored on a system level, members of a heart institute, another unit within the ODS, were invited to participate because physicians from this group work at both locations. The “fresh eyes” included the risk manager and the chief nursing officer (CNO). Neither of the team leaders was associated with the ED or the cardiology department. Eventually, as one team leader became busy with her other roles, team responsibilities fell to the other team leader. Moreover, the process owner also became busy with other responsibilities, leaving much of the monitoring and sustainment responsibility with the team leader from outside the value stream. This team leader was described by several staff members as “diligent.”

Planning and Implementation

A charter was developed in July 2009, but the RCI was scheduled for February 2010 to allow physician participation. The weeklong RCI began on February 8, 2010. The steps or activities implemented by the project team and any Lean tools used are described below.

- Mapped initial state of D2B process (Lean team members described as “confusing,” “disjointed” and “practitioner variable” but “focused on patient goals” and “committed”).
- Mapped target state. Lean team members noted the target state should be “fast,” “goal oriented,” “have clear roles,” “be patient centered,” “be a good use of resources,” and “be easy to instruct.”
- Conducted gap analysis between current and target state.
- Brainstormed possible solutions to reach target state and reduce gaps.
- Conducted rapid “experiments” (trial runs).
- Developed completion plan.

Monitoring, Control, and Sustainment

After the RCI, the team leader collected data on the D2B times using manual tracking sheets. She met monthly with directors of the ED and the cardiology department and also worked with HAU Care’s heart institute to review the D2B data and reconcile the tracking sheets.

In the monitoring phase, the team leader and staff believed that one of the major issues with decreasing D2B times was not the process developed by the Lean team. Rather, it was the ability to quickly determine whether someone was truly having a specific type of heart attack (an ST segment elevation myocardial infarction, or STEMI) appropriate for angioplasty (balloon insertion). Staff wanted to get more experience with identifying, but there were too few STEMIs each year (about 56 out of 55,000) to allow everyone to develop expertise in identification.

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Exhibit 2.10. Project Team Composition: Door-to-Balloon Project

<table>
<thead>
<tr>
<th>Total staff = 14:</th>
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</thead>
<tbody>
<tr>
<td>- Facilitator: Process Improvement staff</td>
</tr>
<tr>
<td>- Team leaders: Nurse manager from patient care services and staff from training and development department</td>
</tr>
<tr>
<td>- Process owner: Department director</td>
</tr>
<tr>
<td>- Two clinical nurse specialists, one from the ED, one from the cardiology department</td>
</tr>
<tr>
<td>- Two physicians, one from the ED, one from the catheterization laboratory from the ED</td>
</tr>
<tr>
<td>- Chief Nursing Officer (CNO)</td>
</tr>
<tr>
<td>- One nurse</td>
</tr>
<tr>
<td>- One risk manager</td>
</tr>
<tr>
<td>- Two stakeholders from an ODS heart institute</td>
</tr>
<tr>
<td>- One staff person from the catheterization laboratory</td>
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</table>
Continued collection of D2B data occurred during sustainment monitoring for the ED and the catheterization lab. In general, interviewees from the ED believed that the process implemented as part of the D2B RCI sustained itself and continued to function well. ED staff believed that they were implementing the new process and their times were showing improvement. Data and adherence to the new process from the catheterization laboratory were less clear because tracking sheets were often not completed or submitted to the team leader.

**Project Outcomes**

The perception of success for the D2B project was relatively consistent among Lean team members and department leadership. Most interviewees believed that D2B was “successful” or “somewhat successful.” One interviewee who participated in multiple RCIs described the D2B project as “her favorite” because of its success. Specifically, staff noted the following outcomes of the Lean project that contributed to its success:

- A decrease in average D2B time from 89 to 77 minutes as a result of a new standardized process. A checklist was developed to improve the process and to ensure that the catheterization lab staff knew exactly what the ED staff had completed prior to handing off the patient.
- A feeling that patients were truly being helped.
- Better rapport and communication between the catheterization lab and the ED. As a result of the project, as soon as ED staff identify a STEMI patient, they notify the catheterization lab so they can begin preparing. Additionally, the catheterization lab helped the ED prioritize the steps to take before a patient moves to the catheterization lab.
- Improved staff morale in the ED.
- For some, a change in the perception of RCIs. Because this event was more successful than other RCI events in the ED value stream, staff’s perception of the value of RCIs improved.

A facilitator, three department leaders, and a physician said the D2B project had seen 60-70 percent improvement, due to tracking and the improved communication with the catheterization lab through a streamlined notification process.

**Management of Surgical Procedure Cards**

**Project Goals**

Surgical procedure cards list the supplies and equipment for each surgical procedure for each physician. The goals for the management of surgical procedure cards (procedure cards) project were to reduce the overall number of procedure cards, improve the accuracy of procedure cards, and improve physician satisfaction. Prior to the surgical procedure, a nurse or other staff member ensures that all supplies on the card are in the operating room. Typically, each surgeon has his or her own set of cards limited to the procedures that the surgeon performs. Each surgeon’s set is unique to that surgeon. If there are a lot of idiosyncratic procedures that vary considerably, the process becomes inefficient—it takes longer to stock the carts and the room, and it is easier to mistakenly leave something out. If something the surgeon needs is missing, the surgeon will
have to use an available substitute that might be less than optimal, or the surgery will have to stop while someone goes to get the item that is missing. If surgeons include items on their cards that they rarely use, the items have to be returned to stock. Items that cannot be restocked are considered contaminated and are disposed. Over time, procedure cards tend to proliferate because the number of surgeons increases and it might not be clear when a card becomes obsolete.

**Site of Implementation**

The procedure card project was implemented in the surgical services department. There are approximately 300 associates in the surgical department. Staff from this department describe it as one of “open communication” with weekly staff meetings. Staff in this department were described as assertive and accustomed to using evidence for decisionmaking. Prior to the procedure card project, this department implemented several projects from the value stream, including case card accuracy, patient-to-room process, pre-admission screening, surgical scheduling, and chart preparation. Additionally, this department did a specific RCI to ensure appropriate linkages between each project.

**Project Selection**

The idea for this project was generated during the value stream analysis conducted by the steering committee (see Lean Project Selection Process section). However, the main impetus for selecting this project was physician dissatisfaction with the accuracy of the procedure cards. The nature of the surgical supply packaging and linkages of procedure cards to other surgery processes also made this an ideal candidate. Prior to the project, the national organization began using unbundled surgical supplies, which allowed the system to purchase individual supplies at the best price and enabled the delivery of supplies and equipment that are more closely tailored to the preferences of each surgeon. For instance, when tools are bundled and the surgeon uses only one tool in the bundle, the others are considered spoiled. Unbundling minimizes this problem. However, unbundling increases the chances that a required tool will be overlooked. Thus, the need for accuracy and efficiency in the surgical procedure cards increases.

**Project Staffing**

The surgical department leadership and the executive sponsor selected the team members for the procedure cards project (see Exhibit 2.11). The process owner monitored much of the project, as a coordinator in the department. A physician and the chief medical officer (CMO) participated in the RCI because a goal for the project was to improve physician satisfaction. Individuals from HAU Care, the regional ODS, also participated in this event because the procedure cards are managed using the surgical information system at the regional ODS level. Finally, two individuals were ad hoc members of the team, meaning they participated only when needed. One ad hoc member said that she was called into the RCI twice to provide input.

The team leader for this event led the RCI event team but did not participate in pre-event or post-event activities because of her responsibilities as a nursing leader. Redefining the role of the team leader was part of an attempt by the Lean leadership at the hospital to see whether the process owner could take more responsibility for the pre- and post-RCI event work and the sustainment efforts in the belief that the process owner would be a more effective change agent, especially when the team leader did not work in the department being changed.
**Planning and Implementation**

The RCI event on surgical procedure cards was the ninth event of the surgical services value stream. A charter for this project was finalized at the start of February 2010, and the week-long RCI event began on February 8, 2010. The steps or activities implemented by the project team and any Lean tools used are described below.

- Mapped initial state for creating, modifying, and maintaining all procedure cards. The initial state was described as “complex,” “time consuming,” and “not meeting the customer’s needs.”
- Mapped target state. Interviewees who were team members stated that the target state should be “simplified,” “smoother,” “safer,” and “more reliable.”
- Conducted a gap analysis between current and target state using root cause analysis techniques.
- Brainstormed possible solutions to reach target state and reduce gaps.
- Conducted rapid “experiments” involving operating room motion; IT/IS system opportunities; and standard work for building procedure cards.
- Developed completion plan.

After the RCI, the team communicated the changes made at the staff meeting held the Wednesday of the following week, despite the pressure from the process improvement team to implement the changes on Monday.

The procedure card team needed three upgrades to the IT/IS system to fully execute the changes from the RCI event. The first upgrade, a free upgrade to existing software, was made. However, the other two upgrades required additional funds and were not been completed during the period of our research.

**Monitoring, Control, and Sustainment**

The process owner monitored the metrics (specifically, the number of procedure cards) from this project weekly through the first few months of the project. After that, data were monitored monthly. Although the number of procedure cards initially decreased, it eventually increased as new physicians and new procedures were added to the system. This pattern reflects an increase in the size of the practice, not necessarily a decrease in efficiency. Additionally, it was the general consensus that further improvements could not be made to reduce the number of procedure cards until the additional upgrades to the IT/IS system were made.

Metrics for the accuracy of procedure cards and the number of times a staff member needed to leave the operating room to get missing supplies or equipment were measured during the RCI event. The number of times staff left the operating room to get missing supplies or equipment...
was manually tracked at random times throughout the first 30 days after the RCI. The surgery department also maintains a SharePoint site, where all surgical staff can view data and progress on their department’s Lean projects.

The RCI event enabled the surgery department to create a business case scenario to approve funding for the IS upgrades. However, despite approvals and funding, the IS upgrades had not been made at the time this report was prepared. The IT/IS staff were unaware of the delay imposed on this project as a result. As of November 2010, this project had not been completed and had not entered the sustainment phase because the hospital was still awaiting the IT/IS upgrade.

**Project Outcomes**

The procedure card project was considered a “success” by most Lean team members and the executive sponsor because it was successful in ultimately reducing the number of cards. The delay for an IT/IS upgrade caused frustration because the project was halted until upgrades could be made. The nurses reported that they are satisfied with the outcome because they do not need to leave the surgical room as frequently to retrieve supplies and equipment. Physicians report satisfaction in having the appropriate supplies and equipment in the room. Additional outcomes attributed to this project include the following:

- The number of procedure cards decreased by 57 percent (from 15,000 to about 8,000 cards) over the duration of this case study.
- The IT/IS infrastructure was recognized as a major constraint on improving efficiency in this and other processes. The team realized that the IT/IS infrastructure was largely inflexible and did not always suit the needs of surgical services staff.
- Heightened and continued engagement of the process owner and a surgeon champion was viewed as a major success factor.
- Physician satisfaction improved.
- A “business case scenario” was developed for funding the IT/IS upgrades. This scenario included a description of the project and anticipated outcomes to justify the financial investment.
- A process was defined and implemented to ensure that procedure cards are updated, current, and accurate. Although the percentage of accurate procedure cards cannot be confirmed (until the new IT/IS system is in place), staff felt that progress had been made in this area as a result of the new standard process.
- The amount of paper printed for procedure cards decreased from 600 sheets per week to 60 sheets per week. This reduction in printing is a result of fewer and more accurate procedure cards.
- The procedure cards event was also seen as a partial success in that nurses were pleased that they did not have to leave the room for supplies and surgeons appreciated the increase in accuracy with their equipment. However, the delay in the IT/IS upgrade caused great frustration for all staff involved.
Outcomes of Lean

In this section, we discuss the outcomes of the Lean initiative at Central based on information provided by interviewees (see Exhibit 2.12). The focus of this case study report is on the qualitative data collected, and thus it addresses mostly the process and perceived impacts of Lean. Where available, we provide outcomes data, including quantitative measures, provided by the hospital during the study.

The discussion of Lean outcomes is organized into two major categories based on our conceptual framework: intermediate outcomes and ultimate outcomes. As described previously (see the Conceptual Framework section of this report), intermediate outcomes include culture change, employee satisfaction, change in Lean knowledge and skills, and Lean routinization. These outcomes can be viewed as intermediary to the ultimate goals of increased efficiency, increased patient satisfaction and experience, improved clinical processes and outcomes assessments, and increased patient safety.

While the findings for outcomes are structured around our conceptual model, most data for outcomes for the hospital are related to employee satisfaction or frustration owing to Lean and increases and challenges to efficiency.

The hospital measures impact at the project level, at the value stream level and ultimately at the organizational level.

Intermediate Outcomes

**Organizational Culture Change**

Change in organizational culture was discussed mostly by process improvement and senior-level staff. These individuals believe that the culture is slowly changing, and concomitantly, enthusiasm to participate in Lean is slowing increasing.

One of the original goals for Lean was a change in the culture at the hospital from a silo organization to one of increased standardization and communication. The outcomes for this appear to be bimodal, with executive staff mentioning and believing that the implementation of Lean can have an impact on the culture of the organization or at least on units, whereas frontline staff mostly described Lean in terms of discrete RCI events. The vision for a “Lean” culture exists primarily for executive staff. However, one department leader felt that although there is “room for improvement” in understanding Lean principles, there is a high level of interest in the concepts. One department leader noted that language around standardization is becoming a normal and frequent part of the staff discussion about procedure cards. This same respondent said that terms like “standard work” and “standardized processes” are becoming commonplace among department leaders in the hospital.

However, administration’s and frontline staff’s perceptions of culture change appear to differ in that at least three frontline staff felt that the Lean process has not changed the way staff think.
about their job. An ED staff member felt that the culture that already existed in the unit (i.e., physician dominance of decisionmaking) prohibited the full integration of the Lean process—namely, that the physicians do not have to adopt the Lean process, which creates a situation where only some staff change their behavior.

**Employee Satisfaction**

Outcomes related to employee satisfaction were mixed; quantifiable successes improved morale in some cases, but an increase in tension caused by implementing Lean processes negatively affected moral in others.

**Visible and quantifiable success improves employee morale.** For D2B, two facilitators noted how the tracking process they implemented for the RCI helped employees see how quickly they were working and where they could improve. They felt it increased their job satisfaction because employees knew when they had done things well and could follow up for improvement. One ED nurse attributed improved employee morale to the fact that the D2B RCI went smoothly and helped them identify problems in communication and mutual understanding with the catheterization lab.

For the procedure cards RCI, two department leaders said that nurse, physician, and team satisfaction increased because of having the appropriate supplies and the right procedure card. This improvement in procedures led to staff having the tools they need to do their job well, in turn leading to improved employee satisfaction. Improved satisfaction also appeared to be due to increased understanding of the process.

There was also a difference in perception by facilitators and frontline staff about the root of the increase in employee satisfaction. One facilitator attributed the improvement in morale to seeing the change in the whole value stream, while the frontline staff did not comment on the bigger picture but instead focused more on their immediate environment.

**Tension among staff caused by Lean has a negative impact on morale.** Six staff, including frontline staff and leadership, indicated that Lean actually had generated a negative impact on employee satisfaction because tensions among staff increased. One department leader cited an example where staff morale decreased when changes from one RCI could not be implemented because the organization would not purchase equipment necessary for the change. Another department leader noted that an RCI resulted in the redeployment of one staff member to another department; according to this interviewee, this staff member was unhappy with the move.

ED physicians were initially contractors, rather than employees, and were not mandated to participate. This caused great tension mentioned by at least two nurses in the D2B project because some physicians resisted or refused to implement changes. The physicians involved in the procedure card process were under a different employment structure and were hospital staff; thus, they were more engaged in the process.

“I think that the staff morale did improve... It also improved the morale of our staff towards RCI as a whole because... they got something that made sense to them.”

—Nurse, D2B
**Lean Knowledge and Skills**

Findings related to Lean knowledge and skills can be grouped into three themes: staff have a new appreciation for other teams, standardization increased across locations, and clinical knowledge improved. Evidence and discussion are limited in this area.

**Some staff have a new appreciation for other teams.** One nurse in the ED mentioned that due to the D2B RCI, she learned what the order entry clerks did and what the catheterization lab was looking for, thus making it easier to understand the needs of others with whom she worked.

**Standardization increased across locations.** One department leader noted that for the first time, the two cardiovascular sites have collaborated on making the D2B project work. He noted that the experience has been positive for all involved.

**Clinical knowledge improved.** Because the D2B process focuses on getting STEMI patients to the catheterization lab quickly, some ER staff were unclear why the team did not use this process for all myocardial infarction (MI) patients. The cardiologist helped staff in the ER understand that not everyone with MI needs an immediate catheterization, so the process helped focus efficiency on those patients who could have an improved clinical outcome.

**Lean Routinization**

Findings related to Lean routinization can be grouped into three main categories: gaps or errors were identified, IT/IS upgrade delays were a challenge, and staff learned to be open to changes.

**Lean processes can help identify gaps or errors to streamline the process.** The Lean process as applied to the D2B project involved the application of a STEMI tracking sheet that follows the patient from the ER to the catheterization lab. One ED nurse reported that they now know the priorities for what to do and in what order for STEMI patients and have created a STEMI kit with the drugs needed in that situation. By using this tracking sheet, the ER, the catheterization lab, and the physicians can see how their timing improves. The process also helped standardize efforts across the two locations. While many found this change to be positive, one nurse felt that the routinization process focused on the bottom line instead of on standardization. A facilitator also felt the outcomes never reached the desired level.

In the procedure cards project, the team has a routine in place to check the cards every day to make immediate changes when necessary. The project has also resulted in an increase in accuracy, with the result that the team does not have to leave the operating room as often.

**IT/IS upgrade delays caused challenges to routinization.** While the procedure card RCI led to improvements and routinization of the cards, the team was still waiting for two IT/IS upgrades to complete the process. The CMO also noted a problem with some entries populating the wrong procedure cards, which needs to be corrected with the software. A department leader for the process felt that having the RCI event supported their efforts to get an upgrade. Another department leader expressed disappointment that they did not get the result they anticipated because they did not have the correct systems upgrade.
Staff learned to be open to changes. One procedure cards department leader felt that the Lean process taught them to try different processes. They also learned to not be afraid to return to old patterns if the new processes did not bring improvements.

Ultimate Outcomes

This section is organized according to the types of ultimate outcomes represented in the conceptual framework. Findings regarding ultimate outcomes were reported by interviewees. Information is available for three of these outcomes: efficiency, value (business case), and patient experiences of care.

Efficiency

Nearly all staff at all levels, from senior management to frontline staff, reported on efficiency-related outcomes as a result of Lean.

Organizational level. Staff reported many substantial gains in efficiency in the hospital during and after implementing Lean. Senior-level and process improvement staff indicated that Lean saved the hospital $1.5 million in 2009. This figure was corroborated by the CFO; however, it is unclear which costs and savings were included in this figure.

Project level. The following impacts on efficiency were linked directly with specific Lean projects. Several of these impacts were discussed in Section 6. However, we have repeated these outcomes in this section to highlight the totality of impacts on this area.

- D2B times improved from an average of 89 minutes to 77 minutes, with only one patient falling outside 90 minutes, in May and April 2010.
- ED door (i.e., time patient enters the ED) to doctor time (i.e., time patient sees doctor) decreased from approximately 55 to 37 minutes.
- One ED project focused on capturing charges and billing. As a result of this project, billing accuracy was improved to 98 percent and revenue increased approximately 5 percent.

Management of surgical procedure cards. For the procedure card process, one department leader cautioned that although it looked like the number of cards increased, this higher number was due to an increase in the number of physicians and procedures. According to three department heads, there has been a 57 percent reduction in the number of cards because they had physicians review their cards for accuracy and maintained them.

There were some negative perceptions surrounding efficiency gains. Staff perceived a shift of work to other staff because of the pressures of Lean process. According to two department leaders, some efficiency improvements in one part of the value stream resulting from the RCI event were achieved by pushing work to another set of staff downstream, instead of truly improving the efficiency of the entire value stream.

“When you start to look at the whole process, it has turned like that the work is being pushed back from one set of people to another rather than overall getting more efficient.”

—Department leader, procedure cards
Additionally, although staff members were told at the beginning of the Lean process that they were guaranteed not to lose their jobs due to increased efficiency from Lean projects, as mentioned one person was redeployed from the procedure cards team. This led some interviewees to question the motivations of leadership.

*Other projects.* One RCI resulted in the addition of one full-time-equivalent (FTE) position to improve the overall process. Interviewees were unsure how this affected efficiency because the additional resource may have resulted in greater efficiency gains. Additionally, one interviewee who had some experience in other RCIs at the hospital noted that improving patient throughput leads to more patients being admitted, which may increase the patient load of the nursing staff, if other factors remain equal.

*Patient Experience*

One department leader for D2B commented that patient satisfaction seemed to increase during the events; however, there was no evidence for this except personal perception. Other than that, patient experiences and patient satisfaction were not specifically mentioned by interviewees. In general, a few staff mentioned that some RCI projects, especially those involving housekeeping and support services, included process changes that allowed nurses to spend more time caring for patients, resulting in a better patient experience.

*Clinical Processes or Outcomes Assessment and Patient Safety*

One finding regarding patient safety was that the focus on the patient increased when the goal of the RCI aligned with the goals of the department, such as improved patient outcomes. Further, in the D2B RCI, one nurse felt that this event was aligned with the department’s goal for increased patient safety and that this common goal facilitated staff communication and engagement. Because of improved communication between the catheterization lab and the ER due to this RCI, the catheterization lab team is more likely to follow up with the ER team on the patient outcome, reinforcing the focus on the success of the patient.

Some staff felt patient safety could be compromised by the Lean process. Two department leaders commented on a project at the hospital not specifically studied in this research. Staff members voiced their concerns regarding patient safety during an RCI on triage, for which a nurse was taken from the triage desk and replaced with an emergency medical technician (EMT). This caused two near misses because the EMT had less medical knowledge and did not recognize certain symptoms. The department leaders stopped the process because of concerns for patient safety.

*Business or Strategic Case*

Senior and department-level staff at the hospital were asked about the business case for Lean. While many interviewees noted the resources required for implementing Lean, senior executives also noted the value in bringing teams together to solve problems and increase efficiency. At the hospital, outcomes were often measured in terms of ROI. Using their consultant’s tools, the hospital estimates the benefit from implementing Lean was 4.5:1 ROI at the end of 2010. This breaks down into cost savings of approximately $8 million with $130,000 per Lean team in 2010.
Overall, the business case at the hospital was somewhat hard to measure beyond ROI because according to one department leader, they often picked projects with “aches and pains” not necessarily projects that would lead to high ROI. The same interviewee noted that the hospital does not have a history of holding people to metrics, and fostering this culture may quantify gains beyond an increase in ROI. From the perspective of some respondents, however, the benefits of implementing Lean at the hospital reach beyond financial gains to increased employee morale, an increase in clinical knowledge, increases in efficiency, and in some cases a perceived increase in patient satisfaction and safety.

In sum, the overall perception of success on the two projects was mixed, and staff were still uncertain about Lean. The CEO noted that some staff have embraced the concepts fully, some see Lean as a passing trend, and some are resistant to change and undermine the process. The D2B project was viewed as a partial success because the D2B time decreased, and staff communication between departments improved.

Factors that Influenced Success of Lean Implementation

During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to success as well as the problems or challenges they witnessed or faced in implementing Lean (see Exhibit 2.13). Findings regarding facilitators and barriers are based on responses to these questions. Barriers to implementation were identified approximately three times more often by staff than facilitators. Staff mentioned a great number of factors that helped or impeded Lean organization or implementation.

All interviewees were also asked to share their insights, that is, their lessons learned based on their experience with Lean at the hospital. More specifically, they were asked whether and how they would change what they had done if they were to do it over again. As expected, these lessons learned were closely aligned with the facilitators and barriers.

Here, we discuss the aspects or factors mentioned by interviewees, noting how they operated as facilitators and/or barriers in the context of organizing the Lean initiative and then implementing it. We also link lessons learned to these facilitators and barriers.

In sum, facilitators related to staff engagement were the most frequently mentioned, with leadership and resources a distant second. Conversely, resource issues were by far the most frequently noted barriers. Issues surrounding communication about Lean and staff engagement were the second highest and were noted with less than half the references. There were far fewer data on lessons learned than barriers and facilitators; nevertheless, issues around scope, pace, and coordination of Lean activities were noted most often.

Because the experiences at the hospital were so mixed, we have organized this section by first providing a summary table showing major factors that facilitated Lean success at Central
Hospital (Exhibit 2.14), followed by a table that presents major factors that inhibited its success (Exhibit 2.15).

<table>
<thead>
<tr>
<th>Exhibit 2.14. Major Factors that Facilitated Lean Success at Central</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Scope, pace, and coordination</td>
</tr>
<tr>
<td>Leadership</td>
</tr>
<tr>
<td>Resources</td>
</tr>
<tr>
<td>Communication about Lean</td>
</tr>
<tr>
<td>Staff engagement</td>
</tr>
<tr>
<td>Lean team composition and size</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exhibit 2.15. Major Factors that Inhibited Lean Success at Central</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Alignment</td>
</tr>
<tr>
<td>Scope, pace, and coordination</td>
</tr>
<tr>
<td>Leadership</td>
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<tr>
<td>Resources</td>
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<tr>
<td>Communication about Lean</td>
</tr>
<tr>
<td>Staff engagement</td>
</tr>
<tr>
<td>Lean team composition and size</td>
</tr>
</tbody>
</table>

**Organizing the Lean Initiative**

**Alignment of Initiative to Organization**

Lack of alignment was listed as a barrier by over half of the department leaders, with three main themes emerging. The first lack of alignment was in the consultant.

The original consultant was not culturally aligned with the hospital. The staff found her to be too focused on manufacturing, and they had a hard time transferring the principles to health care.
When the hospital switched to a consultant who was more aligned with its values and health care, Lean knowledge increased within the organization.

The second area of misalignment was in how staff viewed their primary responsibility to meeting patient needs as being misaligned with the goals of Lean. It was also difficult for some staff to transfer Lean principles to health care, especially around spending time with patients. For instance, many staff felt pressure to standardize the time spent with patients even though they believed this should vary depending on patients’ needs. Thus, the new consultant, who had a history of working in health care, was able to help staff better understand how standardization and efficiency in time spent with patients could actually be patient- and customer-focused.

Finally, an executive discussed plans for expanding the leadership development program, “Building the Best,” so that all staff could be taught change management skills. The training will be integrated into Lean events, and management will attend a 3-day change management training with the experience solidified by participating in a Lean event. The expanded change management program is at least partly in response to a “bimodal distribution,” where some executive sponsors have shown strength in driving Lean forward while others have been more timid.

**Scope, Pace, and Coordination of Lean Projects**

Many lessons were learned at the hospital surrounding scope, pace, and coordination of Lean projects as mentioned by all department leaders and executive staff interviewed.

Interviewees at the executive level recommended starting the Lean process with a project that is relatively simple to implement and has visible gains for frontline workers. When staff see a quick reduction in waste and can link this to improved patient outcomes, their engagement is higher for future projects. Staff leadership noted that the hospital did not follow this advice from consultants, and complex processes and events were targeted first (e.g., the ED value stream) because they represented significant room for improvement. This resulted in frustration from staff, as projects such as D2B felt overwhelming.

Correspondingly, one facilitator also noted that highly interdependent projects require a lot of buy-in, which is sometimes difficult to obtain early on. Thus, an “early win” can improve staff engagement early on in the value stream and pave the way for more difficult projects.

Nearly all interviewees from the ED said that the scope of Lean projects is an important factor in their chances of success. For example, in the D2B project, many interviewees felt that the narrow, well-defined scope of this project facilitated its success. In contrast, they noted that other
Lean projects in the ED were too large in scope and eventually needed to be redefined or ultimately failed.

Many staff, including nearly all ED interviewees, believed that the pace of the Lean projects was too fast. They felt that it was far too difficult to implement Lean changes on the Monday following the weeklong RCI events as instructed. They wanted more time to plan for changes and communicate with other staff about them. Additionally, on a value stream level, the steering committee planned projects each month. As such, staff became very worn out from the events. One Lean project facilitator indicated that it was sometimes difficult to monitor and follow up on all the projects because of limited resources and overlapping events.

**Implementing the Lean Initiative**

*Leadership Activities and Qualities*

**Organizational leadership.** Leadership was mentioned as both a facilitator and a barrier to Lean implementation. Interviewees noted the significant buy-in from senior staff at the organizational level. The CEO’s belief in Lean motivates other staff to keep committed to the process. Likewise, the organizational champion of Lean at the hospital is strategically positioned because he oversees 300 physicians, resident physicians, and staff and is well respected by his peers. Interviewees noted that organizational leadership participated in report-out meetings and also discussed issues with staff when problems at Lean events arose.

**Departmental leadership.** According to a department leader, the consultant originally did not include departmental leadership on the teams, believing that their participation would inhibit sharing and transparency. The staff learned that not including leadership led to solutions that might not be feasible, and leaders have since been included on teams. By including department leads on the team, leaders are aware of changes that have been made and can hold staff more accountable for following through.

Department leaders, process improvement staff, and team members identified the lack of engaged leaders at the department level as a barrier to Lean implementation and sustainability. Specifically, they mentioned that department leaders do not monitor progress to make sure that staff follow new processes designed by Lean teams. One interviewee noted that department leaders are very compassionate people but do not have a history of setting goals and holding staff accountable.

**Project leadership.** The nature of project leadership was mentioned as a barrier by many interviewees from the ED. Because team leaders often were not from the department or the value stream implementing Lean, ED staff interviewees believed that the team leaders were unable to understand the work of the ED and defined changes that were not sustainable. Some interviewees felt very strongly that the team leader should come from the department implementing the Lean projects. Interviewees from the procedure card project did not mention this aspect of project leadership as a barrier or a facilitator to Lean implementation or sustainability; however, the team leader for this project did not play a large role, and most leadership fell to the process owner, who is a member of the department.
Availability of Resources

Overall, commitment of sufficient resources was cited as a key facilitator, and limited resources was the most frequently cited barrier to the implementation and/or sustainability of Lean. Resources mentioned included capital resources for implementing solutions identified through the RCI events, additional IT/IS resources, data collection resources, and staff time resources.

Capital resources. Solutions generated in RCI events sometimes required the use of capital resources. Several interviewees, including Lean team members and departmental leadership, mentioned frustration when the resources were not available to implement solutions. For example, several interviewees were frustrated after Lean events showed the need for another FTE position, but the organization would not provide it. Another solution from an RCI was to put a label maker in each room to label medications, but the organization did not provide it.

IT/IS resources. Every interviewee from the procedure card project in the surgical services department indicated that a lack of IT/IS resources was a barrier to implementing solutions identified through this project. Because IT/IS has different priorities and slim resources and is located at the health care system level, the upgrade necessary to complete changes identified through the RCI was delayed for over a year.

Data collection resources. Several interviewees at all levels noted that data collection was a huge barrier to Lean sustainability. Because nearly all data collection is time consuming, it is difficult to monitor changes from the Lean projects. For the D2B project specifically, data were collected using paper tracking sheets that staff did not always complete.

Staff time resources. The hospital involved staff at many levels in the weeklong RCI events. However, there was frequently a lack of physician participation due to limited time. Further, time constraints on staff to follow up on and monitor the progress of Lean projects were cited as a barrier by many interviewees. The hospital process improvement staff indicated that time for staff to participate as process owners or team leaders was 10 percent of their time after the RCI event. However, while staff are leading and participating in Lean projects, their regular duties are typically unchanged, essentially adding responsibilities. Staff time was especially an issue during the first months of Lean implementation when Lean facilitators were not full-time facilitators and still maintained other clinical or administrative responsibilities. However, Lean project facilitators are now full-time and can dedicate more time to Lean projects. Further, three frontline staff specifically described Lean as mostly just more work for team members. For them, Lean resulted in additional responsibilities, which they felt put them behind in their core work obligations after an RCI event.

Communication About Lean

Many individuals at all levels indicated that lack of training prior to Lean events was a barrier to participation. As a result, process improvement staff at the hospital added a short 1- to 2-hour introductory session to Lean a few weeks before the RCI. Nevertheless, some interviewees still desired more preparation on the Lean/RCI process and on the issues or problems being tackled in the Lean events prior to engaging in the actual RCI process.

"Education [on the Lean process] ahead of time for all of the hospital staff I think is key."
—Executive sponsor
Several interviewees suggested doing more training on Lean and data collection on the problem being targeted prior to the start of the project. Further, a senior-level clinical executive noted that it is important to make sure participants know that the goal is attainable and to make the pre-event training actionable. Some project team members also commented that there was too much training in the week of the event, which became overwhelming. These individuals believed that more training, especially on Lean terminology and concepts, would be useful prior to the RCI. Therefore, doing the pre-work and more extensive education on both Lean and the problem prior to the event would help reduce the intensity during the week of the RCI.

Lack of communication with department staff about process changes resulting from the RCI was mentioned as a barrier to sustainability by Lean team members and departmental leadership. Specifically, communication about the RCI and solutions to be implemented was largely left to the staff participating in the RCI to do in meetings or small-group settings. This was a difficult role because staff not involved in the event sometimes felt that their voice was not heard.

**Staff Engagement**

The employment status of physicians within the hospital was mentioned as a barrier to their engagement, participation, and buy-in to Lean. These interviewees noted that it was difficult to engage physicians in the ED and in surgical services in the Lean process because they were contracted or independent medical staff and were not employed by the organization. Further, the CMO noted that even with employed physicians, the organization needed to consider the short-term productivity loss if they participated in Lean events.

Events considered by participants to be successful had managers who were engaged and held staff accountable. It was also important to have buy-in from executive management; without buy-in, it is difficult to get the necessary resources to implement the Lean changes. It is frustrating for employees to spend time on events and then not be able to implement changes because of a lack of resources.

**Lean Team Composition and Size**

**Use of a consultant.** Perceptions of the quality of the external Lean consulting group used by the hospital varied among interviewees. A few interviewees, including senior-level leadership, process improvement staff, and several individuals from surgical services, believed that the consulting organization had been very responsive, and one described the consultant as a “masterful teacher.” In contrast, a greater number of interviewees expressed frustration toward the external consulting group used by the hospital and considered the particular consultant who was first assigned to work with the hospital to be a barrier to Lean implementation. The hospital asked the consulting group to change its initial consultant a few months into the Lean process. Some interviewees felt that the initial consultant did not fit in culturally with the organization’s
mission and values. Other interviewees believed that this individual was not familiar with health care and used too much “Lean jargon.” Further, several interviewees believed that the consultant had predefined solutions to issues instead of taking into account staff’s opinions when coming up with solutions during the RCIs. Staff were more satisfied with the second consultant, who was more versed in health care principles.

Additionally, a few interviewees believed that the consulting group could have done a better job of providing information and sharing lessons learned from the experiences of other health care organizations implementing Lean. They believed that their hospital was “recreating the wheel” and that the consulting firm was not sharing tools that had already been developed.

**Staff.** Interviewees indicated that team member selection and composition were barriers for the following reasons:

- For some departments, such as the ED, that are short staffed, department leaders reported that it was difficult to get staff to participate.
- “Fresh eyes,” or staff who were not familiar with the process and were considered an important member of the Lean team, were seen as both helpful and disruptive to Lean events. One individual believed they were essential to helping view the process in a new light and to generating additional suggestions for solutions, while many others believed that “fresh eyes” suggested unrealistic or untenable solutions. Staff in the program also often felt criticized by the “fresh eyes”; they took pride in the work they were doing and were resistant to critique from outsiders.
- Staff who were close to the work were not always those making the changes. Related to the issue with “fresh eyes” participants, many interviewees, especially from the ED, noted that when staff outside the work area defined solutions, there was usually a huge barrier in implementing and sustaining them. However, the Lean team also included staff closest to the work, which facilitated making the changes.
- Departmental leadership was not initially involved on the Lean teams in their departments. As such, department staff participating in the teams sometimes came up with solutions that were not feasible given resource constraints. Accordingly, departmental leadership was included in the Lean teams after the first few months of implementation.
- A few staff noted that when physicians were not involved in the Lean projects, they often resisted changes defined from RCI events.
- Roles of team members, particularly after the RCI event, were not well defined, and team members were unsure who to talk to when Lean project solutions begin to slip or fail.

Further, several staff from the D2B project mentioned that having a common goal across team members facilitated buy-in for Lean implementation and sustainability. Because all Lean team members shared a common goal and understanding of the importance of decreasing D2B times, implementing solutions became easier.

Interviewees agreed that when staff saw the changes and improvements resulting from Lean, buy-in increased. However, there was some disagreement on whether this aspect was a facilitator at the hospital. Some staff did believe that the effects of Lean were seen quickly, and that
changes were realized in a relatively short time. However, other staff noted that changes from Lean projects often failed to bring about the desired results, and in turn, staff became unenthusiastic about Lean.

Two staff involved in the early Lean projects recommended not including too many people because this could introduce competing priorities among team members. One interviewee cited 8 to 10 people as the ideal project team size to ensure that everyone would have a chance to express his or her opinion.

Conclusions

Central Hospital has aggressively moved forward with Lean while in a relatively early phase of implementation. The hospital’s approach to implementing Lean involves training senior management on the concepts and tools \textit{a priori} and training frontline staff on a project-by-project basis. This training happens by doing while putting Lean principles into practice. Executive leadership sees Lean as a tool for changing the culture, breaking down silos, and improving care, in addition to improving efficiency. Conversely, many frontline staff equate Lean solely with improved efficiency and an improved bottom line for the hospital. This appears to impede staff buy-in to Lean projects. While executive managers are concerned with all ultimate outcomes (efficiency, quality, safety, and patient satisfaction), frontline staff appear to be less concerned with an improved hospital cost savings and more concerned with improved patient quality, safety, and satisfaction.

Recommendations for Similar Organizations Implementing Lean

- \textit{Align Lean with what matters to clinicians and their patients.} Executives must carefully map out and effectively communicate how Lean will support fulfillment of the organization’s mission in a meaningful way. This message should be repeatedly and publically reinforced in a variety of ways from the selection of Lean projects to rewarding of staff.

- \textit{Senior leaders must respond quickly when Lean implementation challenges arise.} Senior executives must closely monitor the execution of Lean in the early phases by being involved on rapid improvement event (RIE) teams and talking with staff members, managers, and staff supporting Lean implementation. Executives should use a variety of sources to become familiar with Lean so that they have the knowledge to make decisions and effectively respond when implementation goes awry.

- \textit{Consultants must engage managers and frontline staff.} Don’t assume that all Lean consultants will have the ability to translate Lean into health care and communicate effectively with managers and frontline staff. Build internal expertise by allocating staff in positions where they will assume RIE support and, eventually, Lean training responsibilities.

- \textit{Start simple and show visible gains to staff.} There will be the desire to go after more complex projects that may save more money, but tackling complex projects requires training, buy-in, and experience, which take time to achieve. Moving too fast or too aggressively can have very negative and unintended consequences for staff engagement, motivation, and hoped-for outcomes. Start with simple projects that have a narrow and well-defined scope. Gain experience in executing RIEs before taking on clinically focused projects.
• **Moving too fast to implement changes can hinder success.** Lean is time consuming for staff, and organizations require time to collectively develop the expertise to show consistent success with RIEs. Starting with a smaller number of RIEs allows organizations to perfect their implementation strategy without expending undue resources on projects that may not yield the desired return.

• **Middle management support is critical for frontline staff buy-in.** Some managers may actively resist Lean and impede staff from constructively engaging in RIEs. As with all new initiatives, there will be early and late adopters. Particularly in the early phases of Lean implementation, middle management support should be considered as a deciding factor in selecting projects.

• **There is a learning curve to Lean implementation.** Expect that challenges and setbacks will arise as Lean is introduced to a health care organization. Thoughtful planning can avert some problems, but inevitably, the unexpected will arise. Quick corrective action will minimize the lost momentum that can occur from setbacks.
Case 3. Grand Hospital Center

Organizational Background

This report presents the results of the study of an academic medical center, Grand Hospital Center, and its experience implementing Lean. Two projects, Hip and Knee Replacement Costs and Cardiology Follow-up Appointment Scheduling, were selected for study from this organization. The case study methods, including the criteria for selection of the projects for analysis, are described in the introduction section of this document. For this case, we conducted 31 interviews with 20 individuals. Their roles and positions at the hospital varied as described in Exhibit 3.1.

Exhibit 3.1. Interviewees by Type of Participant and Clinical Role

<table>
<thead>
<tr>
<th>Position in organization</th>
<th>Senior executive</th>
<th>Department level leaders or managers</th>
<th>Frontline</th>
<th>External individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians (including surgeons)</td>
<td>n = 2</td>
<td>n = 2</td>
<td>n = 0</td>
<td>n = 0</td>
</tr>
<tr>
<td>Mid-level providers</td>
<td>n = 0</td>
<td>n = 2</td>
<td>n = 1</td>
<td>n = 0</td>
</tr>
<tr>
<td>Other clinical staff (including nurses)</td>
<td>n = 0</td>
<td>n = 0</td>
<td>n = 1</td>
<td>n = 0</td>
</tr>
<tr>
<td>Non-clinical staff</td>
<td>n = 1</td>
<td>n = 4</td>
<td>n = 6</td>
<td>n = 1</td>
</tr>
</tbody>
</table>

Description of the Health Care System

Grand Hospital Center is part of a larger, not-for-profit enterprise, which includes hospitals, clinics, and other health care facilities (see Exhibit 3.2). The system has two major components: the parent organization and an affiliated multi-State network of community hospitals and clinics. The parent organization trains many students and researchers.

Description of the Health Care Organization

The focus of this report is a 214-bed academic medical center situated in a Southern city. Grand’s hospital and clinic facilities are located on a joint campus. Prior to 2008, inpatient care was provided at an affiliated hospital. In 2008, the academic medical center opened its own hospital facility. Exhibit 3.3 highlights key characteristics of the center.

All of the physicians are salaried staff physicians. The organization as a whole and each department are managed jointly by a clinical and an administrative leader (see Exhibit 3.4). Interviewees indicated that Grand is a physician-led organization, but that these complementary roles of clinical lead and administrative lead are equal in hierarchy. All medical staff report to the Chief Executive Officer (CEO); all administrative and non-physician staff report to the Chief Administrative Officer (CAO). Many clinical and administrative managers, as well as many executive leaders, had previously worked at other sites in the parent organization before coming to Grand.
Exhibit 3.2. Grand Hospital Center

Grand Hospital Center has 214-beds and is one of three campuses under its parent organization. At Grand, as in other institutions, Lean has been implemented at several levels. It is viewed as an organization-wide initiative and part of a larger quality improvement (QI) strategy that predates Lean.

In 2008, Grand suffered a $38 million loss. This was one of the factors that generated support for Lean as a means to reduce waste. An executive experienced in Lean implementation at other hospitals in the system was appointed as CEO of Grand and assigned to lead the Lean initiative. Grand selected an external consultant to launch and implement Lean. The consultant conducted four waves of Lean training and project implementation, with six teams participating in each wave. A fifth wave in 2011 was facilitated by Grand staff without the use of the external consultant.

To implement Lean, the leadership at Grand assessed the organization, defined priorities, identified departments for inclusion, and selected Lean project teams. The Lean teams then carried out activities related to their specific project.

As part of a multi-site study of Lean implementation, we conducted a rigorous case study of Grand Hospital Center. We selected two Lean projects for analysis: Hip and Knee Replacement Costs (retrospective) and Cardiology Follow-up Appointment Scheduling (prospective), both of which involve processes relevant to frontline staff. Thirty-one interviews with 20 staff at various levels in the organization were conducted between February and November 2010. Data were collected during two site visits through digital diaries recorded by Lean project participants and through phone interviews.

Interviewees reported that the medical center had experienced relative improvements in patient experience, staff satisfaction, and efficiency. In FY 2009, there was a shift from a negative to a positive operating margin. This improvement in the center’s financial status may have reflected steps such as making expense management a high priority; reducing administrative costs, filling only essential new and vacant positions; placing constraints on capital spending; streamlining of business processes to improve efficiency; and restructuring of employee pension and postretirement plans, as well as the contributions of the center’s Lean projects. Several staff interviewed, particularly at the management level, also noted a positive cultural shift within the organization during this period.

This medical center’s case highlights the importance of correctly positioning Lean to be successful:

- **Alignment**: Align Lean with the organizational goals, and engage physicians so they are on board.
- **Leadership**: Make support of Lean by hospital leaders visible to frontline staff.
- **Team membership**: Include multidisciplinary teams in Lean projects.
- **Resources**: Ensure adequate staff time, data, information technology, and Lean expertise to implement and sustain Lean projects.
- **Communication about Lean**: Ensure communication about changes resulting from project occurs.
- **Staff engagement**: Include physicians in Lean projects, while ensuring openness to multiple staff views.
### Exhibit 3.3. Characteristics of Grand Hospital Center

<table>
<thead>
<tr>
<th>Factors</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational experience with Lean</td>
<td>Some experience</td>
</tr>
<tr>
<td>Geographic location</td>
<td>South</td>
</tr>
<tr>
<td>Regional density</td>
<td>Large urban</td>
</tr>
<tr>
<td>Type of hospital</td>
<td>Tertiary care center</td>
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<tr>
<td>Hospital beds</td>
<td>214</td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>Yes</td>
</tr>
<tr>
<td>Physician employment model</td>
<td>Staff</td>
</tr>
<tr>
<td>Use of an external Lean consultant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Exhibit 3.4. Complementary Leadership at Grand

- **Academic Medical Center**
  - **Chief Executive Officer (CEO)**
  - **Chief Administrative Officer (CAO)**
    - Radiology: Clinical Lead
    - Radiology: Administrative Lead
    - Infectious Disease: Clinical Lead
    - Infectious Disease: Administrative Lead
Other Environmental Context

Local Competition

Grand operates in a competitive market. The CEO described local competition as greater than national competition; however, he noted that his medical center competes with large hospital systems in the region (South) and beyond it. The CEO indicated that Lean may make the medical center more competitive in this market by reducing the cost of care.

Funding and Payers

Grand’s largest payer is Medicare, accounting for 52 percent of payments. Further, given the large population of older residents in the State and the importance of Medicare as a payer, it is critical for Grand to deliver care at or below Medicare reimbursement rates. One interviewee noted that with limited resources, shrinking reimbursements, and an aging population, if Grand cannot provide quality care at Medicare reimbursement rates, it will not survive.

Local Resources

An important aspect of the context for Lean adoption is the availability of local expertise. In 2009, Grand joined a Lean consortium, which is a cross-industry group of more than 50 area organizations that are implementing Lean. The group collaborates to improve the performance of businesses and organizations applying Lean methods and tools, so they may become more efficient, profitable, and competitive. Grand is the first health care delivery system to join this consortium. Through the consortium, it has access to resources for Lean projects (e.g., seminars, materials), participates in tours of other Lean organizations, and learns from the experiences of other members. For example, as part of the consortium, several medical center employees had the opportunity to observe Lean implementation at a printing company and at a manufacturing facility that produces surgical devices. Of note, only one other hospital is part of this consortium.

Lean and Quality Improvement at the Organization

In this section, we discuss the history of both Lean and QI at Grand. Exhibit 3.5 outlines the overall timeline for Lean and QI initiatives at the center. The specific activities noted in the timeline will be discussed throughout this report.

History of Quality and Efficiency Improvement Efforts at the Organization

As noted by executive level staff and other senior staff, the parent organization as a whole has historically placed a strong emphasis on performance and QI. A philosophy of continuous quality improvement (CQI) is part of its organizational culture. The parent organization has benchmarked companies like 3M and General Motors in the private sector, and one of the aspects they share is a systems approach to process improvement. The parent organization chose DMAIC (Define, Measure, Analyze, Improve, Control) as the overall or “generic” approach to QI systemwide because it would allow staff to incorporate several tools, including Lean and Six Sigma, into improvement work.
### Exhibit 3.5. Chronology of Quality Improvement and Lean at the Parent Organization and Academic Medical Center

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp-up Implementation Study Period</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Years</td>
</tr>
<tr>
<td></td>
<td>2006 2007 2008 2009 2010 2011</td>
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<tr>
<td></td>
<td>Quarters</td>
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<td></td>
<td>1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2</td>
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</table>

**Case Study Data Collection**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp-up Implementation Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>History of QI &amp; Concurrent QI Activities</td>
</tr>
<tr>
<td></td>
<td>Parent system begins using DMAIC approach to quality improvement (QI)</td>
</tr>
<tr>
<td></td>
<td>Quality Academy created</td>
</tr>
<tr>
<td></td>
<td>Quality Academy staff visit Grand to provide overview of Lean</td>
</tr>
<tr>
<td></td>
<td>Quality Academy provides classes and sessions to all parent organization sites</td>
</tr>
<tr>
<td></td>
<td>Parent organization implements enterprise-wide priority projects on core measures</td>
</tr>
</tbody>
</table>

**Introduction of Lean**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp-up Implementation Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grand in financial trouble</td>
</tr>
<tr>
<td></td>
<td>New CEO hired for medical center</td>
</tr>
<tr>
<td></td>
<td>Lean implemented formally at medical center</td>
</tr>
<tr>
<td></td>
<td>External consultant hired for medical center</td>
</tr>
<tr>
<td></td>
<td>Lean included in medical center strategic plan, which outlines operations through 2012</td>
</tr>
</tbody>
</table>

**Lean Training & Projects**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp-up Implementation Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>External consultant mentored S&amp;P staff at medical center</td>
</tr>
<tr>
<td>Phase</td>
<td>Ramp-up Implementation Study Period</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td><strong>Years</strong></td>
<td>2006</td>
</tr>
<tr>
<td>External consultant conducted Lean trainings (2009 - 2010)</td>
<td></td>
</tr>
<tr>
<td>Wave 1 of Lean training and projects occur. Trainings conducted by external consultant. Wave 1 includes Hip and Knee Replacement cost and four other projects.</td>
<td></td>
</tr>
<tr>
<td>Wave 2 of Lean training and projects occur. Trainings conducted by external consultant. Wave 2 included six projects.</td>
<td></td>
</tr>
<tr>
<td>Wave 3 of Lean training and projects occur. Trainings conducted by external consultant. Wave 3 included Cardio Followup and five other projects.</td>
<td></td>
</tr>
<tr>
<td>Wave 4 of Lean training and projects occur. Trainings conducted by S&amp;P staff.</td>
<td></td>
</tr>
<tr>
<td>Wave 5 of Lean training and projects occur. Trainings conducted by S&amp;P staff.</td>
<td></td>
</tr>
<tr>
<td>Advanced Lean training offered by Quality Academy</td>
<td></td>
</tr>
<tr>
<td>Lean integrated into corporate QI training institute</td>
<td></td>
</tr>
</tbody>
</table>
The first course offered by the parent organization’s corporate QI training institute was the training course on DMAIC. This is a 10-day course on total quality management (TQM), Lean tools and principles, Six Sigma, and aspects of project management and change management. In addition, the institute offers many other individual level courses to employees through traditional face-to-face classroom delivery and online training. Project based collaborative workshops organized around a specific topic, such as heart failure, are also held periodically.

Training on quality management and process improvement is offered to employees, including physicians, through the parent organization’s training institute. Training is delivered by quality and process improvement practitioners, and largely resourced through the Quality Management Services Department, and the S&P Department at each site. Additional trainers are available from one of the campus as needed.

Many of the senior leaders and management staff at Grand have attended the institute’s Teams’ training course and completed projects applying the DMAIC methodology. Classes and sessions continue simultaneously with the Lean training and projects at Grand. Many interviewees felt that the DMAIC principles were not identical to Lean, yet had a great deal of overlap. One Lean participant noted that Lean efforts were more concentrated and visible than those related to DMAIC. As such, they allow Lean project teams to focus on particular opportunities and solutions, and partly due to increased visibility, managers and senior leaders may be more supportive of these efforts.

In addition to ongoing training, the medical clinic undertakes enterprise-wide priority projects that focus on core measures determined by the parent organization for all locations. Areas of focus in previous years have included obstructive sleep apnea, high-risk medications, and mortality. The enterprise priority projects are the main focus of the Quality Management Services Department. There were approximately 10 QI projects for Grand in 2010.

Initiation of Lean at the Organization

Prior Organizational Experience with Lean

At the parent organization, Lean is viewed as a specific approach to streamlining care delivery processes and as a way to identify waste and define solutions within a larger context of QI. The organization as a whole became interested in expanded applications of Lean principles in late 2003, based on positive feedback and results obtained in pockets of the organization that implemented Lean to streamline their operations and improve the patient and staff experience.

For training purposes, in particular, the parent organization opted to merge concepts and tools from Lean with Six Sigma and various management approaches, as discussed above. Since 2006, the organization has standardized process improvement training under the auspices of the corporate QI training institute, which provides “Lean Sigma” training to Lean project team members, their project champions (which include physicians and administrators), and individual employees.

In late 2006, a member of the training institute visited Grand to provide the department charged with process improvement – Systems and Procedures – with an overview of Lean, but a specific Lean program was not put into place at that time.
Financial Losses and a New CEO Drive the Need for Change

In 2008, following a $38 million loss by Grand, the parent organization sent a team to the site to conduct an assessment of operational improvement opportunities. Based on the assessment and previous experience with Lean at two other sites, the executive leadership of Grand decided to implement Lean as part of a larger strategic plan to make improvements in the organization. The strategic plan included reducing administrative costs, filling only essential new and vacant positions; placing constraints on capital spending, streamlining of business processes to improve efficiency; and restructuring of employee pension and postretirement plans in addition to implementing Lean. Although other process redesign approaches were considered, Lean was selected because of its focus on identifying and eliminating waste and empowering frontline staff to formulate solutions. Additionally, the leadership felt that Lean would allow staff to see quick positive results, thus increasing buy-in from staff.

Lean is generally implemented using the corporate QI training institute across the parent organization’s system. However, at Grand, the executive leadership stressed the urgency of the issues facing the site, and from 2008–2010 was able to hire an external consultant to focus Lean training and accelerate the change process. The consultant had previously worked with the executive leadership at the other sites under the organization’s umbrella to implement Lean. The training institute staff and the outside consultant worked together to train and mentor Grand’s Systems and Procedures’ staff as Lean coaches and facilitators to transition Lean to an internal effort. Day-to-day management of Lean at Grand is the responsibility of analysts from the Systems and Procedures (S&P) Department who serve as internal consultants and collaborate in training Lean teams.

Conceptualization of and Goals for Lean

According to statements by nearly all interviewees, Grand uses Lean as a mechanism to reduce waste and improve processes. In addition to the focus on identifying and eliminating waste, Lean also empowers frontline staff to formulate solutions, thereby reinforcing a culture of QI. Nearly all interviewees recognized that these goals for Lean were strongly driven from the senior leadership, specifically the CEO.

Exhibit 3.6 lists the goals for Lean at Grand expressed by staff at various levels of clinical and administrative responsibility in the organization. Although there is some agreement (e.g., all five employee categories agree on waste reduction as goal), there is also important variation (e.g., only department leaders and nurses and other frontline staff cited QI). Summarizing these goals across all labor categories suggests that, at a broad conceptual level, Lean at Grand is intended to improve efficiency, improve quality, enhance the QI skills of staff, and engage the entire staff in these efforts. In addition, members of the senior leadership team indicated that Lean is also intended to change the organizational culture.

Reduce or eliminate waste. Nearly all staff across all levels of the organization indicated some form of waste reduction as an organizational goal for Lean. Individuals believe that Lean will
allow the organization to “do less with less,” meaning that Lean will remove undue burden on staff by finding and removing waste within existing processes. Related to waste reduction, a few interviewees noted that a key goal of Lean is to reduce costs or save money.

**Develop improvement skills.** Reflecting an interest in increasing the capacity of the organization to implement Lean, several senior executive and department leadership interviewees mentioned that a goal of Lean is to provide new skills in process improvement to Grand’s staff. The CEO hopes that staff will continue to use these skills after their participation in formal Lean projects ends.

**Change organizational culture.** Two senior executive staff noted that organizationally, they hope that Lean will be hard-wired into the organization’s culture. As stated by the CEO, after Lean implementation, staff at Grand will never stop finding ways to improve processes. Further, the CEO noted that he hopes that as a result of Lean, staff will not be afraid to try something new through a rapid test of change.

**Improve quality of care.** Several interviewees, primarily department leads but also nurses and other frontline staff, described improvement in quality of patient care as a goal of Lean. Several of the Lean projects at Grand focused on processes that will improve the quality and experience of care for the patient.

**Promote participation of all staff.** One interviewee from the S&P department and the CEO hope that Lean will be adopted throughout the organization.

**Alignment of Lean and Quality Improvement Efforts**

Even among staff who did not include QI as a Lean goal, Lean and QI are seen as complementary and part of a larger whole. Nevertheless, they are housed in different departments. Lean is housed in the S&P Department, reporting to the head of the Support Services Division. The Quality Management Services Department staff reports to the Division of Clinical Enterprise. These two departments are seen as having distinct goals. The S&P Department is largely in charge of process improvement, and related training.

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**Exhibit 3.6. Organizational Goals of Lean**

<table>
<thead>
<tr>
<th>Type of Interviewee</th>
<th>Aims of Lean (in order of most frequent mention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior leaders</td>
<td>• Reduce waste</td>
</tr>
<tr>
<td></td>
<td>• Develop staff’s improvement skills</td>
</tr>
<tr>
<td></td>
<td>• Change organizational culture</td>
</tr>
<tr>
<td></td>
<td>• Participation of all staff in Lean</td>
</tr>
<tr>
<td>Department leaders</td>
<td>• Eliminate waste</td>
</tr>
<tr>
<td></td>
<td>• Improve quality of care</td>
</tr>
<tr>
<td></td>
<td>• Reduce costs</td>
</tr>
<tr>
<td>Providers (physicians and mid-level, non-department leaders)</td>
<td>• Reduce waste</td>
</tr>
<tr>
<td>Nurses and other frontline staff</td>
<td>• Goals focused on project level outcomes only (e.g., reduce costs for hip and knee replacements, improve continuity of care for cardiology patients)</td>
</tr>
<tr>
<td>Systems &amp; Procedures staff</td>
<td>• Reduce waste</td>
</tr>
<tr>
<td></td>
<td>• Develop staff’s improvement skills</td>
</tr>
<tr>
<td></td>
<td>• Promote participation of all staff in Lean</td>
</tr>
</tbody>
</table>

"We're giving new skills and then, we expect you to use them after you're done with the wave. Because – then you should be able to put together your own team and just go. The first three waves, four waves are teaching new skills to people. Once they've got that down, they should be able to go do it by themselves."

—Executive leadership
and technical assistance, while the Quality Management Services Department is responsible for the clinical quality outcome committees and submits the data required by the Centers for Medicare & Medicaid Services (CMS) and the Joint Commission. These data include clinical process and outcomes measures, patient safety data, and patient satisfaction data. Exhibit 3.7 shows the complementary nature of the two departments.

Exhibit 3.7. Departmental Responsibility for Lean and Quality Improvement

<table>
<thead>
<tr>
<th>Systems and Procedures</th>
<th>Quality Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division of Support Services Responsibilities:</td>
<td>Division of Clinical Enterprise Responsibilities:</td>
</tr>
<tr>
<td>• Performance improvement</td>
<td>• Quality improvement</td>
</tr>
<tr>
<td>• Lean</td>
<td>• Clinical quality outcome committees</td>
</tr>
<tr>
<td>• Lean training</td>
<td>• Data collection for CMS and Joint Commission</td>
</tr>
<tr>
<td>• Technical assistance</td>
<td>Complementary</td>
</tr>
</tbody>
</table>

Process for Implementing Lean

Exhibit 3.8 depicts the key steps involved in Grand’s Lean implementation process, including planning, project selection training, project implementation (including how the project and team are structured), monitoring and control, and sustainment of project results. Each of these steps is described in more detail in this section.
Exhibit 3.8. Overall Lean Implementation Model at Grand Hospital Center

Planning Implementation of Lean

Lean has been implemented at many levels and is viewed as an organization-wide initiative. This initiative began with the leadership studying the whole organization, defining priorities, identifying departments for inclusion, and selecting Lean project teams; those teams then carried out their projects. Grand’s implementation model relies on the principles of adult learning and uses specific Lean projects to train staff, implement Lean tools, and routinize Lean into everyday work.

Lean Project Selection Process

The first wave of Lean projects, April-August 2009, was selected by the center’s Executive Operations Team (EOT). The EOT is composed of the CEO, CAO, and other organizational leaders nominated by the CEO and approved by the center’s Board of Governors. EOT members were required to complete Lean project team training and define a topic to be addressed with Lean methodology. The initial projects and training heavily emphasized processes that could reduce costs in the short term, in response to a $38M loss registered in 2008.
For the second wave of Lean, August – December 2009, the EOT sent out a general announcement requesting staff to submit ideas for Lean projects, resulting in a relatively large number of applications. One senior leader thought that many teams volunteered because “the word was out there that Lean was something that would have a ‘halo’ effect if you [participated].” For the third wave in February – March 2010, the EOT established an application process that required teams to write a charter and collect baseline data. The winning applications were selected by the EOT – six for the second wave and six for the third wave.

Across all waves, there was a deliberate selection of both clinical and administrative projects. The EOT looked for cost-savings but also for projects that could improve health care quality, including patient safety, patient experience, and clinical quality outcomes. Thus far, the EOT has steered away from projects requiring a large information technology (IT) component because the electronic health records system and other components were being upgraded as part of a continuing enterprise-wide effort in summer 2010.

**Lean Training**

In 2009 and 2010, Lean training at Grand was conducted by an external consultant (Exhibit 3.9). The consultant-led training program had been used at three other sites under the parent organization before it was customized and used at Grand. In 2011, after four waves of training, responsibility transitioned to the S&P Department. There are two levels of Lean training: (1) just-in-time project-based training, and (2) advanced Lean training. A complementary, but independent data analysis course is also offered.

<table>
<thead>
<tr>
<th>Exhibit 3.9. Training Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation:</strong></td>
</tr>
<tr>
<td><strong>Session One:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Session Two:</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Session Three:</strong></td>
</tr>
</tbody>
</table>

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* An *Ohno* circle is a literal circle in which a person, most frequently a manager, can stand and observe to document problems in a particular area. The circle can be drawn or created anywhere. This exercise is used as a way to train people to see waste and to provide structure for daily improvement.
* 5S is a tool used to standardize and organize workspaces. The 5 “S’s” are sorting, straightening, systematic cleaning, standardizing, and sustaining.
* A3 reports are reports on A3-sized paper that detail problems and examine the root causes of such problems. Detailing the problem and solution on a single piece of paper ensures the examination process is focused and structured.
* *Hansei* is a concept meaning to acknowledge your own mistake and to pledge improvement.
Project Team Training

Training on Lean principles and initiation of Lean projects are fully intertwined. Once projects are selected, staff are required to participate in training as a team. For 2 years, from 2009–2010 training was conducted by a private, outside consultant who also advised Grand on Lean as a whole. Each training wave included six teams, comprising upwards of 60 staff. The training lasted 4.5 days divided over three 1.5 day sessions. During the 3- to 4-week period between sessions, teams worked on their specific projects, applying what was taught during the previous session.

In most cases, after an application is approved, staff are assigned to participate in a particular Lean training by a manager or supervisor depending on the topic of interest and their organizational role. Staff participating in the training are provided with release time to attend the training. However, many staff reported that they needed to work on the Lean project before or after hours in order to meet the requirements of their regular duties.

Other Training

Advanced Lean Training was offered at Grand for the first time in January 2010 (Exhibit 3.10). The purpose of this training was to certify individuals as “Lean Specialists.” This training was targeted to S&P Department staff (analysts) and organizational leaders. As of January 2011, 21 individuals at Grand had participated in the advanced training. While interviewees did not discuss the content of this training in detail, it included site visits to other organizations in the area that are implementing Lean.

In addition, a data analysis course was offered by the external Lean consultant and a statistician at Grand. This training was independent of the Lean trainings offered but highly recommended as Lean training did not include data analysis methods and reporting. These skills are often needed to define, monitor, and sustain Lean projects. The data analysis training is a 4-day course covering aspects such as charting, graphing, and data analysis using Excel (Microsoft Corporation, 2003). This training course was offered five times in 2009 - 2011. As of January 2011, approximately 50 staff had attended the training; 80 percent of them had experience with Lean projects.

Process for Lean Projects

All Lean projects at Grand Hospital Center follow a process established with the consultant at the inception of Lean. Prior to the start of the training and projects, the director of the S&P Department meets with the project leadership. The activities conducted to prepare for upcoming Lean training are presented in Exhibit 3.11.

In addition to the formal activities listed above, teams are encouraged to meet on a regular basis to work on their projects.
Exhibit 3.11. Lean Project Activities

| Overall: Lean training and experience is gained through participation in a Lean project |
| Duration: 4.5 days total, conducted in three 1.5 day sessions over 9-16 weeks |

**Pre-event**
- Prepare project charter *
- Create a project aim
- Identify at least one primary measure of success
- Create a project scope
- Flowchart relevant processes at a high level
- Assemble relevant baseline data
- Identify the key players and engage them.
- Submit application for project to the Executive team

**Project**
- Identify the key players and engage them.
- Make the work visible through the use of mapping tools.
- Identify the customers of the work process or flow and determine how they define value.
- Determine the desired future state.
- Analyze the work process or flow and identify improvement opportunities.
- Evaluate and prioritize the improvement opportunities.
- Conduct Rapid Tests of Change for targeted smaller opportunities and create an implementation plan for targeted larger opportunities.
- Present the implementation plan and gain necessary approvals.

* A charter is a document that outlines the aims and measures for the project.

**Project Organizational Structure and Roles**

Lean project teams generally have 10-12 participants, four of whom play champion, coach and team lead roles. Grand has identified four formal roles for Lean teams (Exhibit 3.12).

**Physician and administrative champions.** Assigned to each Lean team, champions are usually the physician department chair and the operations administrator for the department. Their major responsibilities include assuring Lean activities are linked to the organizational strategy, serving as a liaison to the EOT, helping to select team members, working with the team leader and coach throughout the process, and keeping the team focused.

**Coach.** Staff from the S&P Department serve as the project team coaches. The coaches can assist with facilitating meetings, educating team members on Lean tools and measures, and monitoring team progress.

**Team lead.** The team lead is responsible for managing the day-to-day aspects of the Lean project, including meetings between training sessions, data collection, and data analysis.

**Team members.** Staff at every level, including both clinical and administrative staff, may participate in a Lean project. It is a priority that physicians be involved in all clinical projects (as
a physician champion and/or team member). Physicians are also encouraged to participate in administrative projects that might affect their work. Initially, the EOT directly selected the staff for Lean teams. Now, the department leadership champions for the project select staff as part of the project charter and the application process.

### Monitoring, Control, and Sustainment

Project monitoring occurs throughout the first 100 days through formal report-outs during each session of the Lean training. Teams may also post interim data on a bulletin board, located where team members can view it. The team leader, with support from the physician and administrative champions, monitors the project after the process changes are implemented. Specifically, team leads collect and monitor the data on the specific metrics related to the project. Of note, interviewees indicated that it is often challenging to obtain needed financial data unless a member of the finance department is on the team or the champion facilitates access.

Data are collected from available systems, including electronic health records (EHR) and scheduling systems when possible. Most often, data are collected manually because the systems are not set up for easy extraction of the data, or data are not collected in the form required for the project. In 2010, during the time that this case study was conducted, the parent organization was updating the EHR system enterprise-wide, in part so that it would be compatible across the organization’s campuses. As a result, there was a moratorium on requests that would require modifications to the EHR system or other IT systems at either campus.

At the end of the training, each team conducts a “100-day report-out” to the EOT on results. If the project has achieved its goals, it enters the “sustainment phase” (described in the next section). If the project goals have not been achieved yet, the team continues the implementation process, described previously.

After the project has met its goals and entered the sustainment phase, the team lead is required to submit a quarterly report to the EOT on the project’s progress. The quarterly reports provided by all completed Lean projects are the primary means for monitoring overall implementation of Lean.

The team leader, the project champions, and/or sponsors ensure that the project continues to be monitored. These individuals must also ensure that improvements are sustained and that staff are taking ownership of these changes. If progress slips, one of these individuals, usually the team lead, alerts the others and seeks a solution.

### Exhibit 3.12. Lean Project Roles Mapped to Functional Roles

<table>
<thead>
<tr>
<th>Lean project role</th>
<th>Typical job title/role(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician champion</td>
<td>Department chair, physician</td>
</tr>
<tr>
<td>Administrative champion</td>
<td>Operations administrator</td>
</tr>
<tr>
<td>Coach</td>
<td>Systems &amp; Procedures staff, analyst</td>
</tr>
<tr>
<td>Team lead</td>
<td>Manager, lead nurse</td>
</tr>
<tr>
<td>Team members</td>
<td>Physician, nurse, scheduler, receptionist, financial analyst</td>
</tr>
</tbody>
</table>
At the project team level, the ongoing monitoring and sustainment are highly dependent on the project. For example, daily monitoring may be necessary for projects that examine scheduling and patient flow issues. Other projects may require less frequent monitoring—perhaps on a weekly, monthly, or quarterly basis. Monitoring may require an audit of a patient’s record or other documentation to show process compliance. Examples of other metrics include: turnaround time, number of procedures, cost reports, or frequency of falls or pressure ulcers.

**Dissemination and Spread of Findings**

*Spread of Knowledge and Findings Across Grand Hospital Center*

As discussed earlier in this section, during the study period, there were three waves of Lean training and 18 participating teams. As of April 2011, two additional waves of training were completed, one in late 2010 and another in early 2011; executives interviewed estimated that 10-15 percent of the organization’s staff had participated in Lean. Among those trained in each wave, about half were people who had no previous Lean exposure. Given the level of Lean penetration within the organization, executive staff and process improvement staff noted that they expect that departments will begin initiating Lean projects and using Lean tools in a more organic fashion in the near future.

As shown in Exhibit 3.13, Grand Hospital Center also disseminates and promotes findings from Lean projects across the organization, but the impact of these efforts is unknown.

**Exhibit 3.13. Dissemination Activities Across Grand Hospital Center**

- Newsletter featuring Lean team projects and results
- Intranet featuring results from Lean projects
- Quality improvement boards in public spaces with results from Lean projects
- Annual process improvement value symposium to highlight quality improvement initiatives
Sharing with Other Entities in the Organization

Many interviewees noted that the efficiency gains and other improvements resulting from the academic medical center’s Lean projects could be replicated across other hospitals in the parent organization’s network, leveraging the work done by the project teams for systemwide improvements. It is expected that the Hip and Knee Replacement Costs project will be spread to orthopedics groups at other organization hospitals. In general, if a project goes well, team members may be asked to share their Lean redefined processes and results for broader dissemination. For example, results from the Hip and Knee Replacement Costs project were shared with the specialty counsel, which operates enterprise-wide to ensure consistency in care and patient experience.

External Dissemination

In 2009, Grand Hospital Center joined a local Lean consortium, which is a cross-industry group of more than 50 area organizations implementing Lean, including health care providers, an insurance provider, and aerospace manufacturers. As described earlier (see Other Environmental Context), this group seeks to collaborate to improve the performance of businesses and other organizations by becoming more efficient, more profitable, and therefore, more competitive in the global marketplace. The consortium offers the academic medical center a place to share Lean experiences and findings as well as gain new insights and ideas.

Lean Projects Studied

We selected two Lean projects that focus on processes relevant to frontline staff to facilitate comparison of findings across the multiple organizations included in our study. For Case 3, the two projects studied were: Hip and Knee Replacement Costs (retrospective) and Cardiology Follow-Up Appointment Scheduling (prospective). Retrospective projects were studied after the project had been completed and in the sustainment phase. Prospective projects were studied as the project occurred (i.e., from the initial training and project implementation to sustainment).

Hip and Knee Replacement Costs

Project Goals

The focus of the Lean orthopedics project was to bring actual expenses in line with Medicare reimbursement rates for total hip and knee replacements. This project was part of the first wave of projects (April – August 2009) at Grand Hospital Center, many of which focused on cost containment.

Implementation in the Orthopedic Surgery Department

This project was implemented in the Orthopedic Surgery Department. The department has a high volume of patients and procedures and had performed more than 600 knee and hip replacement surgeries in the year preceding the project. The physician department chair, who was also the clinical project champion, was highly involved in the project from the start and took personal responsibility for leading the team and ensuring that project objectives were accomplished.
**Project Selection**

The high volume of surgeries combined with financial losses due to a gap between Medicare reimbursement rates and actual costs made this project a priority for cost containment.

**Project Staffing**

The EOT selected the members for the project team as part of the first wave of projects (Exhibit 3.14). The project leadership included the department chair (who was the physician champion); a coach from the S&P Department; and the department’s operations administrator, who was designated as the formal project team lead. Commonly, the operations administrator serves as a champion, but given the nature of the project, the executive leadership team felt that it would be more appropriate if the operations administrator served as the team lead.

The project team included other members from the orthopedics department and a member from the financial analysis and planning department, given the focus on expenditures.

**Planning and Implementation**

As part of the planning process, the team collected baseline data on the gap between costs and Medicare reimbursement for hip and knee replacements in 2007, 2008, and the first quarter of 2009. Using this information and the tools from the Lean training, the team began looking for ways to decrease costs to better align with Medicare reimbursement rates. The specific tools used and activities completed by the project team were:

- **Current state maps** for preparing a patient for surgery, performing the surgery, recovery in the post-anesthesia care unit, inpatient care, and medication use. The team identified opportunities for “quick fixes” in the current state maps and focused on two general processes: performing surgery and inpatient care.

- **Future state maps** of performing surgery and inpatient care.

- **Spaghetti maps** of the physical therapy services performed on the first day post-surgery.

- **Identification of waste** to help cut costs for surgery and inpatient care. The team addressed several areas of waste, including supplies used for inpatient care after surgery. They examined the use and effectiveness of the hip abduction pillow and determined that generic pillows could be used instead at a lower cost. In the long term, the team planned to renegotiate contracts with the implant providers to further reduce costs.

- **Workplace organization (5S)** on storage areas to reduce inventory waste.

- **PDSA** (Plan-Do-Study-Act) on discharge time to identify opportunities to streamline the discharge process.

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A spaghetti map is a Lean tool that shows the flow of people or information through systems.
• Rapid test of change using a whiteboard to record notifications of the time of the next surgical case with the purpose of reporting and recording operating room changeover time (the period of time between surgeries required to prepare the operating room for the next patient).

Monitoring, Control, and Sustainment

During the 100-day implementation period, the team met on a weekly basis for an hour before the surgical schedule started. This process helped keep the project moving forward.

The team periodically collected updated data from the Financial Services Department on the total cost of hip and knee replacement surgeries and the gap in Medicare reimbursement. In addition, the team monitored data on operating room changeover time\(^1\) and discharge time using information technology software that routinely tracks this information. Decision Support System (DSS) data, as well as medical and surgical records, were used to examine anesthesiology costs, supply costs, and resource costs from other medical specialty departments. Further, staff conducted rounds to monitor use of unnecessary supplies.

Once the 100-day monitoring period was complete, the team lead and team champion revisited the project on a quarterly basis to examine whether new processes established to decrease changeover and discharge time, along with costs (for example, review of surgical supplies being used), were being maintained. A quarterly update comparing Medicare reimbursement to costs incurred, both for total volume of hip and knee replacements and on a per case basis, was compiled and provided on an ongoing basis to the EOT. In addition, the team monitored special orders per case; a special order indicates that special and expensive equipment that is not part of the plan is being purchased. The team also continued examining ways to save costs; some were implemented as described in the next section. The primary physician who played a role sustaining this project after the 100-day report out was the department chair and physician champion.

Project Outcomes

Nearly all project team members and senior executive staff indicated that this project was considered to have been highly successful. A summary of the project outcomes can be found in Exhibit 3.15.

The team succeeded in greatly reducing costs for hip and knee replacements, though not enough to match Medicare’s reimbursement rate. The team was able to identify $656 per case in “quick hit” savings from reductions in supplies or services. After the formal project ended, the team implemented additional changes identified during the project and reduced the gap between actual costs and Medicare reimbursement to just $300-$400 per case compared to the initial $845 gap for total hip replacements and $2,357 gap for total knee replacements. Savings were accounted for by:

---

\(^1\) Changeover in the OR refers to a reduction in the time between procedures, or the time required to prepare an operating room for the next patient.
• **Decreasing supply costs:** The team evaluated all of its supply costs, from IV tubing to surgical supplies, to determine where efficiencies and cost-savings could be achieved without sacrificing patient care. For example, at the outset of the project, IV tubing used in the operating room was replaced once the patient left the surgical recovery room. To decrease costs, the Lean project team identified alternative types of tubing that could be used in both the OR and other inpatient units. The project also led to the substitution of the abduction pillow used by hip replacement surgery patients with an equally effective, but less costly, pillow, thereby saving $32 per patient.

• **Decreasing implant costs:** The cost of the actual hip or knee replacement implant is a major expense. Working with the Orthopedics Specialty Council, Grand’s surgeons agreed to reduce the number of vendors supplying the hospital with these implants. Ultimately, the Lean team reduced the number of vendors, purchased more cost-effective implants, and obtained a higher volume discount, saving 20-30 percent on the overall cost of implants.

• **Decreasing other resource costs:** Typically, patients received their first physical therapy on the same day as the surgery. Since only 2–5 percent of patients received a significant benefit from this day 1 session, the Lean team piloted a program to replace same day physical therapy with a more intensive therapy session the day after the surgery, which resulted in a savings of $200 per patient.

In addition to these cost savings, the project accomplished other gains by reducing waste:

• Reduced discharge time by 3.5 hours.

• Discontinued blood typing and screening on the day of surgery, since very few patients required blood transfusions.

• Assigned rehabilitation therapists and aides to specific floors to avoid the need for physical therapy staff and tools to travel across the hospital.

Though there were significant reductions in cost and wasted resources as a result of this project, team members indicated that there were no impacts on other outcomes. Of note, interviewees did not mention improved patient satisfaction as a specific result of this project. In addition, some team members felt overshadowed by the role of the physician champion and therefore were not empowered to participate. This finding may indicate that this project did not affect employee satisfaction. In contrast, one mid-level provider team member believed that camaraderie and teamwork improved as a result of the multidisciplinary teams.

**Cardiology Follow-up Appointment Scheduling**

**Project Goals**

The Cardiology Follow-up Appointment Scheduling project was implemented in January – June 2010. The goal of the project was to increase continuity of care for cardiology patients transitioning from inpatient to outpatient care. According to the project champions and team lead, the main objective was to increase the proportion of patients who receive an “accurate” followup appointment on discharge from the inpatient cardiology unit to the outpatient cardiology unit, defined as the followup appointment made within 1-2 days of request, with the right provider, within the time period specified for followup. The goal was to achieve 80 percent accuracy on this measure. This project targeted the approximately 25 percent of patients
discharged from the inpatient cardiology department who require followup in the outpatient cardiology department; the remaining 75 percent of cardiology patients discharged are referred to other departments (e.g., internal medicine, cardiothoracic surgery, and transplantation) and were not targeted for this project. As a secondary outcome, the project champion and team lead believed that this project could improve efficiency for physicians, since followup visits can be quicker and more streamlined when physicians are familiar with patients and their care history. A third desired outcome mentioned by interviewees was to increase patient satisfaction as a result of correct itineraries and a followup visit with a familiar provider.

Implementation in the Cardiology Department

This project involved the cardiology inpatient and outpatient departments. The physician champion was the chair of the cardiology department (including both inpatient and outpatient care). Staff involved in and/or affected by the project included physicians, medical residents, advanced registered nurse practitioners (ARNP), and schedulers based in the inpatient and outpatient departments. The same providers tend to see patients in both inpatient and outpatient departments to allow for continuity of care and consistent coverage.

Project Selection

The team initially applied for participation in the second wave of Lean projects (August 2009) and submitted their charter for review. The project was not accepted at that time, but the team revised and resubmitted it for wave three, and it was accepted for a February 2010 start date. One interviewee, a manager in the department, believed that the aims of the charter as originally submitted were too broad, and that the narrower scope in the revised charter submitted for the wave three application process made it a more feasible project. All interviewees from this team agreed that the project goal was to improve patient experience and quality of care by creating better continuity between the cardiology inpatient and outpatient departments.

Project Staffing

As with all projects at Grand, the project leadership included the clinical department chair as the physician champion, the department operations administrator as administrative champion, a coach from the S&P Department, and a team lead (Exhibit 3.16).

The team lead for this project was an advanced registered nurse practitioner (ARNP) because they are responsible for the bulk of the patient care in the inpatient setting. This specific ARNP was selected because she had the most experience working in both the inpatient and outpatient departments. In addition, team members included five nurses from the cardiovascular lab, clinical services, and hospital services; a physical therapist, a scheduler, and a representative from the medical education department. Other staff, such as the surgery scheduler and residents, were brought in on an ad-hoc basis to provide input.

Exhibit 3.16. Project Team Composition–Cardiology Follow-up Appointment Scheduling

<table>
<thead>
<tr>
<th>The team included 12 staff:</th>
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</thead>
<tbody>
<tr>
<td>Physician champion: clinical department chair</td>
</tr>
<tr>
<td>Administrative champion: operations administrator for the cardiology department</td>
</tr>
<tr>
<td>Coach: systems and procedures staff member</td>
</tr>
<tr>
<td>Team lead: Advanced registered nurse practitioner (ARNP)</td>
</tr>
<tr>
<td>Team members: five nurses representing the cardiovascular lab, clinical services, and hospital services; a physical therapist, a scheduler, and a representative from the medical education department</td>
</tr>
</tbody>
</table>
Planning and Implementation

In advance of the training, the project team collected baseline data on the accuracy of the followup appointments, defined as getting an appointment with the right provider within the right timeframe, meaning within 1-2 days of request. The baseline rate for an accurate followup appointment was 41 percent at the start of the project in January 2010, and the initial objective defined by the Lean project team was to increase it to 80 percent by the end of June 2010.

Using this information and the tools from the Lean training to design the project, the team began looking for ways to increase the efficiency of the inpatient cardiology discharge process and the accuracy rate for followup appointments. The specific Lean tools used and associated activities included:

- **Voice of the customer interviews** with patients and department staff verified hypothesized gaps in service and followup that needed to be addressed as part of the project.
- **Swim lane flow chart** of the cardiology inpatient discharge process identified process responsibilities by role.
- **Seiketsu** (standardization): changes were made to the scheduling process and template, and to staffing assignments, including shifting to a single scheduler handling the followup appointments.
- Initially, two **rapid tests of change** were conducted to see if the changes to the schedule process were effective.
- **Using “mistake proofing,”** it was detected that 75 percent of medical residents’ discharge orders contradicted the scheduling guidelines proposed as part of this project.
- A third **rapid test of change** was completed to correct for issues discovered in the mistake proofing process.
- **Quick changeover:** To improve the efficiency of the process, the team implemented an instant messaging program between the inpatient and outpatient staff handling discharge and followup scheduling, respectively.
- **Using visual management techniques,** the team created a cardiology discharge checklist for use on the inpatient floor.

The project team lead reported that the department chair (the physician champion) set broad goals for improving patient experience in the transition from cardiology inpatient to cardiology outpatient care. He was described as being accessible, collaborative, and easy to talk to. The chair was instrumental in selecting the scheduler, a key member of the team who was critical in being able to put in place the new scheduling system from the inpatient side.

The team ran into structural challenges related to scheduling and had to adjust the project plan. There were not enough followup slots in the timeframe needed to meet patient safety requirements, or there were slots available but they were not for the right type of appointment. The team made some small changes to the physician scheduling templates but could not implement all the changes proposed because of a freeze on changes to Grand’s IT system. In the meantime, the team found a workaround that allowed certain staff to make changes to the template on an as needed basis.
In addition, the project team changed the scheduling process dramatically, shifting the responsibility from a group of schedulers in the inpatient area to a single scheduler in the outpatient area. To make this change work, the team lead worked with scheduling supervisors to get approval and educated all of the schedulers on the new process. However, when the scheduler responsible for followup appointments is out of the office, the scheduling process is put on hold or reverts back to the inpatient schedulers (the process in place prior to Lean improvements). Therefore, the continuity of the new process hinges upon a single individual and has not been institutionalized. This is partly due to limitations in modifying the scheduling system, given the moratorium on IT system changes.

**Monitoring, Control, and Sustainment**

During the 100-day project implementation, the team lead and the administrative champion met weekly to discuss project progress. The team lead performed a monthly audit to monitor the followup appointment process by reviewing a subset of charts from the inpatient department. This process was completed by hand, and data were entered into an Excel (Microsoft Corporation, 2003) spreadsheet on a monthly basis by the team lead. Information collected includes whether the followup appointment:

- Was made within 1-2 days of the discharge order request.
- Was scheduled with the right provider.
- Was scheduled for the specified time period.

After the project ended, the team continued to audit charts manually and report findings to the EOT on a quarterly basis. The team lead left the organization a few months after the project ended but transitioned sustainability monitoring responsibilities to another member of the project team.

**Project Outcomes**

Overall, the Cardiology Follow-up project was regarded as moderately successful by the team members. The project team was able to achieve their goal of 80 percent accuracy in scheduling cardiology followup appointments, doubling the initial 40 percent accuracy rate. The accuracy rate ranged between 72 – 80 percent as the project moved into the sustainment phase. This progress is impressive in the face of structural challenges. The project team created temporary workarounds to implement their solutions, but they may be able to shift to more permanent solutions as the freeze on changes to the IT systems ends. As new computerized discharge orders can be built and scheduling templates for appointments are revised, the team lead stated that it would be easier to schedule followup visits, since more of those slots would be open rather than being assigned as new patient slots.

Improved communication and teamwork was mentioned as an outcome by several Cardiology Follow-up team members. One team member specifically noted that the Lean process and common language promoted collaboration and communication between team members. Another nurse manager and a frontline staff person indicated that this improved communication was facilitated by the instant messaging system implemented as part of this project.
Several interviewees reported that the project had positive effects on patient satisfaction as expressed by patients in interviews when asked about the discharge process and the transition from the hospital to the clinic. Patient survey results showed an increase in satisfaction with the discharge process in the first quarter after the project, but there was a decrease in the second quarter after the project (the last time period for which data were available at the end of the study). Interviewees did not provide suggestions as to why this decrease may have occurred.

Outcomes of Lean

In this section, we discuss the outcomes of the Lean initiative at Grand Hospital Center based on interviews with staff and materials provided by the organization. Overall, the center experienced significant gains in efficiency and moderate improvements in employee satisfaction and culture change. Improvements in clinical quality and patient safety were also reported, primarily in conjunction with the Cardiology Follow-up project discussed above.

The discussion of Lean outcomes in this report is organized into two major categories, based on our conceptual framework: intermediate outcomes and ultimate outcomes. As described previously and shown in Exhibit 3.17, intermediate outcomes include culture change, employee satisfaction, change in Lean knowledge and skills, Lean routinization, and dissemination. Ultimate outcomes include impacts on efficiency, patient satisfaction and experience, clinical process and outcomes assessments, and patient safety.

The findings reported here are mainly based on qualitative reports from staff, since they had difficulty identifying specific quantitative data that addressed the effectiveness of Lean for these two projects. We found that managers and frontline staff agreed that Lean activities had contributed to desirable outcomes, but they struggled to attribute specific outcomes to Lean activities. The importance to Grand of directly attributing results to Lean is not clear, but it seems likely that the long-term viability of Lean as a valid approach to reducing waste and improving performance will be limited without data specifically linking Lean implementation to cost savings, QI, or other goals.

Intermediate Outcomes

“At the end of the day, it doesn’t matter to me much that, let’s say, there was $2,000 savings, [where] the $1500 came from Lean and $500 came from other areas.”

—Executive leadership
In our conceptual framework, intermediate outcomes refer to organizational culture, employee satisfaction, increased Lean knowledge and skills, routinization of Lean, and dissemination of Lean, both within the organization and externally. These intermediate outcomes are in turn linked to ultimate outcomes—efficiency, value, and quality—as defined in the conceptual framework and discussed in the next section. Interviewees reported progress in the areas of culture change and employee satisfaction. However, Lean seems to have relatively less impact on increased Lean knowledge and routinization.

**Organizational Culture Change**

Nearly half of the interviewees noted significant changes in organizational culture. Those individuals indicated that Lean has improved teamwork, empowered staff to attempt change, and improved communication and openness.

**Improved teamwork and collaboration among staff.** Many interviewees mentioned that the culture at Grand reflects improved teamwork and collaboration. For example, one interviewee specifically noted that connecting frontline, administrative, and clinical staff has been very valuable. Another frontline staff member noted that getting everyone in the same room has fostered communication that will last beyond the Lean project. One Hip & Knee replacement project team member noted that as a result of Lean, the physician champion (and department leader) discussed process improvements with the physical therapist (a frontline staff person).

**Empowering staff to try new ideas.** The second major cultural shift included empowering the staff to try out new ideas (using rapid tests of change) and implement appropriate improvements without having to run these ideas through committees or obtain unnecessary approvals. This shift was attributed to the executive leadership’s decision to use Lean to engage frontline staff in process change and to dissolve many decisionmaking committees. According to one S&P interviewee, the rapid test of change—the notion that individuals can try something new and move forward with an idea—is the most important outcome of Lean.

**Recognition of waste.** One S&P analyst and one senior executive noted that Lean is showing staff new forms of waste and allowing them to recognize more waste in the workplace. As noted by the CEO, prior to Lean, many staff believed that they were already “lean” and did not have waste in their processes. With the initiation of Lean, staff are realizing that waste exists in their processes.
**Employee Satisfaction**

About half of interviewees reported changes in employee satisfaction as a result of Lean implementation. Most of these interviewees attributed increased satisfaction to improved communication and collaboration, as discussed above. In addition, several interviewees also attributed improvements in employee satisfaction to process improvements and efficiency gains. According to senior executives, the nurses’ jobs are improving because they have more time for patient care as a result of Lean.

Only one interviewee suggested that employee satisfaction may be decreasing. Specifically, one department leader noted that Lean may be having negative impacts on staff satisfaction, particularly for physicians. She noted that the increased responsibility placed on physicians, paired with the current staffing issues, may be causing some dissatisfaction.

**Lean Knowledge and Skills**

Through three waves of training, over 60 staff in 18 teams participated in Lean. Waves were completed in April–August 2009, August–December 2009, and February–March 2010. Although a number of tools, concepts, and techniques were introduced to the staff through Lean training, only a few interviewees mentioned increased knowledge or skills as an outcome. The CEO and department leaders noted that certain Lean tools – particularly white boards which display metrics being measured – were being used in several departments.

Many interviewees, including department leaders and frontline staff, reported liking the Lean training and finding the sessions valuable. Some individuals found the training sessions valuable because they were able to collaborate with staff from other departments or disciplines, while other interviewees enjoyed learning about specific Lean skills and tools.

**Lean Routinization**

A few individuals, namely department leaders and a senior executive, indicated that Lean was becoming a problem-solving method for staff. These individuals felt that Lean provided a structure and a mentality to address multiple types of problems.

Critical to routinization of Lean at Grand Hospital Center is the shift for frontline and departmental staff to learn data collection and analysis skills to measure and monitor their Lean projects. Though S&P staff usually support this analysis at the center, they reported it was difficult for them to pull back from their normal role to allow staff to learn the skills necessary to own the project.

**Ultimate Outcomes**

Information is available for three of the ultimate outcomes: efficiency, value (business case), and, within quality, patient experiences of care. Based on interviewee reports, Grand Hospital Center has realized significant cost savings as a result of Lean, and patient experiences and quality of care have improved.
Efficiency

Interviewees had quite a bit to say about improvements in efficiency. Overall, nearly all staff at all levels, from senior management to frontline staff, reported improvements in efficiency as a result of Lean.

Organizational Level

A few executives at Grand reported that Lean may have helped the organization overcome their $38M loss in 2008 and achieve a $48M gain in 2009, although they could not attribute the savings directly to Lean. There are many other factors that may have led to this financial turnaround, including making expense management a high priority; reducing administrative costs and filling only essential new and vacant positions; placing constraints on capital spending and streamlining of business processes to improve efficiency, including improved patient access; and restructuring of employee pension and postretirement plans.

Project Level

The following impacts on efficiency were linked directly with specific Lean projects. Although several of these impacts were discussed earlier, we are repeating them here to highlight the totality of impacts on this area.

Hip and Knee Replacement Costs:

- On the Hip and Knee Replacement Costs project, rehabilitation therapists and aids were assigned by floor to avoid having staff and tools traveling across the hospital.
- The team discontinued blood typing and screening on the day of surgery, since very few patients required blood transfusions, resulting in time saved.
- Cost savings for the Hip and Knee Replacement Costs project averaged $656 per case and reduced the gap between actual costs and Medicare reimbursement to just $300-$400 per case. Savings were achieved by decreasing supply costs, implant costs, and resource costs.

Cardiology Follow-up Appointment Scheduling:

- On the Cardiology Follow-up Appointment Scheduling project, the team streamlined the process by consolidating the scheduling activity to a single scheduler, which increased accuracy of followup appointment scheduling from 40 to 80 percent.

Other Lean projects:

- In the clinic laboratory area, the Lean project team reduced patient wait times by increasing use of early morning appointment times.
- The transplant team reduced their time to evaluate a kidney transplant from 60-70 days to 9 days.
- Adjustments made to the lab process increased capacity to see patients by 50 percent and did so with fewer staff. This change allowed one physician to leave the lab and see more patients, while eliminating the need for an additional staff member (a secretary) that had been requested.
- The neurology lab project reengineered their processes and withdrew their prior request for additional space and staff.
- An executive team member reported that Grand reduced its allocated expenses by $5-7M by doing Lean process reengineering in the financial/administrative area of the organization.
- In the orthopedics department, the team reduced discharge time by 3.5 hours, a change that may ultimately reduce the charge to the patient because the patient is released before incurring charges for an extra day’s stay.

**Patient Experience**

Improved patient experience and satisfaction is one of the key outcomes that Grand seeks to achieve with any Lean project. Several interviewees across all levels of the organization referred to a variety of Lean projects that were expected to result in better patient experiences, some of which were confirmed through patient surveys and other data. Most of the information regarding improvements in patient experience comes from the Cardiology Follow-up project. Specifically, interviewees noted:

- An increase in the proportion of patients receiving an accurate followup appointment prior to discharge from the hospital.
- Patients’ accounts of being satisfied with the discharge process and the transition from the hospital to the outpatient clinic as reflected in patient interviews.
- Mixed results in terms of scores for patient satisfaction with discharge as reflected in patient surveys, which increased in the first quarter after the cardiology project but decreased in the second quarter.

Further, senior executives described how Lean was affecting patient experience and satisfaction in other areas of the hospital where Lean was implemented. They specifically pointed to improved satisfaction due to decreased patient wait times in the laboratory area achieved by reducing overbooking and establishing earlier time slots for appointments; they also noted increased patient satisfaction scores in the context of a hospital department that had achieved reduced pain scores.

**Clinical Process/Outcomes Assessment and Patient Safety**

Overall, about one-half of interviewees reported improvements in clinical process and patient safety as a result of Lean implementation. As with patient experience outcomes, these impacts are mostly linked to specific Lean projects; nearly all of the interviewees from the Cardiology Follow-up project noted an improvement in clinical process attributed to the increase in patients being discharged with a followup appointment. As the team lead noted, continuity of care through followup appointments is critical in ensuring patients receive the followup care they need. Thus, the improvement in scheduling of followup visits enhanced clinical process and safety in addition to enhancing the patient experience of care, as noted previously.

The CEO also described another Lean project where clinical guidelines and patient safety guidelines were integrated into a process for rounding (i.e., visiting the patient’s room) developed as a result of a Lean project. This process ensured that a staff person visited each patient at least once every hour to check on the patient’s pain scores, the cleanliness and safety of
the room, and the position of the patient. The CEO reported patient safety improvements as a result of this process and also noted that phone calls from patients to nurses decreased as a result of this new process.

**Business or Strategic Case**

At Grand, outcomes were often expressed in terms of their effect on the value equation, where value equals quality (e.g., clinical outcomes, patient safety, and patient satisfaction) divided by cost. Favorably affecting one if not both elements of the equation will result in added value that is not exclusively financial. The CEO and an S&P staff member noted that immediate financial paybacks might not occur, but benefits are achieved through improved patient safety, quality of care, and patient satisfaction. In one Lean project, hourly checks on all patients led to a reduction in patient calls to the nursing station and improvement in pain control. This change is an example of how replacing unplanned and reactive effort with planned and scheduled effort can improve the value proposition. Planned and scheduled effort is likely to be less expensive than unplanned sporadic effort, but even if it is not, the resulting benefits to patient experience and pain control offer the potential for enhanced benefits.

Senior and department level staff were asked about the business case for Lean. While nearly all interviewees recognized the resources required for Lean implementation, specifically in terms of staff time, nine interviewees—ranging from S&P Analysts, to department leads, to executive staff—indicated that there was a positive business case for Lean, while two indicated uncertainty. All but one interviewee attributed the business case to positive financial gains at both the project level and the organizational level. Further, these interviewees believed that a decrease in waste and improvements in productivity contributed to Lean’s business case. Only one interviewee mentioned that the reduction of work silos and the increase in ownership were the primary factors in the business case for Lean.

**Factors that Influenced Success of Lean Implementation**

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**Exhibit 3.18. Key Facilitators and Barriers to Organizing and Implementing Lean at Grand Hospital Center (from Conceptual Framework)**

<table>
<thead>
<tr>
<th>Organizing Lean</th>
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<td>Alignment of initiative to organization</td>
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<th>Implementing Lean</th>
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<tr>
<td>Leadership qualities and support</td>
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<tr>
<td>Resources</td>
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<tr>
<td>Staff engagement or resistance</td>
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<tr>
<td>Communication about Lean</td>
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During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to success, as well as the problems or challenges they had witnessed or faced in implementing Lean at Grand Hospital Center. Findings regarding facilitators and barriers are based on responses to these questions and on interpretation of findings overall by the research team (Exhibit 3.18). As expected, barriers to implementation were identified much more often than facilitators. Further, senior executives and department leaders provided the greatest amount of information regarding these issues.

Here, we discuss the factors mentioned by interviewees, noting how they operated as facilitators and/or barriers in organizing and implementing the Lean initiative. We also link lessons learned to these facilitators and barriers.

Using the elements of the conceptual framework, facilitators related to the Lean initiative including, leadership, staff engagement, Lean team composition and size, and alignment of Lean to the organization, were the most frequently mentioned. The major barriers to implementation mentioned by staff related to staff engagement, resources, and communication about Lean. It appears that factors related to the external environment, the applicability and locus of Lean activity, and the scope, pace, and coordination of Lean were not significant either as barriers or facilitators. Lessons learned addressed staff engagement most often. We have organized this section by first providing a summary table of Major Factors that Facilitate Lean success (Exhibit 3.19), followed by Major Factors That Inhibit Lean Success (Exhibit 3.20).

### Exhibit 3.19. Major Factors that Facilitate Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
</table>
| Alignment with organization | - Embed Lean in strategic plan  
- Existing culture that embraces QI facilitates Lean implementation                      |
| Leadership            | - Leadership needs to set expectations for results for Lean, monitor progress, and remove barriers to progress, as possible                  |
| Availability of resources | - Staff time, data, IT, and Lean expertise are necessary to implement and monitor projects                                                  |
| Staff engagement      | - Physicians must be engaged in Lean for it to be successful, despite scheduling challenges                                                 |
| Communication about Lean | - Communication about changes resulting from project is critical                                                                              |

### Exhibit 3.20. Major Factors that Inhibit Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
</table>
| Resources | - Lack of information technology resources impedes the implementation of solutions  
- Lack of resources for data collection was a barrier to measurement and sustainability  
- Lean events are time consuming for staff  
- Prior training on Lean tools facilitates better and faster tool implementation during project  
- Staff turnover may make it difficult to sustain Lean changes |

• Lean team composition and size
The challenge that we're finding is that our team members, all of them, are clinical staff that have clinical responsibilities every day, all day. So breaking them out of that to go to the meetings and then participate in the training, there's a lot of stuff that goes on outside of the formal training. So that has been—that's an ongoing challenge for us” —Department manager

Organizing the Lean Initiative

In this section, we discuss barriers, facilitators, and lessons learned related to organizing the Lean initiative. The most important facilitators and barriers to organization of the Lean initiative, as discussed by interviewees, were related to alignment of Lean to the organization. Notably, there were very few statements related to the applicability of Lean to health care processes.

Alignment of the Initiative to the Organization

Interviewees from the S&P Department and the Quality Improvement Department noted the importance of integrating Lean into the organization from a strategic perspective. As noted previously, Grand integrated Lean into their strategic plan, a key facilitator according to senior executives and department leadership.

Interviewees also indicated that the center’s culture is supportive of QI and is committed to improving patient care, and they surmised that Lean implementation was smoother as a result. The center’s staff tend to be interested in professional development, seek to improve their departments through QI, and look for opportunities to improve patient care, all of which are consistent with the tenets of Lean. As part of the Lean initiative, Grand now encourages QI/Lean certification (bronze, silver, gold) and has removed several layers of decisionmaking bureaucracy to allow staff to implement the Lean rapid tests of change.

Executives mentioned the challenge of aligning the goals of Lean with the goals of Grand, as well as with the enterprise overall. These barriers were not noted by other types of staff.

Implementing the Lean Initiative

Major facilitators and barriers to implementing Lean were related to leadership qualities and activities, level of staff engagement, communication about Lean, resource availability, and Lean team composition and size.

Leadership Activities and Qualities

Strong leadership at certain levels was generally regarded as the most important factor to the implementation of Lean and to the success and sustainability of changes from Lean projects. This leadership manifested itself in several ways, as described by interviewees.

As noted previously, Grand’s Lean initiative was driven and heavily influenced by senior leadership. The external consultant and senior executives noted that Lean must start with leadership, and in the case of Grand, it began at the highest levels. These individuals viewed this as a facilitator to Lean implementation. Further, frontline interviewees and S&P staff
Interviewees also indicated that leadership involvement in Lean from the very beginning was helping to sustain the initiative. Senior executives were involved in the first Lean project. Regarding senior level leadership, the visibility of the CEO as a supporter of Lean facilitated not only the initiation of Lean at Grand, but also promoted accountability to Lean. Importantly, the CEO meets with every Lean team to discuss the progress and outcomes of the project.

Leadership at the Lean project level was also cited as a facilitator to success. Across the board, interviewees of all levels believed that Grand employs “infectious” leaders committed to the projects. The critical nature of the senior leadership’s support is noted above, but these interviewees also believed that departmental leaders and processes owners also play a key role. These leaders are approachable, encouraging, and attempt to mitigate barriers to implementing Lean. Further, they show their commitment to the Lean project by motivating others to sustain changes or by putting in extra time to complete Lean activities, such as data collection. Finally, they often are the individuals who foster accountability to changes from the Lean projects. In one project, the enthusiasm and dominance of the department leader thwarted the participation of other staff and limited their role in the Lean project.

Availability of Resources

Barriers related to the availability of some form of resources were mentioned by nearly all interviewees. Nearly one-half of interviewees across all levels of staff mentioned that it was a challenge to get release time for staff to be able to do the work on the project. Although Grand ultimately supports staff’s time during their participation in Lean, many interviewees noted that competing responsibilities and priorities leave individuals, mostly clinical staff, unable to participate. In general, interviewees noted that staff have little capacity for additional Lean project work.

A special resource barrier mentioned by several interviewees is the availability of IT resources. IT was a challenge because IT resources were being focused on a system upgrade and could not be allotted to making updates for Lean projects. The moratorium on IT-related solutions held up one project we studied and also meant that all projects that might have an IT component had to be put on hold. This barrier was mentioned most frequently by team members from the Cardiology Follow-up project and as the most significant barrier by the team leader.

A third barrier mentioned by several interviewees at all levels was access to data, data collection, and data analysis. While Grand employs a strong S&P Department, much of the data collection and analysis from Lean projects are completed by the Lean project team. A few interviewees expressed some frustration that data collection is time consuming and, if done manually, can introduce human error. Further, some frontline staff may not possess even rudimentary data analysis skills to support Lean projects.

Another resource that is critical to Lean is expertise or knowledge. Several interviewees, including nurse managers and department leaders felt strongly that training is needed prior to participation on Lean projects. These interviewees had mixed reactions on whether or not the training model used by Grand fulfilled this need: two interviewees felt that the training was excellent and gave

“Lean won't be sustained without a leadership team actively engaged . . . you can start it and do it, and experience some success with disengaged senior leaders, [but] it simply won't be sustained.”

—Consultant
everyone a foundation for the implementation, while another individual believed that more training on the specific Lean tools was needed. Related to Lean expertise, several interviewees, mostly senior executives and department leadership, indicated that external (i.e., external consultant) or internal (i.e., S&P staff) expertise in Lean is a key facilitator to implementation. A few interviewees noted that beginning Lean implementation with an external consultant was critical, as he fostered a sense of accountability and really helped launch Lean at the organization.

Staff resources may play another role in sustaining Lean: staff turnover may make it difficult to sustain Lean changes. This aspect was noted by a few members of the Cardiology Follow-up project, including one of the sponsors, with regard to the departure of the team lead.

**Communication about Lean**

The quality and content of communication about Lean have had a role in the nature of the implementation of the initiative. Interviewees from Grand primarily discussed issues related to communication about Lean activities and changes resulting from these activities with staff members who were not involved in the projects. Several interviewees noted specific struggles in communicating about the removal of the hip abduction pillow as part of hip replacement surgeries. This change met resistance from the nursing staff who did not receive or absorb the communication about why these pillows were no longer needed. Although interviewees participating in the Cardiology Follow-up Appointment project also described challenges communicating about Lean to staff who had not been part of a formal project, the champion and team lead felt that encouragement of staff and emails about how changes were now part of the standard of care were sufficient in overcoming any barriers.

**Staff Engagement**

Staff engagement is highly influenced by leadership and communication about the vision and goals for Lean. In addition, Lean as an approach facilitates, or more accurately requires, full staff engagement. Physicians are a particularly important constituency for Lean, given the influence they wield over both their peers and their clinical teams. Several interviewees who participated in the Cardiology Follow-up project emphasized the important role of the physician leader of their department and the clinical champion for the project, noting that he was highly engaged and very passionate about improving processes through Lean. However, not all physicians are as highly motivated to implement Lean. Physician schedules and opportunity costs might not support participating in Lean training and meetings, and several interviewees noted that a physician with a strong personality may overshadow other team members.

Physicians at Grand are salaried staff employees. The exclusive relationship between the center and its physicians may result in more effective adoption and implementation of Lean, compared to the use of more loosely coupled, independent contractors and privileged physicians who might
have relationships with multiple hospitals and not be paid by the hospital. The external consultant noted that physician-led organizations are the most responsive towards Lean changes because physicians are so “highly influenced by their peers.” Notably, physicians and department managers rarely mentioned the fact that the organization was physician-led or even the strong leadership in the organization as a facilitator, while this was mentioned by all others quite frequently.

**Lean Team Composition and Size**

Nearly half of interviewees, across all levels and types of staff, indicated that the multidisciplinary teams from all organizational levels are important facilitators for Lean projects. According to a department manager, this team composition makes for a good representation “of what goes on both on the inpatient and outpatient side,” and therefore everyone potentially involved in the change is participating from the start. The executive and physician assistant both state in their own words that this type of team composition improves communication and commitment to Lean.

In addition, several interviewees noted the importance of a physician champion for each Lean project. Champions of Lean are important if any Lean project is to have a chance at being successful. As noted above, Grand staff believe that for the project to be a success, one of these champions should be a physician.

**Conclusions**

Grand’s approach to implementing Lean involves training senior management on the concepts and tools *a priori* and training frontline staff through projects paired with formal training. The CEO views Lean as a tool for culture change, empowering frontline staff to implement new solutions. Many frontline staff equate Lean solely as a tool to reduce waste in the organization. Though staff may not necessarily view Lean only as a tool and not as a mechanism for culture change, this view does not seem to be impeding staff buy-in to the Lean initiative. Overall, the staff at Grand Hospital Center seem to be concerned with their ability to collect data and positively affect the value equation. These abilities are complicated by IT issues at the organization and by lack of staff time. Recommendations suggested here emphasize the clinic’s strengths and also address barriers faced.

**Recommendations for Similar Organizations Implementing Lean**

- **Provide opportunities for staff to get involved with Lean.** Allowing more staff to be involved in Lean trainings or projects will improve the dissemination of Lean knowledge and skills, and will help to accelerate culture change.

- **Align incentives to encourage additional participation.** Staff engagement can be a challenge. A traditionally participatory culture may encourage involvement in Lean and QI, but rewards and incentives are also needed.

- **Staff learn Lean skills on their own, but they keep other priorities in perspective.** Grand made a conscious decision to not let S&P staff take over staff’s participation in Lean. However, there is fine line between overwhelming staff with skills in data collection and analysis as opposed to ensuring they have the basic skills needed to participate.
• **Explore ways to improve communication of changes after the Lean project.** Communication can be improved by finding alternate mechanisms to email and by translating results into metrics and language that will resonate with employees. For example, talking about the impact on patient satisfaction or safety might be more compelling than communicating about gains to efficiency alone.

• **Leverage successes for replication.** Successes achieved in both the Hip and Knee Replacement and Cardiology Follow-up projects could be replicated in similar departments of the system or other entities. Maximizing the benefits of Lean by translating key successes and minimizing the high labor costs of a Lean event may result in improved value return.

• **Recognize that IT can both facilitate and hinder Lean projects.** In theory, IT could assist with Lean projects by facilitating data collection and providing more efficient solutions. However, for the Cardiology Follow-up project, IT was a huge barrier. Grand Hospital Center and other organizations should try to overcome these issues and leverage IT as a facilitator to Lean.

• **The executive team should be highly engaged when implementing Lean.** Grand’s executive team was deeply involved in learning about Lean concepts and selecting the initial Lean projects. This approach fostered support from the very top levels of the organization.

• **Embed Lean in the organization’s strategic plan.** Aligning Lean with the strategic plan will ensure that staff understand the importance of Lean to the organization and that it is not just another “flavor of the month.”

• **Acquire appropriate internal or external expertise.** Grand opted for an external consultant to facilitate the implementation of Lean. The major advantages of hiring an external consultant were accountability and additional Lean expertise.

• **Develop a strategy for physician engagement.** The Grand Hospital Center case shows that physician engagement is difficult, even when physicians are salaried or employed by the organization. A strategy that uses physician champions is necessary for Lean success.

• **Collect data in order to show improvements.** The ability to show results from Lean projects will foster engagement and excitement from Lean team participants.

• **Be prepared for significant investment of staff resources.** As noted by academic medical center staff, many of the Lean project activities were completed during “off hours.” Time during the regular workday must be carved out for staff participation and followup on Lean projects.
Case 4. Suntown Hospital

Organizational Background

Suntown Hospital, a critical access hospital (CAH), is located in a rural community in a Western State. It has a total of 45 acute and long-term care beds and an outpatient clinic. Two projects, Urinary Tract Infection Prevention (UTI Prevention) and Redesigning the Process for Electronic Prescribing (E-Prescribe), were selected for prospective study from this organization. The case study methods, including selection criteria for projects to be analyzed, have been described previously in this report. For this case, we conducted 28 interviews with 13 individuals. Their roles and positions at Suntown Hospital varied, as described in Exhibit 4.1.

Exhibit 4.1. Number of Interviewees by Type of Participant and Clinical Role

<table>
<thead>
<tr>
<th>Position in organization</th>
<th>Senior executive</th>
<th>Department-level leaders or managers</th>
<th>Frontline</th>
<th>External individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians (including surgeons)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mid-level providers</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other clinical staff (including nurses)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Nonclinical staff</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Description of the Health Care Organization

Suntown Hospital is part of a public hospital district. It comprises three distinct units that provide nonspeciality care: long-term care, outpatient services, and acute care inpatient services. In addition, it offers primary care at a medical clinic, emergency services, diagnostic lab and radiology, and therapeutic services (physical therapy, massage therapy, dietary counseling, speech therapy, and telehealth). It is the primary source of health care for the entire surrounding community (Exhibit 4.2).

Suntown Hospital can be categorized as both a public hospital and a CAH. As a public hospital, it is subject to the Public Records Act and the Open Public Meetings Act, which require the hospital to make meetings, documents, and presentations transparent and open to the public. Many interviewees commented that this context defines the culture at Suntown Hospital, as there is a level of transparency to foster public trust. Further, Suntown Hospital receives a regular maintenance and operating levy from the community. Suntown collects approximately $70,000 per year from

Definition of Public Hospitals

Public hospitals in this state were defined as “community created governmental entities authorized by State law to deliver any services which might be reasonably expected to improve the health of the district’s residents and others in the district’s market areas.”

Definition of a Critical Access Hospital

Critical access hospitals are defined by the American Hospital Association as “rural community hospitals that receive cost-based reimbursement (American Hospital Association, 2011).”
this levy. Additional funds are voted on through community ballots. However, in 2008, personnel issues and delays in accounts receivable affected taxpayer trust, and new funds were not approved. Accordingly, increasing public trust was a major organizational goal for the hospital in 2009. Management leaders and employees universally participated in a voluntary furlough and in wage reduction in order to achieve a balanced budget. That same year, Suntown Hospital filled the chief medical officer (CMO) position, which had been vacant for 2 years.

Exhibit 4.2. Suntown Hospital

Suntown Hospital is a critical access hospital located in a rural western State. The hospital serves the needs of a rural population with an outpatient clinic and a 45-bed inpatient facility, providing, acute, skilled nursing, and long-term care services. In 2000, a new chief executive officer (CEO) began his term at Suntown with the goal of creating a culture that supports quality improvement.

A rigorous case study of Suntown Hospital, which included 28 interviews with staff of all levels of the organization, occurred between February and November 2010. Data were collected during two site visits, through digital diaries recorded by Lean project participants and through phone interviews. Two projects, Urinary Tract Infection Prevention and Redesigning the Process for Electronic Prescribing, were selected for prospective study from this organization.

The hospital developed a 10-step process to implement Lean through “rapid-cycle events” (RCEs). These events bring together selected staff and stakeholders to examine each step of a targeted process. Staff spent approximately 3 days in training and in creating processes that are more efficient. At the end of the 3 days, staff developed an action plan to implement the proposed changes. Because of Lean, employee satisfaction appeared to increase. However, data collection remains a challenge at Suntown, so actual improvements in efficiency because of Lean are unknown.

Potential Lean adopters can benefit from some lessons learned from the experiences at Suntown.

- **Leadership**: Executives can set a positive tone for Lean by participating in Lean events with staff and taking on action items developed at the event. Additional support should be provided to teams when key leadership, such as process owners, become less involved or resign from the team.

- **Education and training**: Self-study modules and training integrated into a Lean event can be effective approaches to developing capacity to apply Lean methods in a small hospital.

- **Resources**: A workable data collection process is necessary for the Lean team to carry a project through to success. Find creative ways to collect data, measuring process change and project impact when resources are limited.

- **Communication about Lean**: Make plans to over-communicate process changes and the progress Lean teams make to staff that do not participate in a Lean event. People need to hear information in different ways and multiple times to understand and retain what has been said.

- **Scope of Lean activities**: Reviewing the medical evidence before beginning a clinical improvement project will help determine who should be part of a RCE team and will help focus the team on processes that will lead to improved care.

- **Routinization**: The best way to develop staff commitment to Lean is to have them participate in Lean events and to have early wins. Processes that were redesigned during Lean events or as a result of them, may still need further refining and even additional redesign over time. Furthermore, additional effort invested in staff training might be needed for widespread adoption to occur.
As a county hospital, Suntown is governed by five publicly elected commissioners who have authority over the district. This Governing Board of Commissioners appoints the CEO, assures compliance with national regulations, and monitors performance.

Suntown Hospital has 25 swing beds, which can be used as needed to furnish acute or skilled nursing facility-level (SNF-level) care. It has an additional 20 long-term care (LTC) beds. In an average month, Suntown sees approximately 30–50 patients through the emergency room and has a nursing home census of between 4 and 14 patients. There are relatively few inpatient stays, about 1–5 patients per month. Suntown Hospital has approximately 110 employees and four medical providers who serve the needs of all patients: one physician who is the medical director (full time), two nurse practitioners, and one physician assistant (PA). According to some interviewees, the organization is largely nurse-driven. Suntown also experiences a relatively high employee turnover rate, averaging about 30 percent per year. Further, it has faced challenges in hiring new staff, evidenced by the CMO position remaining vacant for nearly 2 years. Exhibit 4.3 shows descriptive characteristics of this organization based on the case-selection criteria.

The governing board and hospital leadership establish the strategic plan for the organization. Suntown adopted a strategy map in 2003, the same year Lean implementation began. Suntown’s key strategic objectives are culture change, public education, and clinical outcomes. These objectives are built upon core values of the organization: caring, quality, loyalty, safety, and family.

### Other Environmental Context

#### Local Competition

According to interviewees, the hospital operates in a fairly competitive market, competing with several neighboring hospitals; however, it is over 30 miles from the nearest competing facility. Interviewees noted that long-term care services are extremely competitive, as patients have many choices for this type of service in the surrounding areas. Interviewees noted that Suntown’s commitment to quality improvement (QI) is believed by interviewees to give them the competitive edge over other hospitals and long-term care facilities that struggle with QI initiatives, such as Six Sigma. The CEO noted that the waste reduction from Lean reduces time spent across all business processes and reduces costs, giving the hospital the ability to do things for customers that competitors cannot afford.

#### Funding and Payers

Similar to other public hospitals, the vast majority of income is derived from patient services, in addition to levies and funding from the community. Approximately half of the total revenue comes from outpatient services. Medicare and Medicaid are major sources of revenue with

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**Exhibit 4.3. Characteristics of the Critical Access Hospital**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Organizational experience with Lean</td>
<td>Some experience</td>
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<tr>
<td>Geographic location</td>
<td>West</td>
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<tr>
<td>Regional density</td>
<td>Small rural</td>
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<tr>
<td>Type of hospital</td>
<td>Critical-access hospital (CAH)</td>
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<tr>
<td>Acute-care beds</td>
<td>25*</td>
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<tr>
<td>Teaching hospital</td>
<td>No</td>
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<tr>
<td>Physician employment model</td>
<td>Staff</td>
</tr>
<tr>
<td>Use of an external Lean consultant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Includes swing beds that can be used for either acute or skilled nursing facility-level care.
Medicare, accounting for 98 percent of the acute-care payer mix and 44 percent of the outpatient mix in 2010. Medicaid accounts for about 70 percent of long-term care revenue.

**Lean and Quality Improvement at the Organization**

In this section, we discuss the history of Lean and QI at Suntown Hospital. Exhibit 4.4 outlines the overall timeline for Lean initiatives at the hospital. The specific activities noted in the timeline are discussed throughout this report.

### Exhibit 4.4. Chronology of Quality Improvement and Lean at Suntown Hospital

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<tbody>
<tr>
<td>Case study data collection</td>
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<td>New CEO hired</td>
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<td>Introduction of Lean</td>
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<tr>
<td>Senior-level staff, managers trained on Lean principles</td>
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<tr>
<td>Other QI methods reviewed by CEO</td>
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<tr>
<td>Lean initiatives underway</td>
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<tr>
<td>UTI Project Selection</td>
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<tr>
<td>E-Prescribe Project Selection</td>
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**History of Quality and Efficiency Improvement Efforts at the Organization**

According to one senior executive, the hospital has a long history of participation in QI activities. However, nearly all interviewees who worked there before Lean noted that its QI efforts before Lean had been largely informal and unstructured. These interviewees also described Suntown’s previous QI activities as having been “disorganized,” “reactive,” and “ineffective.” Coordination of QI across activities had been very loose, and QI had been instituted as a result of an issue or problem. With the hiring of a new CEO in 2000, Suntown began a more formalized implementation of QI.

The hospital is governed by an elected Board of Commissioners and a CEO. The quality team reports to the CEO but has no leader. Its members include system leaders, performance leaders, and process leaders, who are all regarded as equal members. The quality team supports the mission of the county hospital district by overseeing quality assurance and improvement processes for the system on behalf of the Board of Commissioners. The quality team is responsible for enhancing quality across the system, focusing on clinical processes and the service experience. The quality team includes senior staff and frontline staff, as well as members of the board. This team meets weekly, and meetings are open to all staff regardless of whether they are official members of the team. The Board of Commissioners plays a large role in QI. As noted by the CEO, the board is extremely interested in participating in the quality team and is “pushing the organization” to improve quality.

Concurrent to Lean implementation, Suntown participated in a series of initiatives and collaboratives to improve clinical quality for the care of various conditions, including diabetes, congestive heart failure, and myocardial infarction. The hospital also participated in the Institute
for Healthcare Improvement’s (IHI’s) 5 Million Lives Campaign, which deployed rapid-response teams at the first sign of patient decline, and medication-reconciliation and patient-safety activities.

The hospital also has some experience collecting and reporting metrics related to hospital performance. For example, it currently has an organizational scorecard that mostly consists of utilization data. In 2007, it deployed three surveys to assess patient experiences and satisfaction: one with inpatients using the CAHPS® Hospital Survey, one in the long-term care unit and one with outpatients. The CEO noted that Suntown does not invest funds in continuously assessing patient experiences because the feedback from the initial assessment was positive.

**Initiation of Lean at the Organization**

As noted above, in 2003 the newly hired CEO sought to formalize the vision for and implementation of QI processes. The CEO reviewed many different QI tools and processes available through State collaboratives and QI resources. After this review, the CEO determined that the Lean tools were the most applicable and valid compared to other QI tools and methods. The CEO noted that Lean is “where the rubber meets the road” and that it provides a mechanism for realizing organizational goals while gathering information through process measures. The inception of Lean marked the first organized approach to QI in Suntown’s history. The first Lean project kicked off in 2003 with a rapid cycle event (RCE) looking at the current physical layout and design of the hospital and clinic.

When Suntown began working on Lean in 2003, it employed the services of outside consultants. These consultants trained 12 senior leaders and management staff in Lean principles. However, use of consultants was discontinued the following year and all Lean activities were internalized.

**Conceptualization of Lean**

The formal plan for QI at Suntown encompasses three levels: the system level, the process level, and the performance level. Quality at the system level is defined by the Baldridge criteria, an integrated framework for managing an organization that helps organizations assess their improvement efforts, diagnose their overall performance management systems, and identify their strengths and opportunities for improvement. The process level is organized using the Planned Care Model, which includes six fundamental areas (self-management, decision support, delivery system design, clinical information system, organization of health care, and community) on which organizations should focus to provide high-quality chronic disease care. Suntown has

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"Before, I think everything was done in-house. We saw an issue, we took care of it and we reported. But we really didn't have a structured process, so we got Lean.

– Department lead

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\(^u\) The aim of the IHI’s 5 Million Lives Campaign was to support the improvement of medical care in the United States, significantly reducing levels of morbidity and mortality over the course of the 2-year initiative (2006-2008). See http://www.ihi.org/offerings/initiatives/paststrategicinitiatives/5millionlivescampaign/pages/default.aspx.


\(^w\) Baldridge performance Excellence Program. Available at http://www.baldrigepe.org/.

extended this chronic care model to its entire system of care. Lean is the primary approach to QI at the organization.

Lean methodology at Suntown is modeled after Lean in the industrial engineering sector. It is characterized by “learning by doing” in levels across the organization. The CEO at the hospital notes that their approach to Lean has been similar to that of Toyota and Boeing, and, in health care, to Virginia Mason Medical Center in Seattle.

Lean at Suntown is nearly synonymous with RCE. RCE is based on the Lean Processing Framework, which identifies and eliminates waste from processes. Suntown primarily uses RCE as the formal approach to improving processes throughout the organization. In each RCE, it uses a specific set of Lean tools. According to one senior executive, Suntown intentionally uses only specific Lean tools to fit the needs of its organization. These tools are discussed in the next section, Process for Implementing Lean.

According to one senior executive, Lean and RCEs are “flat” in that everyone’s ideas and voices are heard equally. He sees this characteristic of Lean and RCEs to be similar to the organization of the quality team at Suntown. One department leader also noted that all participants in Lean projects have a voice and can provide input into solutions.

Goals for Lean

The goals for Lean at Suntown are to reduce waste, change organizational culture, improve quality of care, and improve patient safety (see Exhibit 4.5). These goals were discussed both in terms of organizational goals and project-specific goals. A number of interviewees, mostly providers and frontline nurses, described the goals of Lean only in terms of the specific Lean projects in which they participated. These project-specific goals are discussed in the Lean Projects Studied section of this report. Each of the organizational goals of Lean noted by interviewees is discussed in more detail below.

Improve organizational culture. Only a few interviewees described the organizational goals for Lean in terms of culture change. One senior executive noted that Lean has brought a change in thinking; staff have stopped saying “we can’t” and started looking for ways to improve. This senior executive also noted that Lean focuses on key values of the organization and, therefore, is a primary means to change culture. However, most staff do not recognize Lean as a cultural-change mechanism; instead, they associate Lean with improving specific care processes or with specific RCEs.

Reduce waste and improve quality of care and/or patient safety. Several interviewees across all levels of staff noted that the improvement of processes through Lean leads to reduction of
waste and/or improvement in the quality of care provided to patients. While some interviewees tied these goals to specific projects, others—mostly departmental leaders or providers—indicated that Lean reduces waste and improves quality at the organizational level. These individuals noted that because Lean focuses on every step of the process, individuals can improve the process by making it more efficient and patient-centered.

**Process for Implementing Lean**

This section describes key aspects related to Lean implementation, including training in Lean, the process for selecting Lean projects, the process of Lean implementation at the project level (including how the project and team are structured), and aspects related to monitoring and sustainment of project results (see Exhibit 4.6).

**Planning for Implementation of Lean**

Lean is viewed as an organization-wide initiative. This initiative began with the leadership studying the whole organization, identifying the value streams, and selecting facilitators. Topics for Lean projects can be proposed by anyone. For example, the ePrescribe project that is described later in this report was initiated by a physician’s assistant. The CEO and quality team determine the projects to be undertaken. In terms of criteria for selection, projects should align with the organization’s strategic objectives. The number of projects to be undertaken in a year is determined by the CEO and is generally limited to four, in consideration of staff capacity. The CEO selects the facilitator for each Lean project.

**Lean Project Selection Process**

Lean projects are proposed by hospital staff, including the CEO, providers, nurse managers, and frontline personnel. However, two interviewees—including the CEO—noted that frontline staff do not often suggest ideas for Lean projects, suggesting that most come from senior staff. The quality team, which includes clinical and nonclinical staff from all levels of the organization, selects the projects from among those proposed. After being selected and approved by the quality team, each Lean project, or RCE, needs a charter; the staff member who proposed the project often undertakes this step. Lean projects generally align with one or more of the three organizational strategic objectives—culture change, community education, and improved clinical outcomes.
Suntown Hospital offers voluntary and interactive training modules to all staff. One example is the quality module, which contains the following information:

- Overview of the Baldridge criteria.
- Discussion of quality processes unique to the hospital, specifically the three levels (system, process, performance).
- Discussion of the principles of Lean.
- Description of value stream.
- Discussion of outcome and process measures.
- Example/exercise in Lean.

### Exhibit 4.6. Overall Lean Implementation Model at Suntown Hospital

**Planning**
- Study organization
- Identify value streams
- Facilitator chosen

**Lean project selection**
- Hospital projects proposed by staff - most often CEO, providers, nurse managers
- Quality team selects/approves project

**Training**
- Overview of Baldridge criteria and quality processes unique to the hospital
- Discuss Lean, Value streams, outcome and process measures
- Exercise in Lean

**Project implementation**
- Choose priority process and problem, assign team members
- Discuss solution ideas; conduct RCE
- Develop Value-Added timeline, identify process variation
- Action Plan: flowchart new processes and identify process measures

**Monitoring, control, and sustainment**
- Process owner and CEO monitor after action plan items are completed
- Team leaders report metrics 30, 60, and 90 days after RCE
- Staff report at weekly quality team meeting on process data collected

### Exhibit 4.7. Lean Project Team Training

- Relationship to project: Lean training and experience is gained through participation in a Lean project
- Mode: In person
- Duration: 2–3 day RCE
- Training participants: Lean team members (approximately 8–10 people)
- Trainer: Lean facilitator internal to organization
- Topics covered: Lean principles, specific Lean tools used in RCE
The entire quality training module is about 5 hours long, with 4 of the hours focusing on Lean. Though this training is optional, over half of the staff have completed this module, including most interviewees who participated in a Lean project. According to the CEO, the purpose of this module is to give staff a foundation on Lean for participating in Lean projects or assisting co-workers with Lean projects.

Other Training

When Lean was first introduced to the organization, a consulting organization trained senior-level staff and managers on Lean principles. This group also attended an outside Lean training event, where the Lean process was further expanded, and they visited another health care facility to see the Lean process. However, only two staff who participated in those early training sessions are still with Suntown Hospital.

Exhibit 4.8. Other training offered

- Leadership training when Lean is first brought to the organization with external consultant.
- Online quality module training available to all staff, but not required for Lean team participation. Describes principles and tools of Lean, as well as quality more generally.

Process for Lean Projects

All Lean projects at the hospital follow a similar process and generally revolve around an RCE. Most of the preparation and baseline assessment is included in the RCE, and little preparatory work is done prior to the RCE. Before the event, one person, usually the CEO, sends an email to the team (typically 8–10 people) describing the goal of the project.

Suntown developed a 10-step process to implement the RCE. These steps, described in Exhibit 4.9, provide a structured process for all Lean teams to follow. After the RCE, Lean teams follow an action plan generated during the RCE.

For issues and processes that are smaller in scope, involve only one department or unit, and are more focused, Suntown Hospital Center created a secondary process called the “quick” Plan-Do-Study-Act (PDSA). The quick PDSA follows Lean principles but is at the discretion of the department manager and usually lasts only a few hours. The quick PDSA involves a shorter process, including identification of the problem, a simple root-cause analysis (i.e., asking “why” five times to get to the root of the issue), generating/selecting a solution to the problem, implementing the solution, studying what happened, and finally, determining what to do next.
Exhibit 4.9. Lean Project Activities

<table>
<thead>
<tr>
<th>Pre-RCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Choose process</td>
</tr>
<tr>
<td>• Select team members</td>
</tr>
<tr>
<td>• Send email to team members</td>
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<tr>
<th>RCE</th>
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<tbody>
<tr>
<td>• Step 1: Discuss priority process. Although the process is normally defined before the RCE, the team discusses the start and end points of the process, the customers, the products, the expectations for the products, and the measures.</td>
</tr>
<tr>
<td>• Step 2: Identify and choose priority problem. In this step, the team lists all problems with the process and prioritizes the problems accordingly.</td>
</tr>
<tr>
<td>• Step 3: Write a problem statement. This statement outlines the overall issues with the process and states the objectives for the process redesign.</td>
</tr>
<tr>
<td>• Step 4: Assign roles and responsibilities to team members. Although team members are selected before the event, roles and responsibilities are defined during this step.</td>
</tr>
<tr>
<td>• Step 5: Physically walk the current process. Using stopwatches and clipboards, the team goes to the target unit and walks the process. One person writes down the time each step of the process takes and the number of physical steps in the process.</td>
</tr>
<tr>
<td>• Step 6: Create value-added timeline. Using value stream mapping, the team maps out the steps of the process and notes which are value-added and which are not. The team also notes where hand-offs and queuing occur and which steps are “checking” steps.</td>
</tr>
<tr>
<td>• Step 7: Identify ways to eliminate waste and process variation. The team comes up with solutions or ways to improve the current process, specifically looking at non-value-added steps and variation in processes. The team uses a fishbone diagram to examine sources for variation.</td>
</tr>
<tr>
<td>• Step 8: Flowchart new process steps. The team maps the new, or “future state,” process and estimates the gains from each process.</td>
</tr>
<tr>
<td>• Step 9: Identify output and process measures. The team determines the process measures that will be used to describe improvements.</td>
</tr>
<tr>
<td>• Step 10: Develop action plan. The team develops an action plan to complete changes discussed in the RCE. Each task is given a due date and assigned to a person who is responsible.</td>
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<table>
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<tr>
<th>Post-RCE</th>
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</thead>
<tbody>
<tr>
<td>• Follow up on action plan activities</td>
</tr>
<tr>
<td>• Send email notes from RCE to all staff</td>
</tr>
</tbody>
</table>

Project Organizational Structure and Roles

Staff from all levels are involved in Lean projects at Suntown. A facilitator, often the CEO or senior-level staff or manager, leads each RCE. The facilitator does not receive formal training but is often coached by a more experienced facilitator during an actual RCE.

A process owner is also involved with each Lean project. This individual is responsible for coordinating the followup activities and action plan following the RCE and reporting on progress to the quality team. This individual may also provide communication or in-service training.
related to the changes made during the Lean process. For larger projects with multiple processes, there may be co-process owners.

The composition of the Lean team varies, depending on the scope of the project (typically 8–10 members). Team members are staff members with knowledge of the target processes and those impacted by the processes. These team members may include senior-level staff, providers, nurse managers, nurses, or other clinic support staff (e.g., housekeeping). Exhibit 4.10 illustrates the relationship between Lean project roles and typical job roles. Additionally, because Suntown is a public hospital in a small county, Lean teams also frequently include community members. While Suntown does encourage the participation of individuals from all levels of the organization in Lean events, many of the same staff tend to participate in multiple events. Further, these individuals are more often senior leaders and nurse managers, rather than true frontline staff.

**Monitoring, Control and Sustainment**

At Suntown, the monitoring phase occurs once all Lean changes are made. The process owner, usually with support from the CEO, monitors the project after the action plan items are implemented. Often, after the Lean project ends, the process owner “re-walks” the processes to determine whether and where improvements have been made. These re-walks should occur 30, 60, and 90 days after the project ends; however, these activities do not always take place because of time and resource constraints. Process data are also collected during this period, and at a minimum, staff report on the Lean project at the weekly quality team meetings.

The hospital does not have a strong focus on collecting data; therefore, monitoring activities are often implemented inconsistently. The CEO noted that data collection has always been a struggle for the organization, mostly because data are collected manually and staff resources are limited.

The sustainment phase is often intertwined with the monitoring phase of each RCE. During these phases, processes are re-examined, and compliance with changes related to the Lean project is monitored. Process data or other data related to the Lean project might be collected.
Dissemination and Spread of Findings

Spread Across the Organization

Thus far, Suntown has engaged in approximately four to six Lean projects per year, including administrative processes, such as central supply and billing, and clinical processes, such as the reduction of UTIs across all three of the hospital’s units. According to the CEO, approximately one-third to one-half of the organization’s staff have been involved in Lean projects. The only interviewee who reported having a complete understanding of all current and completed Lean projects since inception was the CEO. Interviewees reported that the quick PDSA has been adopted by many staff and, according to one interviewee, is very popular with nurses and in the long-term care unit.

Dissemination of Findings to Others in the Organization

Suntown has several methods to share outcomes and findings from Lean projects with staff across the organization and with the Board of Commissioners. These methods are shown in Exhibit 4.11.

Despite these dissemination methods, several interviewees, including those who were part of the Lean teams, indicated that they did not know about the results of the Lean projects. For example, many of the interviewees were unsure of the UTI rates and whether Lean had improved these rates. One interviewee, who was a process owner for Lean projects not part of the scope of this project, noted that she did not take ownership of reporting outcomes to the staff because of other competing priorities.

External Dissemination

The CEO noted that he informally discusses Lean with other hospital and health care administrators. He stated that because he believes so strongly in Lean, and because other organizations have a less formal approach to QI, he “talks up Lean a lot.” The CEO makes formal presentations about Lean at rural hospital committee meetings or rural hospital retreats. He is also asked to present at other conferences and to local hospitals.

Lean Projects Studied

We selected two Lean projects that focus on processes relevant to frontline staff to facilitate comparison of findings across the multiple organizations included in our study. For Case 4, the two projects studied were urinary tract infection (UTI) prevention and reduction (prospective) and redesigning the outpatient medication prescribing process (prospective). Prospective projects were from the initial training and project implementation to sustainment.

Urinary Tract Infection Prevention and Reduction

Project Goals

The goal of this project was to reduce the rate of new and recurring UTIs. One nurse manager reported that the goal was to reduce the current 9 percent UTI rate to the national goal of 5 percent or less; however, none of the other staff stated such a distinct, clear goal.
Department Where Implemented: Long-Term Care and Acute Care Unit

This project was implemented in both the long-term care and acute care (hospital) units.

Project Selection

According to senior executives and nurse managers, UTIs have been a longstanding issue at Suntown, with a peak of infections in 2009 at about 9–10 percent, as reported by two nurse managers. Most of the nursing staff interviewed viewed UTIs as an important clinical issue. Before the RCE, as part of activities for a larger collaborative they were working on with other hospitals, Suntown staff began administering cranberry capsules and vaginal estrogen cream as UTI prevention measures. The CEO proposed the project as well as five others to the quality team. The UTI prevention project was selected by the quality team based on the existing collaborative and the importance of the issue as deemed by nurse managers.

Project Staffing

The CEO selected the team members for the UTI project (Exhibit 4.12). The process owner—a nurse manager—also provided input on team staff selection. Because the issue of UTIs was believed to cut across multiple departments that include clinical and nonclinical support staff, the process owner suggested including staff from environmental services (i.e., housekeeping) and the dietary department. Other team members included nursing staff from long-term care (LTC) and acute care services and the chief nursing officer (CNO). The facilitator for the event was a nurse manager who had not previously facilitated an RCE on her own but had co-facilitated and participated in numerous RCEs. An executive who is also an experienced facilitator was present during the event but describes his involvement as a “casual observer.”

Planning and Implementation

The facilitator reported that she prepared to implement the 10-step process, but other staff said there was little to no planning before the Lean event. However, baseline data for the event were available because Suntown routinely collects infection rates as a required patient safety indicator, including UTI rates that are reported at monthly quality team meetings. After beginning the RCE and mapping the process, the team realized that there were several sub-processes requiring attention. An executive and nursing manager described the project and process as being the most complex project they had attempted at Suntown.

After the first day, interviewees said that the team regrouped and divided into two separate teams to, in a more targeted way, review and walk through the processes believed to affect UTI rates. The first team with the residential care advisor as the process owner was a care team that focused on nursing care: perineal care, incontinence and toileting, and urinary catheter care. The second
team was an environmental team focused on hydration, cleaning hard surfaces, cleaning bathrooms, and hand washing. This team was led by the nurse manager who was also the quality assurance coordinator. Several of the interviewees reported that the team was frustrated after the first day when the project scope seemed overwhelming. However, after re-scoping the project on the second day to create the two separate teams (each responsible for four sub-processes), team morale improved, and the team was able to complete the RCE in 3 days.

As discussed above (Process for Lean Projects section), the team walked through Suntown’s 10-step process and implemented each tool:

- **Step 1: Choose priority process.** On the first day, the team worked to scope the project and discussed the start and end points of the process, the customers, the products, the expectations for the products, and the measures. Nearly all of the first day was spent on this step. It was at this point that the team began to list all of the factors and processes that might influence UTI rates. Since the purpose of this project was UTI prevention, as opposed to treatment, several preventive sub-processes were uncovered.

- **Step 2: Identify and choose priority problems.** Given the eight separate sub-processes that were discovered, the team decided to split the processes into two priority areas: (nursing) care processes and environmental processes. Care processes included toileting, perineal care, incontinence, and urinary catheter care. Environmental processes included cleaning the bathroom and hard surfaces, hydration, and hand washing (see Exhibit 4.13).

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Elderly population (decreased hormone levels)</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Dehydration</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Incident rate of UTI’s</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Environment (bathrooms, sinks, and all other surfaces)</strong></td>
</tr>
<tr>
<td>5.</td>
<td>Elimination (peri-care, toileting, catheter, incontinence)</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Lack of proper and frequent peri-care</strong></td>
</tr>
<tr>
<td>7.</td>
<td>Not obtaining an adequate genitourinary (GU) history (history of UTIs prior to admission, physical or structural problems, and history of renal calculi, and co-morbidity)</td>
</tr>
<tr>
<td>8.</td>
<td>Difficulty in obtaining urine samples</td>
</tr>
<tr>
<td>9.</td>
<td>Dementia</td>
</tr>
<tr>
<td>10.</td>
<td>Immobility</td>
</tr>
<tr>
<td>11.</td>
<td>Infrequent voiding</td>
</tr>
<tr>
<td>12.</td>
<td>Tight undergarments</td>
</tr>
<tr>
<td>13.</td>
<td>Nylon or polyester garments</td>
</tr>
<tr>
<td>14.</td>
<td>Improper personal peri-care</td>
</tr>
<tr>
<td>15.</td>
<td><strong>Improper or nonexistent hand washing</strong></td>
</tr>
<tr>
<td>16.</td>
<td>Tub baths</td>
</tr>
<tr>
<td>17.</td>
<td>Urine dipped within 24 hours of symptoms, including a change in behavior, delirium, decreased mental acuity, or decreased level of consciousness</td>
</tr>
</tbody>
</table>

Note: Highlighted processes are the processes that were selected by the team for improvement.

- **Step 3: Write a problem statement for this project.** Given the change in scope from the first day, and following the 10-step process, the team came up with a problem statement (Exhibit 4.14) identifying which issue or process they were working to improve: in this case, to reduce the UTI rate in the LTC unit by addressing eight care and environmental processes. Dehydration was added as a problem to address.
• **Step 4: Assign team members.** Though team members were already selected, this step was revisited when the process was broken into two smaller teams; in addition, a second process owner was selected. One process owner oversaw the care processes while the second focused on environmental processes.

• **Step 5: Physically walk the processes under examination.** The eight care processes were walked and mapped out using sticky notes to examine opportunities for efficiencies and quality. These processes were toileting, toileting with peri-care, toileting with incontinence, catheter care, hydration, hand washing, cleaning hard surfaces, and (cleaning) sinks and toilets.

• **Step 6: Create a value-added timeline.** After mapping out each process, the two smaller teams identified value-added and non-value-added steps.

• **Step 7: Identify ways to eliminate waste and process variation.** The teams began developing new policies and procedures to reduce variation for perineal care for patients with urinary catheters, perineal care for patients without urinary catheters, hard surface cleaning, toileting, and toilet cleaning. However, the policies and procedures were not finalized during the RCE. To eliminate waste, participants proposed changes to the physical layout and additional equipment to reduce the number of physical steps a staff member had to take to provide the care the team believed was relevant to preventing UTIs. For example, new trash cans and cabinets located closer to the patient were proposed.

The team targeted hydration in LTC residents whose intake was poor by setting fluid intake goals for these patients, tracking fluid intake in the chart, and educating the certified nursing assistants (CNAs) about the importance of hydration. Blue-rimmed glasses and blue trays signaled to CNAs that they should encourage fluids in at-risk patients. The CNO monitored charts each week to determine if hydration goals were met.

• **Step 8: Flowchart new process steps.** The team revisited the process maps for each of the eight processes and, using a flow chart, mapped the future state. The new map attempted to showcase the revised policies and procedures discussed as part of Step 7.
• **Step 9: Identify outcomes and process measures.** The team determined that the UTI rate would be the key project measure; however, some information was also collected during the RCE (e.g., number of steps, time required, hand-offs related to toileting and perineal care).

• **Step 10: Develop an action plan.** The action plan of activities to complete after the RCE ended primarily focused on finalizing the new policies and procedures; selecting, purchasing, and implementing new equipment; and training the staff on the new policies and procedures.

After the RCE, the team interacted via email and in meetings over the course of 5–6 months to come to a consensus on and finalize the new policies and procedures. The team had difficulty agreeing on every procedure, so the process owner contacted the staff member viewed as the expert in each area in question to determine best practices, and these became the final process. Ultimately, the new policies and procedures served as “how-to” guides for best completing the eight priority processes (e.g., cleaning hard surfaces, providing perineal care with and without a urinary catheter, and cleaning a toilet). The new step-by-step procedures closely matched the processes developed by the Lean team in the RCE. Once the procedures were finalized, the process owners trained the housekeeping and nursing staff on the new procedures through one-on-one coaching and staff meetings.

The team ordered new equipment, including bathroom cabinets, to make cleaning supplies more accessible at the point of care, as well as trash cans for bathrooms and disposable cloths to provide perineal care. The procurement process turned out to be more cumbersome than originally anticipated, and the team had to wait weeks for some new equipment to arrive. Equipment was used on a trial basis in a few rooms at a time. This allowed staff to make changes, as needed. For example, the original cabinets turned out to be too big and cumbersome; thus, the team tested another type of cabinet before deciding on a final design, ultimately built by a staff member. These environmental process improvements were implemented not only in the LTC unit, but also in acute and swing beds.

**Monitoring, Control and Sustainment**

The process owners re-walked all processes 30 days post-implementation to check on the status of improvements; the 60- and 90-day re-walks did not occur because the care process owner left to take another position outside the State. Process owners have a major role—coordinating the followup activities and action plan, including training and communicating process changes, as well as reporting progress to the quality team. One nurse manager and project team member believed that the lack of engagement of the care process owner—who initially served as the primary process owner for the entire project—and her later resignation was one of the primary reasons the project outcomes were not sustained.

The remaining process owner also monitored compliance with new policies and procedures and provided feedback to staff who did not comply. Additionally, the remaining process owner continued to monitor the infection data shared at monthly quality team meetings. However, this process owner commented that with competing priorities, she was unable to take on the full role of the process owner after the departure of the primary process owner and did not rework the process. For example, the RCE produced better cleaning processes by replacing reusable cloths with disposable cloths. Interviewees reported that staff did seem to initially adhere to the changes
and received some housekeeping education; however, relatively soon, not all staff adhered to the new rules, and no followup on compliance with the new cleaning regulations was undertaken.

The UTI infection rate initially decreased (to a rate unreported in the interviews) but then came back to pre-Lean levels (roughly 10 percent rate of infection). When that occurred, team members insisted on having two aides, rather than one, available for perineal care to ensure that the patient was properly cleaned and dry. Process owners reported on the UTI project at the quality meetings, noting what they did that week, what they learned, and what they would do next for the UTI project. However, at the close of the study, one nurse manager reported that there were plans to have an in-service with staff to reinforce the importance of good practices to control infection rates, conduct a PDSA on bladder infections, and use publicly available forms from AHRQ to monitor UTI rates. An executive stated that staff education would be implemented again to ensure that new processes would become a part of staff duties and that, because of Lean, this is an area that is now emphasized.

**Project Outcomes**

Perceptions about the success of the UTI prevention and reduction project varied among the staff. The resurgence in UTI rates after an initial decline frustrated some staff who participated in the RCE, and they noted that the presence of UTIs in preventable cases was a “dismal failure.” Others, however, noted that the UTI infection rate needed to be taken in context; in particular, some patients have chronic infections that are less likely to respond to these measures.

A few of the nursing staff felt that this project was successful, even if this was not reflected in improvements in UTI rates. These individuals believed that the new policies, procedures, and standardization of work across units and staff were a huge improvement. Specifically, staff noted the following improvements stemming from the Lean project:

- New policies and procedures for perineal care and cleaning bathrooms were implemented.
- The number of physical steps in the general toileting process was estimated to have been reduced by 35 percent and toileting with perineal care by 43 percent.
- The acquisition and use of new cabinets, trash cans, and disposable wash cloths for housekeeping and nursing staff was expected to improve compliance with new policies and procedures.

Three senior staff mentioned the following, less-tangible aspects of this project as indicators of success:

- Staff from nursing, dietary, and environmental services were brought together to focus on all aspects of UTIs.
- The Lean team completed its most complex, challenging RCE to date, despite widespread frustration with the project’s initial breadth and scope. Further, there were a few new staff members participating on Lean projects who had not previously participated in a project.

"Obviously, there were some leadership issues. [We] didn't have anybody that really took ownership for it and there appeared to be some issues in that. Even though the person we assigned to it is well-educated [sic], she just wasn't very interested. So it was always a struggle. And it was assigned to her rather than she volunteered to do it, or was excited about it."

– Nurse Manager
One nurse manager stated that Lean was changing staff thinking and culture. The manager cited the fact that staff—both with and without Lean experience—discussed issues related to UTI rates in a blame-free manner.

Finally, one senior staff interviewee felt that the attention this Lean project brought to hydration was critical to improving patient experiences and care.

When asked if the UTI project was a success, one nurse manager maintained that, although it was not a clear-cut success, it did help the team detect and focus on areas that needed improvement. This in itself was a learning experience and an accomplishment for the team. Additionally, several practices came out of the UTI RCEs related to improved sanitation, which were learned skills for everyone, from housekeeping to the nurses.

**Redesigning the Outpatient Medication Prescribing Process**

**Project Goals**

The goal of the Redesigning the Outpatient Medication Prescribing Process (known as E-Prescribe) was for the pharmacists to receive a definitive script (one that is legible, timely, accurate, and covered by insurance) from Suntown’s medical clinic staff the first time the script is sent.

**Department Where Implemented: Outpatient Clinic**

This project was implemented in Suntown’s outpatient clinic.

**Project Selection**

The idea for the project began with one provider—a physician assistant who also became the process owner for the project. When selecting this project, the hospital’s medical clinic staff knew they wanted to implement electronic prescribing software and to use Lean to redesign the prescribing process so that the results could inform the selection of the software. Suntown was motivated by forthcoming mandates to integrate as part of health information technology (IT) reforms. The quality team, which was well aware that electronic prescribing would soon be mandated for all prescriptions, approved this project.

**Project Staffing**

Exhibit 4.15 shows the team composition for this project. The CEO and the physician assistant who was the process owner selected the team members for the prescribing redesign project. Because most prescriptions from the hospital’s medical clinic are filled by the local community pharmacy, it was important for a representative from the pharmacy to participate in this RCE. Suntown’s CEO decided to serve as the facilitator for this RCE because he is the most experienced facilitator at the organization and because of staff availability. The project team included nurse managers from long-term care and acute care services and the CNO.
**Planning and Implementation**

This project involved all 10 steps of the RCE process and was completed in only 2 days instead of the usual 3 days. Each step progressed without delay, and few barriers were encountered in this RCE. The tools used and activities completed by the project team are described here.

- **Step 1: Choose a priority process.** The team narrowed the starting point of this process to the provider’s decision to prescribe or refill a medication; the end point was to be when the pharmacist received the order.

- **Step 2: Identify and choose priority problems.** A major issue with the current medication prescribing process was the number of call-backs from the pharmacy because prescriptions were either incomplete or unclear. Further, the process involved a lot of discussion between the nurses and providers, with the nurses ultimately faxing the prescriptions to the pharmacy. This often resulted in lost prescriptions, a significant time delay, and a long turnaround time for patients.

- **Step 3: Write a problem statement.** The team described the problem and described the objective of this project: “for the pharmacist to receive a definitive script on the first pass [i.e., the first time it is sent].” A definitive prescription is one that is legible, timely, accurate, and covered by insurance.

- **Step 4: Assign team members.** To some extent this step had already been addressed, as team members were selected before the RCE, and it was clear that the physician assistant would be the process owner.

- **Step 5: Physically walk the processes.** The team walked the current process for writing and submitting both a new prescription and a refill prescription to the pharmacy. The total number of steps and amount of time for each process were recorded.

- **Step 6: Create a value-added timeline.** The team examined where value was added/not added for each step. The team concluded that there was only one value-added step in the process of writing new prescriptions (i.e., the actual writing of the prescription by the provider) and two value-added steps in the refill process (i.e., researching the refill request and writing the refill prescription). Both of these value-added steps were completed by providers. All of the other steps in the process (completed by the nurse) were deemed non-value-added.

- **Step 7: Identify ways to eliminate waste and process variation.** The team developed new policies and procedures to eliminate waste and reduce variation. Using a fishbone diagram, they brainstormed sources of variation in this process and noted potential forms of waste as well as solutions to the issues. A specific area of waste they identified was call-backs. Call-backs refer to the number of times the pharmacy needs to call the outpatient clinic to clarify a prescription; this speaks to the accuracy of the prescription.

- **Step 8: Flowchart new process steps using future-state and process mapping.** The team removed nearly all of the non-value-added steps and estimated the total time and number of steps for the revised processes. These steps were mapped out in a process flowchart.

- **Step 9: Identify output and process measures.** A process measure of pharmacy call-backs was used, and the team hoped to reduce this number by 50 percent.
• **Step 10: Develop an action plan.** A tentative decision to purchase prescribing software had been made as part of project selection. The RCE plan included activities related to purchasing the software, training/educating staff on the software and the process changes, working with the pharmacy to ensure the software matched their platform, and informing the community of these changes.

After the RCE, the CEO and the process owner handled most of the followup activities on the action plan, such as ordering the software, setting up the software for the providers and the pharmacists, and training the providers on how to use the software. To train providers, the CEO and the process owner created a video to demonstrate the new electronic prescribing software and conducted at least two training sessions with medical providers and support staff. The process owner worked with the pharmacy to iron out any software glitches in the new system. The process owner contacted other local pharmacies to let them know that Suntown was now electronically prescribing medications for outpatients. The entire implementation process lasted roughly 5 months.

**Monitoring, Control and Sustainment**

The process measures that were identified in the RCE included the number of pharmacy call-backs and the number of steps or time saved in the medication prescribing process. The process owner reported that initially the call-backs were tracked by having the front office log the number of pharmacy calls. However, interviewees noted that within the first 2 weeks, call-backs became so rare that there no longer seemed to be a benefit to tracking the calls.

The central monitoring activity for this project is ensuring compliance with electronic prescribing. At 3 months after the conclusion of the RCE, interviewees varied in their estimates of the number of medical providers using the electronic prescription software. The process owner/physician assistant estimated that three of the four providers were using the electronic prescription software. A nurse practitioner reported that only half of the providers were using the system because of glitches between the newer E-Prescribe software and older electronic medical record software. A third provider reported that all of the staff were using the E-Prescribe program about 50 percent of the time. Pharmacists reported receiving only 25 percent of the prescriptions from Suntown through the e-Prescribe system. Interestingly, each of the three providers we talked to said that they themselves were using it 100 percent of the time, but that one provider who is not technologically savvy was not using the software at all.

**Project Outcomes**

The E-Prescribe project at Suntown’s medical clinic was considered a “partial success” by most interviewees who participated in this project or who were aware of the project. The process owner felt that this project was 80 percent successful. When asked if the project was a success, one nurse manager stated that incorporation of the new technology was a success. The pharmacists were more measured, identifying gaps in knowledge and understanding of this new system among users. They felt that more training and step-by-step learning by the team was necessary for the system to be a true success.

Though this system was viewed by the process owner as simple and mostly successful, the issue of noncompliance hindered the impact on efficiency. As noted above, the interviewees estimated
that only two or three of the four providers were using the electronic prescribing software and not always using it 100 percent of the time. Further, the pharmacists interviewed estimated that only 25 percent of prescriptions they filled from Suntown were being electronically prescribed.

Outcomes attributed to this project are:

- An estimated 80 percent reduction in the number of steps. These steps shifted the burden of processing the prescriptions from the nursing staff to the providers who are actually writing the prescriptions.
- Most interviewees believed that this system was increasing efficiency and that using the electronic prescribing software saved staff time and reduced costs for both staff and pharmacy. However, impacts on overall efficiency were mitigated by the fact that not all providers were using the software consistently or all of the time.

The process owner estimated that one of every 50 prescriptions required a call-back from the pharmacy, far fewer than the initial state. However, these data were collected only for the first 2 weeks post-implementation.

**Outcomes of Lean**

In this section, we discuss the outcomes of the Lean initiative at Suntown Hospital based on interviews with staff and materials provided by the organization. Overall, hospital staff reported moderate improvements in employee satisfaction and culture change. Staff also believed that gains in efficiency had occurred; however, Suntown does not routinely collect data after each RCE to validate efficiency gains. As noted previously, improvements in clinical quality and patient safety were not sustained.

The findings reported here are based mainly on verbal reports from staff, since they had difficulty identifying specific quantitative data that addressed the effectiveness of Lean. We found that the measurement needed to examine progress and improvements after an RCE ends often does not occur, and actual impacts cannot be quantified; instead, hospital staff often relies on future-state mappings and predicted outcomes as part of the RCE process (see the Process for Implementing Lean section for more detail on the RCE process). The importance to Suntown of directly measuring the impact of Lean is not clear, but it seems likely that the long-term viability of Lean as a valid approach to reducing waste and improving performance will be limited without data specifically linking Lean implementation to improved efficiency, cost savings, improved safety, or other goals.

The discussion of Lean outcomes in this report is organized into two major categories based on our conceptual framework: intermediate outcomes and ultimate outcomes. As described in the Introduction to this report and in Exhibit 4.16, intermediate outcomes include culture change, employee satisfaction, change in Lean knowledge and skills, Lean routinization, and

<table>
<thead>
<tr>
<th>Intermediate outcomes</th>
<th>Ultimate outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Culture change</td>
<td>• Clinical process or outcomes assessment</td>
</tr>
<tr>
<td>• Employee satisfaction</td>
<td>• Efficiency</td>
</tr>
<tr>
<td>• Lean knowledge and skills</td>
<td>• Patient experience</td>
</tr>
<tr>
<td>• Lean routinization</td>
<td>• Patient Safety</td>
</tr>
</tbody>
</table>

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Exhibit 4.16. Outcomes by Category
dissemination. Ultimate outcomes include impacts on efficiency, patient satisfaction and experience, clinical process and outcomes assessments, and patient safety.

**Intermediate Outcomes**

In our conceptual framework, intermediate outcomes refer to organizational culture, employee satisfaction, increased Lean knowledge and skills, and routinization of Lean. These intermediate outcomes are, in turn, linked to ultimate outcomes—efficiency, value, and quality—as defined in the conceptual framework and discussed in the next section. Interviewees reported progress in the areas of culture change and employee satisfaction. However, involvement in Lean activities seems to have relatively less impact on increased Lean knowledge and routinization. In addition, interviewees are not uniform in their views of these changes. Frequently, frontline and other staff do not share as fully in the optimistic view of change compared to senior executive staff.

**Organizational Culture Change**

Senior executives and a few mid-level staff reported improvements in organizational culture because of Lean. However, frontline staff provided fewer comments on culture change as an outcome, indicating that staff did not perceive the same changes as senior leadership and management staff. According to senior executives, Lean at Suntown is an ongoing process of culture change for the organization. Overall, senior leadership and management staff reported improvements in employee attitudes because of Lean. One senior executive maintained that Lean events have challenged employees to move away from what they were familiar with and take on more responsibility. Another senior executive added that Lean is sustained by the culture change it generates: Lean promotes employee ownership and responsibility, which in turn strengthens interest in improvement.

**Greater acceptance of new processes.** Senior executives, one nurse manager, and one mid-level provider noted that because of Lean, staff was more willing to implement and accept new processes. According to one senior executive, “Even the most skeptical individuals on our team are converted by the end of the RCE process, that they’ve seen the real value in doing this.” As Lean team members participate in creating, mapping, and measuring a new process, they are motivated to implement and change existing processes. Specifically, interviewees mentioned that Lean gave individuals a “license for decisionmaking” and encouraged staff to really examine processes to improve them. This motivation, in turn, fosters a culture where process changes are more accepted. Members of the E-Prescribe project noted that the community pharmacist and some of Suntown’s medical clinic providers were willing to revise the way they processed prescriptions after they saw the potential benefits from the E-Prescribe RCE. However, this culture change to implement new processes has not been adapted by all clinic providers, particularly those who are not part of Lean teams. For example, one physician who did not

“Data collection: you have identified our weakness. We do not have the manpower to collect data. On the front end, it’s obvious that a certain process is going to be much better than the process we have. We definitely can’t measure in terms of numbers of how effective that is. So, I have no idea how much cost savings I’m giving my patients...We don’t have someone who can collect that data consistently and that’s the problem with all of our Lean studies...You make the assumptions at the beginning that this is going to be better, but we can’t prove it in the end. Everyone feels like it has in the end, but you can’t prove it.”

—Process owner
participate in the event would not adopt the process changes resulting from the E-Prescribe project.

**Improvement in employee ownership.** Nearly all senior leadership at Suntown indicated that Lean is increasing staff ownership of processes and increasing the responsibility they take over their work. Because of this increased ownership and responsibility, these interviewees believe that staff are more likely to foster their own change internally and are also more likely to remain loyal to the organization. In contrast, frontline staff did not note that Lean is increasing the ownership they take over their own work, but one frontline nurse noted that Lean made her more aware of how her work could more directly improve patient clinical outcomes.

**Employee Satisfaction**

Whereas impacts on culture change were mostly noted by senior executive and management staff, interviewees from all levels reported that participation in Lean events resulted in improved communication with colleagues across the organization and outside of the organization and in improved job satisfaction because of waste reduction.

**Improved communication.** Nearly all interviewees agreed that the Lean RCEs foster a level of open communication, discussion, and teamwork unseen before Lean was implemented. One nurse manager noted that because the RCE team differs each time, staff are able to develop a level of camaraderie with each other that may not have existed before.

**Improved job satisfaction because of waste reduction and improved quality of care.** In addition, several nurse managers and frontline staff said that the perceived improvements in efficiency and quality because of RCEs improved their job satisfaction. One frontline person noted that the learning environment and the perceived positive impact on patient care made her feel satisfied with the Lean process. Another nurse manager stated that after one specific RCE where a new phone system was implemented for nurses, nursing staff were pleased with the improvements and believed this new system made their jobs easier. In general, during and after an RCE event, team members believed that their jobs and the jobs of those impacted by the Lean changes improved as waste in the process was removed. This element was tangible during the E-Prescribe rapid cycle we observed: upon seeing how the new process could make the nurses’ jobs easier, nurses participating in the event grew very excited at the perceived impact. According to one senior executive, employee satisfaction scores rose, then dropped a bit, then rose again. The executive felt that this occurred because employees began to recognize that there is ongoing progress towards better clinical care.

Several interviewees also reported some initial resistance to Lean, which may negatively influence employee satisfaction. Specifically, these individuals reported that staff have been frustrated with the initial time investment and learning involved with a Lean event. However, these same interviewees indicated that staff become more optimistic about Lean and their
satisfaction improves once staff see the potential for improvements or experience improvements as a result of changes implemented through Lean.

**Empowerment of staff.** Two nurse managers also noted that the RCE process gives all staff members a voice in improving processes. These individuals cited examples from past and current RCE projects where nurses specifically felt that they were able to speak up and provide input on how to improve processes and, in turn, the care given to patients.

**Lean Knowledge and Skills**
A number of tools, concepts, and techniques (e.g., process mapping, future-state mapping, fishbone diagrams, etc.) are introduced to the staff through Lean projects and through the quality module training. As such, several interviewees, namely senior executives and nurse managers, indicated that knowledge of the Lean process and quick PDSAs, the other Lean tool employed at Suntown, have penetrated the organization. One nurse manager noted that nurses in LTC often use the quick PDSA as a means to improve processes. However, other managers remain unsure about the degree of uptake and acceptance of Lean tools.

**Lean Routinization**
According to interviewees, Lean provides a method for problem solving. Several interviewees expressed in one way or another that Lean processes (including the RCEs and the quick PDSAs) have become “what people do” at Suntown. Another interviewee noted that because of Lean, staff no longer accept the “status quo.” Along those lines, one senior executive also noted that Lean penetration at the organization has caused staff to start questioning processes.

**Ultimate Outcomes**
Little information is available for the ultimate outcomes of efficiency, clinical outcomes, patient experience, patient safety, and business case (or value) at Suntown. Staff reported perceived increases in efficiency and patient experience; however, little quantitative evidence is available to support those perceptions. As noted in the previous section, Suntown has struggled to see sustained impact on clinical quality and patient safety.

**Efficiency and Standardization**
Efficiency gains projected because of Lean projects at Suntown are often estimated or projected during the RCE. However, the actual decrease in the number of “steps” and in non-value-added processes is not always confirmed after the RCE event. Nevertheless, hospital staff believe that adherence to the processes outlined in the RCE will provide for such efficiency gains. Further, Suntown does not collect cost data for Lean projects, unless the metrics are clearly defined and routinely collected as part of the work process.
Efficiency. Nearly all interviewees reported that Lean projects resulted in reducing the amount of time a process takes, reassigning staff responsibilities, and using existing resources more efficiently. Further, the new processes resulting from each RCE had the potential to reduce the non-value-added steps, overall duration, and distance in terms of number of process steps. Estimated efficiency gains from administrative Lean projects not specifically studied in this project included:

- A reduction in the period for patient billing from 120 days to 50 days after an RCE event.
- Decreased time for processing long-term care admission by 60 percent, the number of steps in this process by 50 percent, and the number of handoffs to admit a patient from 15 to 4.

According to a few interviewees, the E-Prescribe team has not yet observed all of the efficiency gains expected because of some initial time sunk into improving the electronic prescribing software, debugging the system, and getting providers on board. However, one senior executive and frontline staff who were interviewed foresee great time and cost savings for the organization and the patients once providers are fully using the E-Prescribe system.

Standardization. Lean projects at Suntown may also result in new policies and procedures. As discussed previously, because of the UTI project, policies and procedures regarding hydration and cleaning procedures were standardized as a result of the RCE.

Patient Experience

Suntown does not systematically collect information on patient experiences and satisfaction and—because of its status as a CAH—is not required to collect Hospital CAHPS data. Because of resource constraints, hospital executives have opted not to collect these types of data.

However, several interviewees reported anecdotal evidence that Lean is improving patient satisfaction. Two nurse managers noted that after Lean projects, patients have been complaining less. Another nurse manager noted that because of streamlining processes in the long-term care unit, patients seem happier. LTC census numbers, however, have declined from a peak of 94 percent in 2007 to 83 percent in the first part of 2011.

On a larger scale, two senior executives believe Lean has resulted in positive rapport with the community because community members see Suntown as “a facility that is running smoothly and one that they can trust.” Notably, one of the first Lean projects at Suntown was geared toward improving revenue-cycle management. Given that previous struggles with this issue had resulted in some distrust of Suntown in the community, the executives believe that the improvements from this Lean project were instrumental in improving the public perception of Suntown.

Clinical Process or Outcomes Assessment and Patient Safety

There is little solid evidence to support improvements in clinical outcomes associated with Lean implementation at Suntown. Several interviewees believed that in removing non-value-added steps from each process, staff, particularly nurses, would have more time to devote to patient care. For example, the E-Prescribe project removed several steps in prescribing that nurses
formerly had to complete. Lean team members felt that this time would be better spent with the patient, improving patient care.

There is no evidence of improvement in patient safety associated with the implementation of Lean at Suntown. The UTI prevention and reduction project targeted the rate of UTIs in LTC. While the UTI infection rate reportedly decreased in the first 3 months after this project, the rate then returned to pre-project levels. Frontline nurses and management staff did not have a consensus about why infection rates have not decreased but believed that they had implemented better cleaning and hydration practices.

A few other RCEs at Suntown targeted and improved aspects of patient safety. For example, one RCE improved patient documentation in the emergency room so that documentation was 96 percent accurate; this was cited by one senior executive as an improvement in patient safety.

Senior executives at Suntown indicated that Lean was saving the organization time and resources; however, as noted in previous sections, this information was based on perceived or predicted outcomes from the Lean events. While Lean is the primary process-improvement tool used at Suntown, actual impacts cannot be quantified because post-implementation measurement is not done. However, interviewees believe that the revised processes are, in fact, improving efficiency, and therefore having an impact on satisfaction and cost.

Given the community’s denial of supplemental funding for Suntown several years ago, all interviewees recognized the need to improve the trustworthiness of the organization in the community. As Lean is believed to have improved the organization’s financial situation and also allowed it to provide better care to patients, interviewees believed that the community would be more likely to support increased funding for the organization and also would be more likely to seek care at Suntown Hospital.

Factors that Influenced Success of Lean Implementation

During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to Lean’s success, as well as the problems or challenges they witnessed or faced in implementing Lean at Suntown Hospital. Findings regarding facilitators and barriers are based on responses to these questions and on an interpretation of findings by the research team (see Exhibit 4.17). All interviewees were asked to share their insights, that is, their lessons learned based on their experiences with Lean at Suntown. More specifically, they were asked whether and how they would change what they had done if they were to do it over again. The two cases that were studied did not produce concrete evidence of improvements (efficiency, patient experience, and patient safety); thus, evidence of Lean’s success is drawn from anecdotal reports of Suntown hospital’s overall experience with Lean through the years.

<table>
<thead>
<tr>
<th>Exhibit 4.17. Key Facilitators and Barriers to Organizing and Implementing Lean at Suntown Hospital (From Conceptual Framework)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizing Lean</strong></td>
</tr>
<tr>
<td>• Alignment of initiative to organization</td>
</tr>
<tr>
<td><strong>Implementing Lean</strong></td>
</tr>
<tr>
<td>• Leadership qualities and support</td>
</tr>
<tr>
<td>• Resources</td>
</tr>
<tr>
<td>• Staff engagement or resistance</td>
</tr>
<tr>
<td>• Communication about Lean</td>
</tr>
<tr>
<td>• Lean team composition and size</td>
</tr>
</tbody>
</table>
Using Lean’s conceptual framework, the leadership was the primary facilitator of the Lean initiative. The major barriers to implementation that staff mentioned were related to scope, pace, and coordination of the Lean events and resources; leadership (which was seen as a barrier as well as facilitator); availability of resources; staff engagement; and Lean team composition and size. It appears that factors related to the external environment and applicability and locus of Lean activities were not significant as either barriers or facilitators. This section provides a summary table of “Major Factors that Facilitate Lean Success” (Exhibit 4.18), followed by “Major Factors that Inhibit the Lean Success” (Exhibit 4.19).

### Exhibit 4.18. Major Factors that Facilitate Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>• Strong leadership can encourage participation in RCEs and use of Lean tools to make process improvements.</td>
</tr>
<tr>
<td></td>
<td>• Leading by example—executives participating on RCEs and taking on action items—sets a positive tone for Lean projects throughout the organization.</td>
</tr>
<tr>
<td>Education/training</td>
<td>• Self-study modules and training integrated into an RCE can be an effective approach to developing capacity to apply Lean methods in a small hospital.</td>
</tr>
<tr>
<td>Lean team composition and size</td>
<td>• Staff who have participated on Lean teams are more empowered to express their views on process improvements.</td>
</tr>
<tr>
<td>Routinization</td>
<td>• Participation in a Lean event can prepare staff for future events.</td>
</tr>
<tr>
<td>Culture</td>
<td>• The “flat” hierarchy and comfort nurses had with initiating improvements that existed prior to Lean, made it easier for the organization to adopt Lean.</td>
</tr>
</tbody>
</table>

### Exhibit 4.19. Major Factors that Inhibit Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>• Loss of a process owner following an RCE led to poor follow through in implementing and revising process changes.</td>
</tr>
<tr>
<td></td>
<td>• Lack of staff accountability by the process owner and leadership for changes made by the RCEs and for completing activities on the action plan can derail RCE success.</td>
</tr>
<tr>
<td></td>
<td>• Lack of outward support from all senior executives creates a climate where lack of adherence to process changes by all staff is tolerated.</td>
</tr>
<tr>
<td>Scope</td>
<td>• Failure to review the medical evidence base may lead to a focus on improving processes that are unrelated to reducing UTI rates.</td>
</tr>
<tr>
<td></td>
<td>• Attempting to improve too many processes can overwhelm staff.</td>
</tr>
<tr>
<td></td>
<td>• Failure to complete all steps of the improvement process can derail the effort.</td>
</tr>
<tr>
<td>Resources</td>
<td>• Without resources being allocated for data collection, it is difficult to determine the impact of Lean on efficiency, clinical outcomes, patient experience, and patient safety or to revise processes that are not working.</td>
</tr>
<tr>
<td></td>
<td>• Lean events are time consuming for staff.</td>
</tr>
<tr>
<td></td>
<td>• Staff turnover might make it difficult to make and sustain process changes and to develop a Lean culture.</td>
</tr>
<tr>
<td>Communication about Lean</td>
<td>• There is not always effective communication about events and solutions to the staff who do not participate in the event.</td>
</tr>
<tr>
<td>Lean team composition and size</td>
<td>• Using the same staff repeatedly on Lean events might lead to burnout.</td>
</tr>
</tbody>
</table>
Organizing the Lean Initiative

In this section, we discuss barriers, facilitators, and lessons learned related to organizing the Lean initiative.

Internal Context

As a CAH, Suntown Hospital is a small organization with a culture that fosters openness and transparency. Numerous quality team members regard the QI structure as “flat” and nonhierarchical. As such, the existing culture and organizational structure facilitated Lean implementation because some individuals, especially nurse managers, were accustomed to bringing up issues and possible improvement ideas to the senior executives of the organization. However, this value of openness was felt less by frontline staff, who tended to be uncomfortable speaking up on quality issues before Lean. A few interviewees reported that previously they did not have a voice in QI initiatives.

Scope, Pace, and Coordination of Lean Projects

Numerous interviewees pointed to aspects of the scope, pace, and coordination of Lean as barriers to successful implementation. Specifically, all team members mentioned the scope of the UTI project as a barrier to success. As noted previously, this project was eventually broken into two separate projects, each focusing on different processes, because of the large scope. Even after the processes were broken down, several interviewees noted that the connection between process changes and impacts on UTI infection rates was unclear, and even after implementation, they did not understand where problems with the UTI rates arose. Presenting the medical evidence to identify factors demonstrated to reduce UTI rates (e.g., removal of urinary catheters) at the RCE event would have helped to focus the team on processes, with a greater likelihood of making an impact on UTI rates.

The locus of Lean activity was also reported to be a barrier by a few interviewees. Specifically, these individuals noted that sometimes processes targeted for redesign by the RCE might have made staff defensive and more resistant to addressing the problem. In relation to the UTI project, one nurse manager noted that infection control is a sensitive topic, as “no one likes to be accused of causing an infection.”

“But you have to be able to prove it and you have to be able to show how you’re going to implement it and add it to your current processes to bring value to it. I don’t think you can do that if you skip the small steps because, you know, it just breaks down when you—if you skip so many small steps, the whole thing is just going to break down.”

—Frontline staff
Interviewees also indicated that the pace of the RCE Lean events both facilitated identifying issues with processes and was a barrier to staff participation. On one hand, one mid-level provider, the nurse managers, and the frontline staff agreed that the careful step-wise examination of processes that occur in an RCE is critical to understand where and how processes can be improved. These staff noted that if a team skips examining each individual step in a process, the solutions are more likely to fail. On the other hand, according to a few nurse managers and frontline staff, this very slow pace of examination during the RCE frustrates staff. These interviewees indicated that they felt the RCE process might be too slow and could be accelerated.

**Implementing the Lean Initiative**

In this section, we discuss barriers, facilitators, and lessons learned related to implementing the Lean initiative.

**Leadership Activities and Qualities**

Leadership and support was the most frequently cited facilitator to Lean. Nearly all staff across all levels noted that the CEO’s outward support of Lean was a key reason the initiative was begun. A few interviewees also noted that the CEO pushes the organization forward and believes that Lean is a mechanism for doing so. According to interviewees, the CEO often mentioned Lean during meetings and gave Lean team members the opportunity to share improvements and lessons from their projects with other staff through quality team and staff meetings. Further, he attends nearly all RCEs. His leadership of the new pharmacy processes had a very positive influence on the RCE, according to frontline staff. The CEO reported taking responsibility for action items resulting from RCEs and allocating funds to purchase equipment and software requested by Lean teams—though, as noted in the next section, staff sometimes find it challenging to obtain the resources they need for Lean implementation.

While the leadership and support of the CEO was a clear motivator for Lean’s implementation at Suntown, other senior executives might not have been as highly engaged in the Lean process. Specifically, one senior executive noted that while he did not outwardly oppose Lean and saw value for other staff, he did not wish to participate in Lean projects or QI meetings more generally. At the time of the study, the nonparticipation of this senior executive might have had a negative impact on the E-Prescribe project but did not hamper activities on the UTI project, which focused primarily on nursing and environmental health activities. However, this barrier could have a more lasting impact as Suntown Hospital continues to tackle clinical processes that involve the providers.
Leadership at the process-owner level might also be a barrier to implementing and sustaining changes resulting from the RCE. Several interviewees across all levels of the organization noted that lack of followup and accountability from the process owner or project leader is a significant barrier. These interviewees pointed to several examples, notably the E-Prescribe and UTI projects, where staff were not held accountable for changes made by the RCE nor for completing activities on the action plan after the RCE. For the UTI project, this barrier was complicated by the fact that the process owner left Suntown shortly after the UTI RCE. Subsequent process owners were not able to “keep the momentum” on the project, contributing to its failures.

Availability of Resources

Numerous interviewees at Suntown, with the exception of the CEO, described staff availability as a barrier to participation in Lean projects. For projects involving clinical staff, such as the E-Prescribe event, providers were often unable to attend training sessions because of their schedules. One provider expressed frustration at the length of the Lean projects, noting that she would like to have more flexible participation in Lean events. In addition, one frontline staff person described how difficult it was for staff in full-time positions to devote extra time towards Lean improvement processes, with the implementation stage being the most difficult. Even the CEO indicated that there was some frustration among staff when there was no one to cover for them while they were away at workshops. In some ways, this barrier is a result of the organization’s small size and the fact that so many staff members fulfill multiple roles. Despite the challenges of finding the time to participate in Lean events, several interviewees mentioned that salaried employment at Suntown facilitated provider participation in Lean because staff can participate in training without worrying about losing money.

Lack of capacity for data collection and reporting was also cited as a major barrier for Suntown in implementing Lean. As discussed in the previous section, Suntown does not routinely collect data after the RCE event, and actual improvements are not always measured. To overcome this barrier, the plan is to hire a full-time IT staff person who will also take on a data supervisory role. One senior executive indicated that hiring this individual would help improve and streamline data collection capabilities, allowing for a point person for organizational metrics.

Several interviewees also noted that obtaining resources is a barrier to Lean implementation. Notwithstanding the support expressed by the CEO for allocating funds for Lean implementation, these interviewees reported that, because of budget constraints and existing organizational procedures for obtaining approval on purchases, purchasing new equipment to implement new processes designed in the RCE can be difficult. As the care coordinator said, “I have to go and find this paperwork. Once I find the right person who knows what the paperwork looks like then I have to get it signed by some administrator.” This in turn adds to the time drain during the implementation stage. According to the quality assurance and clinical director, even when purchases are decided upon there is often a long lag time—up to 2 months—before the supplier ships the correct item.

Staff Engagement

Several staff, including senior executives and nurse managers, noted that participating in RCEs is important for facilitating staff buy-in to the Lean initiative. These individuals believed that after a staff person participated in a 3-day event and saw the potential reduction in waste, they would
become believers in the Lean process. One frontline staff person whose first RCE was the UTI event also expressed this sentiment: before participating, she was confused and skeptical about Lean. Afterward, she reported that the Lean process was eye-opening, and she now saw how Lean can improve processes and reduce waste. However, according to a few interviewees, many staff who have not participated in a Lean event still remain disengaged or skeptical of Lean. Staff turnover at Suntown could also be contributing to this effect; Suntown reported an approximately 30 percent turnover over the prior year.

Suntown Hospital’s previous Lean projects were viewed as highly successful, especially as these projects helped Suntown earn trust from the community and resulted in tangible changes to the organization. For example, a Lean project that focused on improving communication between nurses and providers ultimately resulted in the installation of a new telephone system. Because of these early successes, many staff members trust and believe in the Lean process.

Lean Team Composition and Size

Because Suntown is so small, many individuals are often called upon for multiple Lean projects. One nurse manager noted that she was “burned out on Lean,” despite believing in the process, because she had participated in so many projects.

Conclusions

Suntown Hospital’s approach to implementing Lean was to train a core set of staff on the concepts and tools and then train frontline staff while they participated in Lean projects. The CEO views Lean as a tool for culture change and reducing waste, while the frontline staff primarily view Lean as a mechanism for improving processes to ultimately increase the quality of care.

In general, the staff have a largely optimistic view that even where Lean has not produced concrete, positive results, there have been improved clinical practices and increased staff learning. However, sustainability of RCE changes is jeopardized by a lack of reporting and accountability. Recommendations suggested below derive from Suntown’s experience with Lean.

Recommendations for Similar Organizations Moving Forward

- **Measure results to document the adoption and effectiveness of process changes.** It is difficult to determine the success of process changes without data. Consideration should be given to identifying simple ways to collect data as part of the work flow that would not be burdensome to staff.

- **Invest in sustainment.** New and redesigned processes resulting from Lean events will most likely need to be refined or additional effort will need to be invested in staff training to ensure adoption and routinization of the new processes.

- **The best way to learn and adopt Lean is by participating in it.** In Case 4, Suntown management and staff noted that they did not truly buy into or believe in the Lean process until they participated in a project and experienced Lean first-hand.
• **Early wins foster buy-in.** Suntown’s first Lean projects were viewed as highly successful, especially as these projects helped Suntown earn trust from the community. Because of these early successes, many senior executives and nurse managers believed in the Lean process.

• **Ensure that the number and scope of Lean projects challenge staff without overwhelming and exhausting them.** Small and large health care providers might experience different challenges in implementing Lean. Smaller provider organizations have the advantage of a smaller staff to train on Lean principles and tools, retrain when processes are redesigned, and engage in supporting Lean. However, staff working in smaller health care settings may be more apt to experience fatigue from taking on multiple roles within a project and being repeatedly called on to support Lean projects.

• **Identify the value-added of a Lean initiative for each specific case.** Lean events represent a significant investment of organizational resources; in some cases, a simpler approach might yield equal results in terms of clinical outcomes and cost savings.

• **Transitioning from administrative to clinical projects might be challenging.** To mitigate these challenges, ensure leadership support and follow-up procedures are in place. Suntown Hospital experienced early successes using Lean on administrative and clinical “back-office” processes. However, as they transition to improving clinical processes using Lean, they must have support from providers and nurses alike, as well as processes to ensure that staff will adhere to the new procedures resulting from Lean.

• **Review the medical evidence.** Reviewing the medical evidence before beginning a clinical improvement process will help in determining who should be part of a Lean project team and focus the team on processes most apt to improve clinical outcomes.

• **Scope the project and break down a large process into manageable sub-processes.** When faced with a large project, assigning team members to redesign specific sub-processes will make the task more manageable.
Case 5. Heights Hospital

Organizational Background

This report presents the results of our study of Heights Hospital, a large full-service acute care hospital located in an East Coast city. Two projects at Heights were selected for study: a retrospective project on the ED Value Stream and a prospective project on Pediatric Continuity of Care. In all, 26 interviews were conducted with 25 interviewees. The interviewees’ roles and positions at the hospital varied as described in Exhibit 5.1. About half of the interviewees were frontline, nonphysician, clinical staff, and the other half were mostly managers at various levels, many of whom were clinicians.

<table>
<thead>
<tr>
<th>Position in organization</th>
<th>Senior executive</th>
<th>Department-level leaders or managers</th>
<th>Frontline staff</th>
<th>Other support staff</th>
<th>External individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians (including surgeons)</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mid-level providers</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Other clinical staff (including nurses)</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Nonclinical staff</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
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</tbody>
</table>

Description of the Health System

Heights Hospital is part of a safety net system, an integrated health care delivery system. Around a third of the system’s patients are uninsured (see Exhibit 5.2).

The system comprises a large group of acute care hospitals, skilled nursing facilities, diagnostic and treatment centers, and community-based clinics. These facilities offer medical, mental health, and substance abuse services.

Description of the Health Care Organization

Heights, located in an East Coast city, is a large safety net hospital that is affiliated with a medical school. As is the case with most public hospitals, it serves a high proportion of Medicaid and uninsured patients. The hospital (and the whole system) often runs at a deficit, partly because of the payer mix and its vulnerability to State and Federal budgetary actions.

Heights Hospital has a very large outpatient business. It operates 341 beds and, in 2009, provided 351,160 clinic visits and 61,393 emergency department (ED) visits (Exhibit 5.3). In March 2006, it was designated as an official Stroke Center. Heights Hospital offers many additional services, including asthma services, women’s health services, youth health services, mental health services, a methadone treatment program, an AIDS center, a Level III perinatal center, and sexual health response teams.
### Exhibit 5.2. Heights Hospital

Heights Hospital is part of a large set of hospitals and clinics operated by a safety net system in an East Coast city. The hospital has 341 beds and provided 351,160 clinic visits and 61,393 emergency department (ED) visits in 2009. This full-service safety net hospital provides care primarily to low-income, uninsured, and vulnerable populations. In 2007, corporation initiated Lean at the corporate office. A new executive director, appointed in 2008, is extremely committed to Lean (called “Project Advance” or just “Advance” by the corporation [our pseudonym for the actual name]) and to an open and participatory culture.

To examine Lean implementation at the hospital and other locations, a rigorous case study methodology was used, and 26 interviews with staff at all levels of the organization were conducted between April and October 2010. Two projects were selected for closer study: a retrospective study of the Emergency Department (ED) value stream project and a prospective study of Pediatric Continuity of Care.

An expert consultant conducted a weeklong visit once per month during the first 12 months of the Lean initiative in 2008–2009, later tapering off to every other month and then to as-needed visits. The consultant worked with the hospital executives to identify six departments or areas of focus from which Lean projects would be selected. Heights Hospital uses “rapid improvement events” (RIEs) to implement Lean projects and provides just-in-time training on Lean principles and tools during these events. RIE teams examine each work step and reduce or eliminate as much non-value-added time and effort as possible over a 4.5-day period, guided by a step-by-step, problem-solving process.

As a result of Lean, the hospital reports direct financial benefits of $9.6 million over the 3 years since the safety net system began Lean deployment in late 2007. A stronger sense of teamwork and connection to others and increased efficiency on a number of projects and overall are also reported.

From the experiences of Heights Hospital, several lessons learned for potential Lean adopters are:

- **Alignment**: Align Lean with organizational goals and closely monitor the progress of Lean projects.
- **Leadership**: Make support of Lean by hospital leaders visible to frontline staff. Leadership should expect that building internal expertise will take time and that there will be a learning curve with setbacks, particularly early on.
- **Team membership**: Include multidisciplinary teams from all levels of the organization in Lean projects.
- **Resources**: Ensure adequate staff time, data, and Lean expertise to implement and sustain Lean projects.
- **Communication about Lean**: An organized communication plan about changes resulting from Lean projects is needed to reach frontline staff.
- **Staff engagement**: Include physicians in Lean projects, while ensuring openness to multiple staff views.
- **Scope**: Multiple small projects in one area can result in major gains, but this must be balanced with the challenge of not overwhelming staff. Project goals must be clear and realistic.
The hospital has approximately 2,500 hospital staff, of which 95 percent are unionized, including most physicians. Although Heights does not directly employ attending physicians (they are contracted by the medical college), they function as staff physicians.

Since 2008, Heights Hospital has undergone significant leadership changes, including a new executive director, deputy executive director, chief nursing executive, and chief financial officer. All of these people were in place and did not change at the time the projects were completed and studied. The changes in leadership heightened concerns about effective communication across Heights Hospital, and senior leaders concluded that traditional management and staff communication methods (e.g., staff meetings, email blasts, and newsletters) were not effective. The leadership put into place Management By Walking Around (MBWA) as a new form of communication in order to interact more with the staff and become more visible.3

## Other Environmental Context

### Local Competition

As a safety net provider, the system takes care of a large number of uninsured patients. The system competes with two other well known, private, not-for-profit systems for insured patients, but it is the primary provider for the uninsured, which includes a large immigrant population.

### Funding and Payers

As noted above, Heights Hospital serves a high proportion of Medicaid and uninsured patients and often runs at a deficit, partly because of the payer mix and its vulnerability to State and Federal budgetary actions. Safety net and public hospitals have experienced additional strain during the economic recession. The city’s public hospital system eliminated 400 positions and closed some children’s mental health programs, pharmacies, and clinics in March 2009. The system’s president said the cuts were necessary because of reductions in State Medicaid payments, a significant increase in uninsured patients seeking care, and rising costs of labor, pharmaceuticals, and medical supplies.2 Given the organization’s commitment to providing services to those who cannot pay, it was vital that the system and its hospitals find ways to efficiently and cost-effectively provide services to prevent layoffs and to avoid reaching capacity to see patients. At the time of the site visit in 2010, Heights Hospital was experiencing a hiring freeze.

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In 2008, the safety net system’s sources of payment were: 46 percent Medicaid, 16 percent Medicare, 7 percent private, 13 percent disproportionate share hospital, 9 percent upper payment limit, and 9 percent pools. The system saw an 8 percent rise in uninsured patients during 2008, probably because of increased unemployment from the economic downturn. This resulted in $850 million being spent to deliver care to the uninsured.

Additionally, many safety net hospitals feared that new health-reform legislation would reduce Medicaid subsidies for hospitals providing large amounts of uncompensated care.\textsuperscript{a} Safety net hospitals in particular feared that the mandate on health insurance would put further strain on an already depleted system.\textsuperscript{b}

**Lean and Quality Improvement at the Organization**

In this section, we discuss the history of both Lean and quality improvement (QI) at the safety net hospital. Exhibit 5.4 outlines the overall timeline for Lean and QI initiatives. The specific activities noted in the timeline will be discussed throughout this report.

**History of Quality and Efficiency Improvement Efforts at the Organization**

Historically, Heights Hospital has had an organization-wide focus on quality and performance improvement. About 10 years ago, corporate-wide quarterly reports were instituted. These reports are designed so that every hospital and department shares with the health system all QI activities during the quarter. In addition, the health system’s board of directors hosts a quarterly meeting with hospital representatives to review the quarterly report.

Heights Hospital’s QI plan is organized to improve the provision of clinical care, treatment, and services using a variety of QI tools and approaches. Efforts are based on the QI cycle of Plan, Do, Study, Act (PDSA) and typically focus on meeting expectations established by The Joint Commission, Medicare’s Quality Initiative, and the Medicare Measures Management System. The executive in charge of Lean reported that the QI department annually plans and monitors QI projects across Heights Hospital and that process improvement meetings are held regularly.

Heights Hospital has conducted QI projects in such areas as environment of care, emergency management, information management, medical recordkeeping, medication management, and infection prevention and control. The executive in charge of Lean reported that the QI department annually plans and monitors QI projects across the hospital and that process improvement meetings are held regularly. Sometimes these projects are supported by external consultants, as is the case with Lean.


### Exhibit 5.4. Chronology of Quality Improvement (QI) and Lean at Heights Hospital

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp up</th>
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<th>Implementation</th>
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<td><strong>Quarters</strong></td>
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<td><strong>Case study data collection</strong></td>
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<tr>
<td><strong>History of QI &amp; concurrent QI activities</strong></td>
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<td>Corporation-wide quarterly reports</td>
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<td>Management by Walking Around</td>
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<tr>
<td>QI projects led by QI department</td>
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<td><strong>Introduction of Lean</strong></td>
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<td>Executives visit Denver Health to observe Lean (approximate)</td>
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<td>Planning for Lean adoption</td>
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<td>The safety net system’s contracts with consulting firm to implement Lean</td>
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<td><strong>Lean training and projects</strong></td>
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<td>Lean consultant makes weeklong visits once per month to facility</td>
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<td>Value streams selected</td>
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<td>Lean consultant visits facility bi-monthly</td>
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<td>Lean consultant visits facility as necessary</td>
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<td>Value stream analysis to identify projects</td>
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<td>Transformational plan of care reviews</td>
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<td>ED value stream</td>
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<td>Pediatric continuity of care</td>
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Initiation of Lean at the Organization

The not-for-profit corporation that operates the overall system considered both Six Sigma and Lean as they went through the process of selecting a corporation-wide improvement approach. The executive director of Heights Hospital (who was in another role in the system at the time) along with corporate executives visited Denver Health during the planning process to observe and learn about Lean processes.

Planning for Lean adoption began in earnest in 2006, with implementation beginning in November 2007. According to executives, the main reason the corporation adopted Lean was to import an improvement process radically different from previous ones that would overcome barriers consistently identified as hampering change in the past. A major barrier was limited staff uptake. Corporate leadership perceived Lean as more accessible than other approaches, such as Six Sigma, and thought it was more likely to be adopted across the safety net system. Lean is viewed as an important way to transform the organizational culture, build teamwork, and increase staff engagement. The system branded Lean as “Project Advance” to avoid negative connotations, particularly those associated with a reduction in workforce that may accompany Lean in manufacturing settings. Senior executives, as well as department leaders interviewed at Heights, recognized that using Lean to change culture involves a long journey that can take 10 years or more.

Many staff members, according to interviewees, were unfamiliar with Lean and were unsure of its applicability to health care. Further, several staff indicated that when Lean was first introduced, they feared they could lose their jobs because of Lean implementation. Given this situation, senior leaders in the corporation signed a letter of agreement with the unions stating that no one would lose their system employment as a result of a Lean event. There was initial skepticism towards implementing Lean because a few staff recalled prior QI activities that had not been sustained at the organization.

Senior executives (four out of seven hospital executives) identified improved financial metrics as a key aim of Lean. Three senior executives identified transforming the organizational culture to improve teamwork as being an important goal of Lean. Two leaders believed that staff engagement and participation in developing solutions were key aims of Lean. Improved patient satisfaction was mentioned by two executives, followed by improved productivity/efficiency as goals mentioned by one executive. Four department leaders added to this list by identifying improved patient care as a central aim. Empowerment and employee satisfaction were mentioned by three department leaders. The remaining aims identified in Exhibit 5.5 were brought up by one department leader.

“Our intent is to be a corporation peopled by problem solvers, and we see that beginning to happen….The other big aspect of cultural change that Lean creates is…the esprit de corps that comes out of the teamwork, and we have a great deal of that, because we are already kind of tied together by our mission. But there is a great esprit de corps that grows out of the actual teams doing RIEs every week, and that those team members individually understand that they are valued, that their opinions are valued, that their expertise and the many years that they've put into this place are valued, and that they really do know the answer, and that people really are listening, and that there can be a safe environment in which to speak one's mind.”

—Senior executive
Providers and frontline staff were most likely to mention improved patient care and efficiency as the goals for Lean, with nurses and other frontline staff frequently couching these in terms of projects in which they had participated.

In the fall of 2007, a corporate subcommittee of the safety net system contracted with a consulting firm with extensive experience in Lean transformation. A Lean consultant was assigned to each of the 14 hospitals, and Heights Hospital was among the first, a decision enthusiastically supported by Heights Hospital’s executive director. After the initial start-up period, the system’s Board of Directors extended corporate funding for the consulting firm for an additional 3 years through 2014 to allow new sites to begin Lean work and provide resources to the sites with the greatest potential for transformation. The consultant made monthly week-long visits to facilities in the system during the first 12 months and then tapered off to every other month or as needed. Ultimately, the system hopes to build in-house expertise at all hospitals, so the consulting firm will no longer be needed to support Lean.

Value streams, projects, and team members are defined by an Executive Steering Committee and Value Stream Steering Committees, indicating that Lean at Heights Hospital could be viewed mainly as a top-down, central office initiative (see Lean Value Stream and Project Selection Process for more details). The executive director of Heights Hospital had a key role in the hospital becoming an early adopter. However, Lean, by its nature, increases participation of frontline staff in decisionmaking.

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“"In the past, it seems like a lot of initiatives are true top-down-type initiatives even on the smaller level within departments, and this was the first true initiative that we really delved into here at Met that really brings the frontline staff in as decisionmakers and allows them to create what their changes are going to be."

—Department lead
Many interviewees across roles and positions noted that the Lean process yielded better outcomes than other QI initiatives that did not involve frontline staff. They found that the Lean process was a productive way to reach end goals and that it went beyond traditional QI strategies (e.g., PDSA [Plan-Do-Study-Act] and the Product Development and Management Association).

Alignment of Lean and Quality Improvement Efforts

The relationship between the QI department at Heights Hospital and its Advance Deployment Office, which the hospital established to carry out Lean, has evolved since Lean began at the hospital in 2008. Many senior leaders mentioned that the goals of these two entities are related: Lean was mentioned by one leader as the technology for QI and by another as a way to provide structure to QI. Most frontline staff interviewed noted that Lean focuses on process improvement, while QI focuses on clinical outcomes. While the departments in charge of Lean and QI remain distinct, and the two continue to move on somewhat parallel tracks (Exhibit 5.6), some senior leaders mentioned that the different processes could be used to complement each other.

Steps are being taken at Heights to integrate traditional process improvement with the Advance initiative, according to three interviewees. In 2010, the hospital’s director of QI received Lean training and began to integrate the PDSA and Lean A3 improvement methods. All Lean outcomes are reported to the Heights Hospital-wide QI committee, which is an interdisciplinary group of the hospital’s clinical and administrative leaders who meet monthly to oversee the progress of all QI projects.

One corporate executive noted that in looking at the safety net system overall, some facilities and networks within the QI work have completely integrated Lean: traditional quality projects are now becoming Lean processes. One executive noted that corporate-level discussions are taking place about the parallel tracks that are being supported and the significant infrastructure that ultimately rests with the board. The system’s board meets weekly to conduct QI meetings with each facility on a rotating basis. These reviews may include presentations of process improvement projects that have been conducted through Project Advance. This same corporate executive indicated that senior-level staff recognize that people are working on parallel QI tracks, which creates more work. She also acknowledged that it takes a variety of QI tools in a package to create a simple, clear pathway that affords monitoring and sustained improvement.

In addition to the two departments, there are several related committees that exist within the hospital. As noted in the next section—Process for Implementing Lean—some of the committees exist to support the Advance work. The Quality Assurance Committee is a corporate-wide committee that, on a weekly rotating basis, hears from the hospitals about their QI activities. The executive director noted that she includes a summary of quality activities, including clinical Lean projects, in a report to the Quality Assurance Committee.
In addition, each clinical department and each hospital department has a performance improvement committee. The performance improvement committees report up to a group called the hospital-wide performance improvement committee, which is chaired by the Chief of Medicine and the Chief Medical Officer. The hospital-wide performance improvement committee, which convenes monthly, tracks the metrics from all the performance improvement activities in heights, whether they are sponsored by Project Advance or a department-specific quality improvement activity.

**Process for Implementing Lean**

In this section, we describe the approach used by Heights for implementing the Lean initiative, including planning and training, as well as general processes related to project selection, implementation, general monitoring and control, and monitoring of sustainment. This approach is illustrated in Exhibit 5.7.

**Planning for Implementation of Lean**

Lean at the safety net system began with the hiring of a consulting firm to support the new initiative. Each of the delivery organizations within the system was asked to hire or reassign a staff member to be the Advance Deployment Officer (BDO) who would manage the effort for that organization. At Heights Hospital, the executive director reassigned the chief financial officer (CFO) to the role of BDO, a change that appears to have been welcomed by the BDO and other staff, who had positive relationships with the CFO and believed he was a good fit for the job. The BDO position was initially funded by the system, and Lean projects were facilitated by the consultants. By October 2010, the Advance Deployment Office had expanded to two full-
time and three part-time facilitators and had a position open for a third full-time facilitator. However, a facilitator resigned, and because of a hiring freeze, her position could not be filled, so the number of full-time facilitator positions remained at three.

As one of the first activities in planning Lean, an external consultant group conducted a day-long executive workshop for the safety net system’s senior hospital managers, hospital union representatives, and other stakeholders to educate leaders about Lean and their roles in the effort corporate-wide. A consultant worked with each organization’s executives to prepare individual plans—known as Transformational Plans of Care (TPOC)—for Lean deployment. Each plan identified initial value streams (processes or areas that deliver a core service to consumers through one or more departments) from which senior leadership at Heights identified projects. Senior leaders and department managers participated in defining the value streams and played different roles in the initial projects to gain knowledge and exposure to Lean.

An external consultant was assigned to support the hospital; this consultant provided onsite support 1 week per month for the first 12 months, every other month for the next 6 months, and on an as-needed basis after that. The consultant supported Heights and the Advance Deployment Office by providing management coaching on the Lean deployment strategy and conducting skills training in the use of Lean methods. The consultant assisted senior leaders with selecting and defining the scope of the value streams and corresponding metrics for tracking progress.
Lean Value Stream and Project Selection Process

In the safety net system, the value stream was defined as the course of a patient’s experience. The process for selection of value streams and projects at Heights was highly structured. Exhibit 5.8 provides an overview of the process.

As noted in Exhibit 5.8, there was an Executive Steering Committee and, for each value stream, a Value Stream Steering Committee. The Executive Steering Committee—comprising executives from nursing, medicine, operations, finance, and quality improvement, along with the hospital’s executive director and BDO—selected the value streams and determined which value streams to continue. The Executive Steering Committee met monthly to review the progress of Lean activities and once each year with a senior consultant from the system’s Lean consulting firm for TPOC meetings. Department managers and Value Stream Steering Committees were consulted. The purpose of the meetings was three-fold, to:

- Identify which value streams should be maintained and what new value streams should be created.
- Analyze gaps in Lean deployment and engagement.
- Direct changes in strategy where appropriate.

A Value Stream Steering Committee comprises an executive sponsor (generally an executive such as the chief financial officer, chief nursing officer, etc.), leadership from the department or areas where the value stream operates, and the process owner who is generally the chief of service or the department’s lead administrator. The executive sponsor is responsible for ensuring that activities link to organizational goals. The process owner is tasked with overseeing the implementation of value stream projects and supporting ongoing monitoring.

- Delivery.
- Cost.
- Productivity and financial impact.
- Quality and safety.
- Human development and growth.

“It’s more than an improvement method. It’s like a whole management structure around building consensus on what it is we need to do, what’s the most important thing we need to do.”

—Senior executive
The initial emphasis was on value streams related to revenue management and perioperative services because they could yield the highest financial returns. Soon, Heights began using Lean in behavioral health because of its large presence among the hospital services offered. For the ambulatory care value stream, several managers and executives stated that the administrative leader in the department saw opportunities to improve processes in the various outpatient clinics. The Emergency Department (ED) value stream became a priority after a patient in a neighboring county’s ED died in the waiting room. Since 2008, when Lean was initiated at Heights Hospital, value streams have included the ED, perioperative surgical services, ambulatory care, behavioral health, revenue cycle (e.g., financial screening processes, accounts receivable, billing practices), pain management, and palliative or end-of-life care.

A new Lean project begins with a planning phase in which service-area leaders, most often working in value stream steering teams, draft a project charter and select a project team, either as part of a value stream analysis (VSA) event or as part of their monthly meetings to monitor Lean deployment. Whenever a project comes up that requires strong clinical support, the chief of service is asked to sit on the project team and participate in the rapid improvement event (RIE) week. When rapid cycle change is appropriate, the project moves to implementation with 4.5
days of an RIE that is coordinated by a facilitator from the Advance Deployment Office and includes Lean training.

**Lean Training**

At Heights, staff training is not formal but, rather, experiential: Lean team training occurs through the implementation of RIEs related to the specific projects.

Learning outside of project teams has been concentrated at higher levels of management through planning work with the consultant, activities such as value stream mapping with stakeholders, process preparation events (usually space design), and vertical value stream mapping events (project planning). RIE facilitators are trained in a 3-day session taught by the external consultant and sponsored by corporate.

**Project Team Training**

The corporation has opted to use a series of project-based trainings to bring about broader cultural change instead of broader training of Lean principles targeted to the entire staff. One executive compared the use of a series of project-based trainings to the use of a general training of the entire staff as a means for creating a Lean cultural transition. The executive stated that Heights was too large to implement broader training that wouldn’t fall to the wayside with competing priorities. The project-based implementation is perceived as successful for the organization because staff get introduced to Lean concepts at the beginning of an RIE, learn more about Lean by participating in an event and conducting a project, and see immediate results. Ultimately, this process excites frontline staff and encourages future events.

**Value stream training.** At the start of Lean in 2008, service-area leaders from value streams that had been identified for Lean deployment received Lean training over 2.5 days through VSA events, which are how value stream stakeholders identify, prioritize, and schedule specific processes for Lean improvement, as verified by one executive. The BDO reported that service-area leaders conduct VSA events every 6–12 months in progressive “passes” to review sustainment and ensure that planned projects meet current needs.

**Project team training.** Training at Heights Hospital was initially conducted by a single consultant from an outside consulting firm; however, after the first year of Lean deployment, the trainer role—referred to as the “facilitator”—was gradually transferred to the Advance Deployment Office. Training on Lean principles and the process of completing Lean projects are now completely intertwined. Most of the hospital’s Lean projects and, therefore, Lean project training, take the form of RIEs, which are structured to facilitate rapid-cycle change.

“Sometimes you do need to sit down at the table like this and say, “This is what we need to do to fix this. And we need to implement it now.” I mean not every issue really needs a week and a team, because it is a lot of resources. But I think for larger systematic issues, it’s been really helpful.”

—Senior executive

“Every site [hospital] typically starts with two value streams and grows to four to six in the first year. You select those value streams; we’re not going to tell you what’s the most important thing to improve. And because our focus at first was, “Let’s just get this off the ground. Let’s test it. Let’s see what works. Let’s make sure that there’s ownership at the local level.” And I’d say, based on results, that that was a good strategy.”

—Senior executive
The main characteristics of Lean team training are in Exhibit 5.9. As in VSA events, project team training includes an overview of Lean tools and principles. This overview is provided during the first half, following which the project team begins the 4-day RIE using the A3 process as a guide (see Alignment of Lean and Quality Improvement Efforts).

**Exhibit 5.9. Lean Team Training at Heights Hospital**

- **Relationship to project**: Lean training and experience are gained through participation in a Lean project
- **Mode**: In person
- **Duration (typically)**: 4.5 day RIE
- **Participants**: Lean team members (approximately 8–10 people, or size of team)
- **Trainer**: Initially a consultant; after approximately 1 year, an internal Lean facilitator, member of the Advance Deployment Office
- **Topics covered**: Lean principles, A3 tool (project roadmap), specific Lean tools used in RIE

At the end of the 4.5-day event, the project might require additional activities or be ready to enter the monitoring phase. At the end of the event, a public report-out is held to share the results of the event, including how hospital processes have changed or will change and initial outcomes. The report-out is open to all, and senior leaders frequently attend.

**Other Training**

In addition to the initial training provided by the consulting firm, the corporation also pays for the hospital project leadership to attend progressively more advanced training modules in formats accredited by the University of Iowa. These modules range from 1-day workshops to 2-week intensive courses led by the consulting firm or by staff from the health system’s Advance Deployment Office. At the end of training, participants are tested. Candidates who pass certification tests and meet experiential requirements, such as participating or leading a required number of Lean projects, are awarded with a green, bronze, silver, gold, or platinum certification in Lean. The corporation also offers workshops in basic Lean tools and techniques.

**Process for Lean Projects**

After being defined as part of the value stream process, all Lean projects at Heights Hospital follow the same cycle. The weeklong RIE is the point where a Lean project suitable for rapid-cycle change goes from planning to testing to the execution of initial process changes. Frontline staff are first introduced to the project by their supervisor who communicates their assignment to a Lean project and corresponding RIE training. A facilitator walks the project team through the A3 tool, which serves as a project roadmap. Key project activities as defined by the A3 tool are presented in Exhibit 5.10. Steps 1 through 10 occur as part of the training, and steps 11 through 13 continue and close the project cycle.

**Project Organizational Structure and Roles**

The Value Stream Steering Committee selects the project participants and their roles. When selecting participants, the committee seeks active, vocal employees who know the process being improved. Further, the committee must have staff on the team for a week while still fully staffing
their areas. There is always someone from another department and/or process to provide an outsider’s perspective. Heights Hospital has identified formal roles, described below, for RIEs and projects. Typical job titles for staff assigned to these roles are presented in Exhibit 5.11.

**Facilitator.** Staff members from the Advance Deployment Office serve as the project team facilitators and trainers. They might also participate in other projects in different roles. Facilitators might also assist with educating team members on Lean tools and measures and with monitoring team progress.

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**Exhibit 5.10. Experiential Training and Project Activities**

<table>
<thead>
<tr>
<th>Based on the A3 tool, the project team:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Problem definition: Reviews the reason for action stipulated by the Value Stream Steering Committee in the project charter and redefines it as a problem statement supported by summary data and highlighting the scope of the improvement project.</td>
</tr>
<tr>
<td>2) Review and update data: Reviews and updates more detailed qualitative and/or quantitative data describing the problem statement in terms of current outcomes. Pareto, or “80/20,” analysis is often used to reveal core sources of adverse outcomes.</td>
</tr>
<tr>
<td>3) Goals: Reviews and confirms the qualitative and quantitative improvement goals that the value stream steering team has stipulated. The project team might modify improvement goals in consultation with the Value Stream Steering Committee.</td>
</tr>
<tr>
<td>4) Gap analysis: Conducts a multistep gap analysis beginning with a Gemba walk(^\text{cc}) followed by documentation of the current process (“current state map”) with identification of points where adverse outcomes appear to originate. The project team then prioritizes barriers, conducts a root cause analysis, and completes its gap analysis by documenting an initial version of a new work flow (the “future state map”).</td>
</tr>
<tr>
<td>5) Verify solutions analytically: Verifies analytically that the changes proposed in the hypothetical new work flow are the actual solutions that will produce the target results.</td>
</tr>
<tr>
<td>6) Rapid experiments: Sets up as much of the new work flow as possible and conducts rapid experiments to see if the solutions work in practice or if additional changes are needed.</td>
</tr>
<tr>
<td>7) Completion plan: Develops a 90-day completion plan and assigns activities to specific staff.</td>
</tr>
<tr>
<td>8) Confirmation: Confirms the new process flow by developing standard work documents to sustain it and by verifying its contribution toward the targets originally stipulated by the value stream steering team.</td>
</tr>
<tr>
<td>9) Lesson learned: Documents insights and lessons learned from the event.</td>
</tr>
<tr>
<td>10) Report-out: Reports results from the event and any future process changes to be implemented as part of the project on the final day of the RIE. Report-outs are open to anyone at Heights Hospital.</td>
</tr>
<tr>
<td>11) Implementation: Implements the project widely within the department during the first 2 weeks after the event, with meetings scheduled as needed. The facilitator and team leadership work closely with team members to implement the project.</td>
</tr>
<tr>
<td>12) Followup reporting: Submits 30-day, 60-day, and 90-day reports of project progress.</td>
</tr>
<tr>
<td>13) Followup team meetings: Continues holding meetings with the project team as necessary.</td>
</tr>
</tbody>
</table>

\(^\text{cc}\) An activity (similar to Management by Walking Around) that takes management to the front lines to look for waste and for opportunities to practice practical improvement in the direct service area.
Project process owner. The process owner is responsible for managing the day-to-day aspects of the Lean project, including overseeing implementation of the completion plan, data collection, reporting on outcomes to the team, and ongoing monitoring.

Team leader. The team leader participates on the project during the event week. The team leader is selected outside the department where the process under scrutiny takes place so that he or she can serve as a neutral entity to organize and focus the team. A person with management experience who is a positive thinker and able to lead groups is ideal for this team role.

Team members. Staff at every level, including both clinical and administrative staff, might participate in a Lean project or RIE. It is a priority that physicians be involved in all clinical projects. Physicians are also encouraged to participate in administrative projects that might affect them, such as appointment scheduling. An executive indicated that including residents on week-long RIE teams has been difficult because of their schedules. He stated that they have addressed this by having RIE teams set aside an afternoon for residents to participate or by using residents as consultants to the team. Another executive noted the importance of having an information systems representative on RIE teams, since there is such a reliance on computers to get the work done.

Value stream process owner. The Value Stream Steering Committee defines a value stream process owner. Although this person is not a member of the project, the value stream process owner oversees implementation of projects belonging to that value stream and supports ongoing monitoring. The process owner is the clinical or administrative director with managerial authority for the value stream’s primary services or functions. In terms of projects, this person executes several functions to improve value stream outcomes:

- Reviewing project progress.
- Removing barriers to implementation (e.g., getting approvals and resources).
- Assuring activities are linked to the value stream and organizational goals.

“Lean is basically the line staff doing the work and coming up with the solution to the situation. And believe it or not, I think that's how you get buy-in. That's how you move the needle.”

—Senior executive

<table>
<thead>
<tr>
<th>Lean project role</th>
<th>Typical job title/role(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator</td>
<td>Advance Deployment Office staff</td>
</tr>
<tr>
<td>Project process owner</td>
<td>Manager in the department</td>
</tr>
<tr>
<td>Team leader</td>
<td>Administrative staff from different department than the one that is the focus of the RIE</td>
</tr>
<tr>
<td>Team members</td>
<td>Physician, nurse, scheduler, receptionist, social worker, patient care assistant, medical records staff, educator</td>
</tr>
<tr>
<td>Value stream process owner</td>
<td>Administrative department director, clinical department chair</td>
</tr>
</tbody>
</table>

“You don’t want any politics or just sitting to be a part of the room, kind of without portfolio or agenda, just leading the exercises... but you want them to be respected… The best team leader is somebody who has some management experience, is a positive thinker, is open to new ideas and knows how to get a group organized, focused on an activity.”

—Senior executive
• Helping to select project team members.
• Keeping the team focused.

An executive sponsor provides the linkage between the value stream process owner and the steering committee.

**Monitoring, Control, and Sustainment**

After the RIE is completed, the Advance Deployment Office facilitator continues to follow up with the team. In the first 30 days of the project, the facilitator might follow up with the process owner and team leader in daily 15–20-minute meetings. The purpose of these meetings is to check on how the project is progressing and to ensure activities in the completion plan are being implemented. The entire project team might get together during the week after the RIE to go through completion items, address concerns from staff members who aren’t familiar with the event or are upset about the new process, and see if any changes need to be made to the approach. One full month following implementation, the process owner provides a written report—the 30-day report—of the project’s progress and resulting metrics to the Advance Deployment Office and to the Value Stream Steering Committee.

During the following month, the facilitator meets with the process owner and team leader less frequently—once per week. The process owner continues to submit monthly reports of outcome data to the Advance Deployment Office and the Value Stream Steering Committee (60-day report, 90-day report, and so on). After the 90-day report, the Value Stream Steering Committee evaluates results to determine if outcomes are satisfactory and should be reported to the Hospital-wide Performance Improvement Committee or if additional process improvements are necessary. Results submitted to the hospital-wide group are included in the quarterly QI reports that are shared with the corporation.

Process owners will sometimes share the 30-, 60-, and 90-day reports with the team or the entire department by email or by posting them on a bulletin board in the department where they might be visible to patients. There are no rules or guidance about the frequency with which the project team and other staff should meet to discuss the project; frequency is based on the project needs and perceived value of the meetings.

**Sustainment monitoring process.** After the Value Stream Steering Committee has reported a minimum of 3 months of outcomes to the Hospital-wide Performance Improvement Committee, the project enters the sustainment phase. A project might continue to be actively monitored, and changes could be instituted, if the goals for the project have not been achieved.

“The first year, people had to learn what the terminology was…the second year, we started to “rock and roll” and get a little bit of enthusiasm. In the third year, [we’re] getting a little more serious, getting at how to really achieve the vision. [We] work really [hard] on [developing] metrics and targets.”
The process owner and executive sponsor ensure that the project continues to be monitored; however, the Advance Deployment Office no longer keeps track of progress on the project because the office prepares and facilitates all new Lean projects at Heights, and the hospital completed over 70 projects through December 2010. The project’s process owner and executive sponsor are responsible for sustaining outcomes by making sure that staff have taken ownership of and implemented the process changes. If progress slips, one of these individuals, usually the process owner, must alert the others, and a solution must be found. It is possible that the team will go back and do another RIE in the same area to find another solution.

Monitoring intensity in the sustainment phase at the project team level is highly dependent on the project. For example, daily monitoring might be necessary for projects that examine scheduling and patient-flow issues. Other projects might require less frequent monitoring, for example on a weekly, monthly, or quarterly basis. Monitoring might require review of a reporting form, generating statistics from patient records, staff reports, or other documentation to show process compliance or noncompliance. Other metrics monitored might, depending on the project, include patient cycle time, productivity, cost reports, or continuity of care.

Dissemination and Spread of Findings

The new executive leadership believes word of mouth and small group meetings are the key to spreading Lean throughout the organization. Hospital executives and department managers used Management by Walking Around\textsuperscript{dd} techniques to help educate employees about Lean. The executive leadership at Heights completes regularly scheduled safety walkarounds in different areas of the hospital. During these walkarounds, the leadership (e.g., chiefs of service, department managers, chief medical officer, chief executive officer, chief operations officer) tries to discuss Lean in connection to the focus on patient safety. Additionally, the Lean project team visits the area of focus for their project to observe and ask frontline staff about their duties and means of increasing efficiency in Gemba walks. These walks help promote the visibility of Lean while also serving as a useful tool for recognizing inefficiencies.

Internal hospital communications. At the completion of a Lean event week (typically on Friday), there is a public outreach presentation in the auditorium, which many hospital leaders and chiefs of service attend. Also, findings are shared at quarterly staff meetings and QI meetings, which are highly attended by executives and department managers.

At the completion of a Lean project, results are posted within the department on a blackboard or storyboard. These boards are updated as the project progresses and are visible to all staff. Heights Hospital also uses newsletters and email blasts to inform staff about outcomes.

External communications. The majority of the hospital’s external dissemination of information about a Lean outcome is to its corporate offices. There are also corporate-wide projects, and results from these are shared with all of the organizations annually. For example, the hospital

\textsuperscript{dd} Unstructured approach to hands-on, direct participation by the managers in the work-related affairs of their subordinates.
shared the outcomes of its Lean projects at a corporate-wide, day-long conference. At this conference, members of all hospitals were invited to learn about other projects and value stream progress. The corporation hopes to develop a “Lean University” that includes a Lean Lab, which would allow staff from other hospitals and at corporate headquarters to learn and participate in Lean activities and events.

**Lean Projects Studied**

Implementation of Lean at Heights Hospital includes clearly defined value streams and corresponding projects as already described. For this case study, we retrospectively studied the ED value stream as a whole and prospectively examined a project to improve pediatric continuity of care. Retrospective projects were studied after the project had been completed and in the sustainment phase. Prospective projects were studied as the project occurred (i.e., from the initial training and project implementation to sustainment).

**Emergency Department Value Stream Projects (Retrospective)**

The ED value stream included a number of RIEs for study. A hospital executive said one of the motivators for improving the ED value stream was an incident in a neighboring county hospital in which a patient died in the ED waiting room. Lean projects in the ED value stream began in January 2009 and continued through our second site visit in October 2010.

**Project Goals**

The goal of the ED Value Stream projects was primarily to create efficiencies in the department and improve clinical practices. The specific goals were to:

- Improve efficiency of triage and identification of resources needed through to ED disposition.
- Reduce patient wait times.
- Reduce the number of patients leaving without being seen.
- Decrease number of charts open at a given time.
- Create a standard work process for patients presenting with abdominal pain.
- Remove duplication of effort.
- Improve workspace organization.
- Improve billing and medical records processing.
- Encourage hand washing.
- Improve pain management.

“Eighty-seven percent of our admissions come from the emergency room. So, getting the flow through the emergency room smoothly is a major issue. We’ve made major strides but there are also major issues.”

—Senior executive

“The most difficult time we’ve had so far is the emergency department because their volume is unpredictable. It’s easier to do things with patient flow. The emergency department, one of our TPOC metrics is getting patients through the system quickly. It starts in the emergency room.”

—Senior executive
The following projects that were part of the ED value stream were mentioned in documents supplied by Heights or by interviewees, but detailed information was not provided:

- Triage system change.
- Triage system change: Convert from Canadian Triage and Acuity Scale system to the Emergency Severity Index (ESI) triage system.
- Cycle time for patients, primarily women of childbearing age with abdominal pain.
- Time reduction for urgent care patients to be seen by a doctor.
- Nurse workstation and code area organization.
- Chart billing and scanning enhancement.
- Discharge process improvement.
- Pain management improvement.

**Implementation Site: Emergency Department**

The value stream focused entirely on the ED, which is headed by a physician, as the chief of service, and a nurse manager. There are approximately 40 beds, but only 11 rooms in the department for evaluating and triaging patients. The ED is located in a cramped space, and patients are sometimes placed in common areas when no examination areas are available. In addition to emergency care, the department includes an urgent care service, known as Express Care, which treats walk-in patients with minor emergencies.

**Project Selection**

The value stream process owner, who is also the chief of the ED, reported that 13 potential RIEs were identified by the ED Value Stream Steering Committee. Projects were selected if they addressed the value stream goals mentioned previously. Patient wait times and service quality were most often the focus of the projects, either directly or as an indirect outcome of more efficient operations. Examples of some of the projects undertaken include:

- ESI Triage: Expediting patient access to an initial clinical encounter by improving time to triage using the ESI triage system.
- Reducing Wait Time/Increasing Urgent Care Capacity: Increasing the ED treatment capacity and decreasing the number of patients with immediate care needs that are not serious enough to warrant treatment in the emergency area.
- Diagnosis and Discharge Cycle Time: Reducing the cycle time patients spend during diagnosis and disposition.
- Cycle Time for Patients with Abdominal Pain: Reducing the time spent in the ED by a female patient presenting with abdominal pain.
- Storage and Work Area Organization: Reorganizing supply storage areas and specific work areas (e.g., code area and the nursing workstation) with the goal of eliminating expired equipment; better organizing the area, particularly for supplies, charts, and staff; and
reducing clutter. The BDO reported that such work space organization efforts were a core Lean activity known as 6-S for Sort, Straighten, Scrub, Safety, Standardize, and Sustain.

- Chart Coding and Billing: Improving performance in finance-related processes, specifically the confirmation of patient demographics and financial information and the service coding and billing process for ED visits.

**Project Staffing**

The projects in the ED value stream were staffed, as shown in Exhibit 5.12, with physicians, nurses, administrative staff, and team leaders from outside the department. Several interviewees reported that the project focusing on cycle time for patients with abdominal pain did not include any administrative staff. One interviewee, a clinical department manager, noted that RIE staffing needs were sometimes revealed during events and that staff were then brought in as consultants for part of the training or asked to participate in the remainder of the week-long event.

**Planning and Implementation**

As with all RIEs and projects at Heights Hospital, project teams that were part of RIEs in the ED value stream followed the A3 process. There was a heavy focus on walking the process, repeating the process as necessary to understand the current state and to continuously adjust the future state map.

The project to reduce triage times resulted in adopting the ESI triage process during the RIE week. The urgent care project changed patient flow so arriving patients were directed into available exam rooms. The project focused on cycle time for patients with abdominal pain created a standard work process to ensure the contrast fluid required for the CT scan was stocked at all times and that the patient drank the contrast fluid in a sequence synchronized with the availability of radiology staff to conduct the scan. This ensured that the scan did not have to be repeated, which would lengthen the patient’s stay in the ED.

The nurse workstation organization project created a neater area by moving desks and office equipment and by relocating the medication station, which had been in the workstation, to the former triage room that was nearby. This saved space and provided a more controlled environment for medication administration. The reorganization allowed for the establishment of a new process to organize patient charts so physicians could clearly see which patient was next. The project team reorganized cycle time, equipment, and supplies in the code area.

To improve business processes, project teams created a brief preregistration process to improve the collection and documentation of demographic information recorded in patient records and to relocate medical records coding staff into available space in the ED. The intent was to improve communication between physicians and coding staff and to decrease billing delays.

**Monitoring, Control, and Sustainment**

Only one monitoring activity was mentioned by

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**Exhibit 5.12. Project Team Composition—ED Value Stream**

<table>
<thead>
<tr>
<th>Project staffing: varied from 5–12 staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Physician(s)</td>
</tr>
<tr>
<td>- Nursing staff</td>
</tr>
<tr>
<td>- Administrative staff as they related to the project (i.e., medical records staff)</td>
</tr>
<tr>
<td>- Staff/specialists from other areas related to the project (i.e., radiologists)</td>
</tr>
<tr>
<td>- Team leader from an outside department</td>
</tr>
</tbody>
</table>
participants in the ED Value Stream projects. The team monitored the patient’s cycle time in the ED using daily improvement management techniques. For example, whenever a patient was in the ED for more than 5 hours, a provider registered that fact and the cause of the delay on a tracking sheet posted on a bulletin board in the hall. Within the week, the project team and ED staff not on the team discussed what had happened and how to improve the process in the future.

*Sustainment Monitoring*

Heights Hospital shared sustainment information on some of the ED value stream projects:

- ESI Triage: The ESI triage process was sustained from implementation.
- Diagnosis and Discharge: Teams created to accelerate diagnoses and discharges were also sustained, as were the whiteboards used by these teams to track the status of their patients.
- Abdominal Pain: Staff continued to monitor patient cycle time and posted it on the department’s bulletin board on a daily basis.
- Nursing Workstation Organization: Structural changes to reorganize the seating and set up of the nurse workstation remain in place, although executives and senior managers stated that the conversion of the triage room into a medication room might be revisited. One frontline staff member noted that after the nurse workstation event, pictures from the RIE event were posted in the areas that were cleaned, providing visual cues and guidance for how to keep the area clean and organized.

A few ED frontline staff stated that, for several projects, no one on the project team was tasked with monitoring the project’s progress, so processes had reverted back to their original state. Staff did not specify what those processes were.

*Project Outcomes*

Interviewees from the ED Value Stream project teams mentioned very few metrics stemming from their value stream projects. Most of the projects sought to reduce inefficiencies in process time, but this was not tracked with any rigor or in a public manner except for one project—the Cycle Time for Patients with Abdominal Pain project.

The BDO reported that the new patient flow process implemented in Urgent Care increased the percentage of ED patients treated in that service area from 15 percent to 30 percent during the months immediately following the project, but results have not been tracked since then.

The BDO also reported that the adoption of ESI at triage had decreased the lead time from patient entry to initial clinical evaluation from at least 1 hour to only a few minutes. In some cases, nursing staff were more comfortable conducting full nursing assessments at the point of initial evaluation, which tended to increase patient flow time beyond expectations.

Making the nurse workstation area cleaner made it easier to organize charts and to triage patients. Now, physician-led patient care teams could be held accountable for seeing patients and could no longer pick and choose which cases to see. Ultimately, clinical project participants felt

“They developed a process to be able to do the whole process faster. And the goal is to increase the volume of patients they put through...The more patients we can take care of, the better off all patients are, and coincidently it covers cost [to operate the hospital].”

—Senior executive
this would reduce patient wait time, but project team members provided no metrics to show this outcome was achieved.

Not only did the project result in a cleaner area, a few of the clinical project participants reported that changing the physical layout reduced wasted space and created fewer steps. Participants felt this contributed toward increasing their productivity. Heights provided data to this project team that indirectly supported this finding. Comparing the 7-month periods ending January 31, 2010 and January 31, 2011, Heights Hospital showed that while the number of adult visits to the hospital’s ED increased from 20,888 to 25,255—a 21 percent increase—staffing didn’t need to be increased to accommodate this growth, and patients didn’t experience increased cycle times.

The Chart Billing and Scanning project altered the process so that visits to the ED were coded and closed on the same day as the patient’s visit or soon afterwards. The BDO reported anecdotal evidence that the timeliness of communication between medical records staff and ED physicians regarding the accuracy of documentation had improved.

One physician executive noted that there have been challenges to implementing Lean in the ED because of a number of factors. For example, because of the nature of the department, the ED was constantly under stress and had difficulty retaining nursing staff. Further, Lean had to be halted at times in the ED because of staffing issues with nurses and an H1N1 outbreak. In like manner, it was also reported by staff that projects that focused on clinical operational process were more successful and were monitored more consistently through daily management of improvement when they included clinical staff only vs. when administrative staff were included on the teams.

Pediatric Continuity of Care Project (Prospective)

The Pediatric Continuity of Care project was the fifth project in the ambulatory care value stream. The project built upon a similar project conducted in the adult outpatient unit a few months earlier.

Project Goals

The Pediatrics Department sought to increase continuity of care for patients by increasing the number of patients who saw their assigned primary care physician in a subsequent visit, which would help to reduce insurance payment denials and lay a foundation for improved quality. In this way, the number of walk-in appointments necessary could also be reduced by redirecting patients to available appointments.

Department Where Implemented: Pediatric Ambulatory Care

This project was implemented in Ambulatory Care in the Pediatrics Outpatient Department. The department also holds specialty clinics (e.g., an HIV clinic) for pediatric specialists on certain days of the month. One executive stated that the outpatient units had an increasingly high volume of care.
Project Selection

This project is part of the ambulatory care value stream, which was identified by the Executive Steering Committee during its Transformation Plan of Care review meetings. A couple of executives reported that ambulatory care was added as a value stream because it would provide a high rate of return, was in need of process improvement, and could break down existing silos among staff in different departments and across staff in different roles within the organization. Finally, one executive noted that changes to reimbursements based on the Ambulatory Patient Group, a patient classification system that was designed to be used as the basis for an outpatient prospective payment system, in 2010 made focusing on pediatric continuity of care a way to optimize the synergies between flow and financial aspects of care.

One reason for action, according to interviewees on the team, was to improve compliance with an insurance company requirement that patients be seen by their primary care providers, rather than any available provider; otherwise Heights would risk insurance denials. A second reason, as noted by interviewees, was to move towards becoming a patient-centered clinic by improving continuity of care.

Project Staffing

The project leadership included an executive sponsor, a facilitator from the Advance Deployment Office, a process owner from within the department, and a team leader. Initially, because the assistant director was new, the process owner was the pediatric floor manager. The assistant director attended the RIE during his first week and, once he became more familiar with the department’s operations, he and the floor manager shared duties as process owners. Eventually the assistant director felt comfortable enough with the staff, department operations, and RIE duties to fully take on the role of process owner. The process owner(s) was the most active team member outside of meetings. He communicated decisions made by the project team to clerical staff and put new processes into practice.

In addition to the project team leadership, team members included floor managers, nurse managers, staff nurses, physicians, schedulers, and other staff from key areas. A nurse manager stated that it was important to have staff on the team who knew the process and felt comfortable being vocal about the process so project outcomes could be achieved. Exhibit 5.13 lists the members of the project team.

Planning and Implementation

The facilitator from the Advance Deployment Office met with the project team to help scope the project and provide some minimal background on Lean principles in advance of the RIE. No data were collected in advance of the RIE week. The team began the RIE on Monday and continued.

Exhibit 5.13. Project Team Composition—Pediatric Continuity of Care

<table>
<thead>
<tr>
<th>Project involved 14 staff:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Executive sponsor: Administrative director for ambulatory care services</td>
</tr>
<tr>
<td>• Facilitator: Advance Deployment Office staff</td>
</tr>
<tr>
<td>• Process owner: Assistant director</td>
</tr>
<tr>
<td>• Team leader: Staff from another department (HR director)</td>
</tr>
<tr>
<td>• Two consultants: Chief of pediatrics (physician manager) and another attending physician</td>
</tr>
<tr>
<td>• Pediatric floor manager</td>
</tr>
<tr>
<td>• Two physicians: Resident and an attending</td>
</tr>
<tr>
<td>• Two patient care assistants (PCAs), one of which was a union representative</td>
</tr>
<tr>
<td>• Scheduler</td>
</tr>
<tr>
<td>• Guest relations representative</td>
</tr>
<tr>
<td>• Assistant director of social work</td>
</tr>
</tbody>
</table>
through Friday afternoon. The tools used by the project team and team activities are described in Exhibit 5.14.

The team created a series of standard workflow processes so that staff called patients in advance to verify their appointments and insurance coverage. The process owner held 20-minute meetings with clerical associates every Wednesday after the RIE to explain what needed to be done and how to go about it. Issues were addressed such as who is going to take over if staff call in sick. During this RIE, three new clerical associates were hired, so the process owner assumed responsibility for training them on how to do insurance verification and scheduling, following the processes designed by the RIE team.

The new insurance verification process required staff to identify patients with expired Medicaid managed care coverage who needed to be recertified in advance of their visits. In addition, staff regularly verified that physicians were on the primary care physician list with the managed care insurer. A booking system was revised to ensure patients would see their primary care physician. The appointment center was standardized and the residents’ schedules updated so that appointments could be booked 6 to 8 months in advance.

“I tell you, the Lean process, they gave us the tools. Great tellers, good system, that's where they get to do it. They don't force things on us. They tell us, "These are the tools that we have. You can implement these tools and go this avenue." And we use the tools that they gave us and we run with them.”

—Department lead

Exhibit 5.14. Lean Tools and Activities for Pediatric Continuity of Care Project

- Rationale: Identified the reason for action
- Problem identification: Laid out the initial state of the department for this issue by conducting a walkthrough of the unit and identifying problems
- Brainstormed about what the target or future state might look like, including measurements for verifying the managed care primary care physician list, cleaning the clerical area, and ensuring patients were seen by their primary care doctor
- Future state: Drafted a future-state map of the workflow necessary to reach the target state
- Gap analysis: Conducted a gap analysis to see what management and personnel, equipment and systems, and methods and flow were causing gaps or issues that prevented the team from achieving its target state
- Solution approach: Created a solution approach to counteract the gaps identified as part of the gap analysis
- Conducted rapid experiments: Reviewed the daily activity reports to see which insurance information could be corrected 72 hours in advance of appointments; made reminder calls to patients; redirected walk-ins to appropriate locations or appointments; cleaned the front desk area
- Completion plan: Made a completion plan and assigned activities to specific staff with deadlines over the next 90 days
- Standard work processes: Developed standard work processes for reminder calls, appointments, walk-in redirection, and verifying insurance

The Pediatric Department director described how the frontline manager had been working in a clerical capacity rather than as a manager. His role was revised to working alongside the residents in the processor room, a space where physicians had previously not allowed clerks to work. This change enabled the frontline manager to more fully use his skills to manage walk-in patients.
The team ran into challenges and needed to make adjustments to the project plan. Initially, the team had not planned to make changes to the pediatric appointment scheduling template to improve clinic flow but then realized the template made it difficult to provide continuity of care. Phantom slots were put on the schedule to hold appointments for same day and next day availability.

At first, the goal was for 90 percent of patients to be seen by their assigned primary care doctors, but the goal was later raised to 100 percent when the definition of the metric changed. The project team realized that it would be impossible to reach 100 percent if walk-ins were included, because including them would have required that all doctors be available at all times. Thus, walk-ins were excluded from the measure and the target was raised to 100 percent. The project team formed provider teams to facilitate continuity of care so that patients would see the same resident(s) and/or attending physician at each visit.

**Monitoring, Control, and Sustainment**

The RIE process owner monitored data on a weekly basis to determine whether pediatric patients were seen by their assigned primary care physician and to assess clinic productivity. Clinic productivity was measured as the ratio of the number of patients actually seen to the total slots available per provider. This process was initially completed by hand, but the floor manager and former process owner helped develop a spreadsheet for entering the data to calculate the measures more efficiently. The following measures were reviewed on a weekly basis:

- Verification completed to determine whether physicians were on the primary care physician list with the patient’s managed care insurer.
- Verification of patient insurance coverage 72 hours before the visit.
- Cleaning of the clerical area.
- Patients seen by the assigned primary care physician.

In addition, ambulatory care administration tracks:

- Clinic productivity, which was calculated as the number of patients actually seen by each provider as a rate of total scheduling slots available per provider.
- Staff absenteeism.
- Time to third, next-available appointment.

Once the project ended and the team reported on the data after 90 days, no formal tracking or reporting was completed. However, all of the interviewees reported that the changes from the project had been sustained and had become ingrained in the department. During our visit in October 2010, the standard work process was still posted and being followed by the staff, and the process owner continued to follow up with staff to make sure they were following the new process.

**Project Outcomes**

The project team members and process owner/assistant director felt the project was very successful because, as

“We’ve had a number of events that haven't been as successful and I think that it's been a learning process. We might not have seen the success in their 30-, 60-, or 90-day reports, but they've definitely taught us lessons for how to move forward and what events we’re going to do in the future and how we’re going to approach different problems.”

—Department leader
they reported, they achieved their goal of 100 percent accuracy in scheduling patients with the patients’ primary care providers and verifying insurance in advance of patient appointments. At the start of the RIE, none of these activities was being monitored, so there is no baseline with which to compare the outcomes. However, the rates did progress throughout the project.

- At 30 days, 75 percent of patients were being seen by their primary care doctors.
- At 60 days, 95 percent of patients were being seen by their primary care doctors after the metric was altered to exclude walk-ins.
- At 90 days, 100 percent of patients were being seen by their assigned physicians.

Other reported outcomes mentioned by at least one interviewee, including the process owner/assistant director, consultant/physician manager, executive sponsor/administrative director, or another executive, include:

- Fostered a stronger sense of teamwork and connection to others across nursing, physician, and administrative roles.
- Changed patient workflow and scheduling, which ensures that the daily clinics start and end on time.
- Eliminated staffing with a separate doctor just to see walk-ins.
- Decreased denials of payment by an estimated 70 percent.

Further, one manager observed that staff absenteeism rates and promptness had improved as the result of an increased sense of camaraderie among the team, but no factual evidence was provided.

The amount of efficiency that could be gained from this RIE was limited, according to two department directors. As the result of process changes, staff took on increased duties and responsibilities that require more documentation and checkpoints per patient. These changes mean that staff are spending more time checking insurance cards and patient insurance-related data on the computer rather than engaging with the patient. This additional work was offset by fewer denied claims requiring followup by the billing department.

A few senior leaders and executives reported that the Pediatric Continuity of Care project was less successful than others in the ambulatory care value stream because Lean principles have not spread as far as in, for example, the emergency room where multiple projects were undertaken. The Continuity of Care project was the only Lean project conducted in pediatric ambulatory care.

Outcomes of Lean

In this section, we discuss the outcomes of Lean for the organization as a whole, based on the projects included in the case study, as well as other information about Lean implementation provided by interviewees. Outcomes are classified as intermediate or ultimate outcomes, according to the conceptual framework. As described previously, intermediate outcomes are culture change, employee satisfaction, change in Lean knowledge and skills, and Lean routinization. Ultimate outcomes are impacts on efficiency, patient satisfaction and experience, clinical process and outcomes assessments, and patient safety. For organizations to sustain Lean,
there has to be a business and/or strategic case resulting from the initiative. Exhibit 5.15 offers a convenient overview of the outcomes, and Exhibit 5.16 identifies some of the facilitators and barriers to implementing Lean at Heights Hospital.

Before describing outcomes according to these categories, we address two overarching themes that surfaced at Heights Hospital.

“True north” metrics were established to guide the Lean initiative at all levels. As described by two executives, the hospital set forth hospital-wide goals and “true north” metrics in five domains to measure the success of Lean beyond the project level: quality and safety, human development, financial impact, throughput/delivery, and growth/capacity building. Selection of value streams and definition of value stream goals and metrics are defined at the Value Stream Steering Committee level. A departmental leader and a frontline staff person, however, reported that the “true north” metrics and project metrics were not always aligned. This is attributed to the wide degree of project scope; projects could be organization-wide or focused exclusively at the patient care unit or department level.

Perspective that all outcomes have a financial impact. The executive director mandates that financial metrics be included in every project. Nearly all senior leaders and managers emphasized the importance of positive financial returns and perceived Lean as contributing to increased revenue or reduced costs. For example, staff identified fewer insurance payment rejections, reductions in process times, and increased patient volume (stemming from referrals from satisfied patients and improved patient flow) as financial outcomes beyond efficiency outcomes. However, at both the organizational and project levels, executives and managers struggled to identify concrete financial outcomes stemming directly from Lean, except as they relate to revenue cycle value stream activities.

Executives also had difficulty attributing clinical outcomes to Lean. A few executives stated that financial targets were easier to capture than were measures representing changes in clinical outcomes, patient safety, or patient and staff satisfaction. There were challenges, particularly in the first year, as leaders were becoming familiar with Lean principles, but by the time this evaluation took place there was an overall sense that Lean was yielding clinical successes.

Intermediate Outcomes

We present here the findings from intermediate outcomes of the Lean initiative according to the categories mentioned in Exhibit 5.16. Intermediate outcomes are linked to ultimate outcomes described in the next section. Progress was noted by interviewees in the areas of culture change most of all, as well as employee satisfaction and
routinization of Lean. Interestingly, when we analyzed the findings by interviewee, we found some differences in perceived intermediate outcomes between leaders (executives and department managers) and frontline staff. Culture change, employee satisfaction, and increased Lean knowledge and skills were solely reported by those in leadership positions, while outcomes related to Lean routinization were reported by all.

Organizational Culture Change

Four executives and two managers indicated that Lean has produced positive cultural changes, with five of these six interviewees emphasizing that many areas still had not experienced an RIE. Participation in an RIE was key to this cultural shift, since Lean training took place within the RIEs, and RIE participants develop a strong sense of teamwork as the result of diverse staff—nursing, medical, clerical and administrative—coming together to work towards a common goal. One executive emphasized that this shift was only the beginning of a long journey of cultural transformation for the organization.

Interviewees (four executives and one manager) saw a change in culture with respect to increased participation, teamwork, and more accountability at all levels. There was a sense that prior to Lean, some frontline staff were coming late to work and calling in sick, making other employees frustrated with the lack of commitment to the team. After participating in an RIE, absenteeism rates went down. Staff felt responsible to each other to arrive on time each morning so they could meet as a team. One executive noted the increased teamwork across departments where historically there had been little, and another commented on the enthusiasm of the clerical staff that was transmitted to the medical staff.

The cultural shift also manifested itself in the approach to how work was done. One executive noted how staff not only came to him with problems but now offered solutions to those problems as well. A manager observed two frontline staff working together on the unit to get everyone on “one side,” creating a more inclusive, team-oriented environment.

One physician executive noted that it is hard to say that cultural changes were due solely to Lean activities because the new executive director, a nurse who knows staff by their first name and readily shares her cell phone number, came to the organization in 2008 and began implementing MBWA. A couple of other executives concurred that the organizational culture had shifted since the arrival of the new executive director.

Employee Satisfaction

Reports of improvements in employee satisfaction come from observation and discussions with others rather than standardized instruments. One executive reported that too few employees have participated on RIEs to see a shift in an employee satisfaction survey.
Several staff at all levels of the organization reported that Lean activities engendered greater connection to others. Overall, executives and higher order managers reported that employees were satisfied with Lean because it gave them the opportunity to provide input on process changes and speak up when proposed changes weren’t feasible. One executive stated that project participants were enthusiastic: “This is the first time they owned anything in their job—felt empowered.” One frontline staff person described the emotional rollercoaster of participating in the Lean event in which the participants start the first day excited: “The second day [you ask] ‘Can I do this?’ On the third day you’re okay, and on the last day you say, ‘Wow. Look at everything we did.’” However, some interviewees felt that the 4.5-day RIE was too long, taking away from patient care.

Examples of increased job satisfaction came as the result of process changes instituted through Lean projects. A frontline manager had previously been operating only in a clerical capacity. Following the RIE, he was able to reinstitute his managerial role within the adult care clinic to direct walk-in patients to the appropriate point of service within the clinic.

In the adult primary care clinic where a project similar to the Pediatric Continuity of Care project had occurred, several interviewees reported that before Lean, physicians felt overworked, stressed, and burned out because, by seeing walk-ins in addition to attending to a full schedule, they were seeing many more patients than expected in a day. After the system was modified by applying Lean, two managers agreed that physicians were less stressed; they commented to one another that there were fewer complaints and less frustration from physicians.

**Lean Knowledge and Skills**

Although a number of tools, concepts, and techniques were introduced to the staff during Lean training, only the BDO and one manager mentioned increased knowledge or skills as an outcome of training and project participation. The BDO does track the number of newly trained staff and the number of RIEs conducted. A process owner stated that he had trouble communicating with senior staff about the status of the Lean project during the report-out. This process owner felt that it would have been beneficial to have some training or preparation for effectively carrying out this function. A couple of staff stated that there is a positive cumulative effect if the Lean team is able to focus on an area and do four to five projects in a year, causing staff to start understanding and using Lean language consistently.

In addition, these same interviewees mentioned that Lean offered an opportunity for staff to engage in new roles and to develop leadership skills. One executive stated, “Employee morale and leadership skills develop every time we do one of these rapid improvement events.”

**Lean Routinization**

As of December 2010, about 337 staff at Heights Hospital had participated in Lean events, which represents approximately 13 percent of all staff. The Advance Deployment Office set a goal of reaching 20 percent of staff through projects and training by the end of 2010. Interviewees noted that staff members often participated on more than one team. It is expected that these supporters will help spread Lean through the organization.
There have been a few attempts to transfer modified workflows and other Lean project outcomes to other departments within the hospital; some have been successful, and others have not. Interviewees shared an example of each. Although the lessons of the Pediatric Continuity of Care project have been shared with other departments (e.g., adult primary care, women’s health, dental, and the geriatrics clinic), several interviewees were skeptical of the feasibility of transferring the actual processes. Because of the vastness of adult primary care at Heights Hospital and the individuality of the clinics, the process defined in pediatrics could not be directly applied to these other departments. On the other hand, a previous project that focused on creating a schedule for the eye clinics has been transferred to other departments. This case developed a template for scheduling that is now used in the neurology, rheumatology, and gastroenterology departments.

**Internal hospital communications.** At the completion of a Lean event week, there is a presentation in the auditorium, findings are shared at quarterly staff and QI meetings, and results are posted in the department, newsletters, and email blasts. However, two senior executives and a department head said that there is no formal method for communicating successes to staff. The CFO stated that the return on investment from an enterprise level is unknown and therefore cannot be communicated to employees.

**External communications.** As noted previously, most of the external communication about a Lean outcome at Heights Hospital is primarily to the corporate offices, including at a day-long conference.

**Ultimate Outcomes**

This section is organized according to the types of ultimate outcomes noted in the conceptual framework and as reported by interviewees and in documentation provided by the organization. According to interviewees’ anecdotal accounts, the hospital and safety net system have realized substantial cost savings and efficiencies as a result of Lean. To a lesser extent, Heights has seen improvements in patient experience, clinical process or outcomes assessment, and patient safety.

**Efficiency**

In addition to cost reductions, Heights Hospital was able to increase efficiency on a number of projects and overall by reducing the amount of time a process takes, reassigning staff and space, and using existing resources more efficiently.
**Project level.** The following impacts on efficiency were linked directly with specific Lean projects. These impacts were discussed in the Case, but we have repeated these outcomes here to highlight the totality of impacts on this area.

**Emergency department value stream:**

- An administrative project changed the coding and billing processes so that activities were completed on the same day as the visit.
- The new patient flow process implemented in Urgent Care increased the percentage of ED patients treated in that service area from 15 percent to 30 percent during the months immediately following the project.
- The BDO reported that the adoption of ESI at triage had decreased the lead time from patient entry to initial clinical evaluation from at least 1 hour to only a few minutes in most cases.
- Organizing the workspace made it easier to properly position charts for the medical team’s review and triage patients, ultimately reducing patient wait time.
- Workspace reorganization also reduced wasted space and created fewer steps. Participants felt this contributed toward increasing their productivity.
- A standard work process for stocking CT contrast fluid and synchronizing patient ingestion of contrast fluid with availability of radiology staff ensured that the scan did not have to be repeated.
- Comparing the 7-month periods ending January 31, 2010 and January 31, 2011, the number of adult visits to the hospital’s ED increased from 20,888 to 25,255, a 21 percent increase; however, Heights reported that staff didn’t need to be increased to accommodate this growth, and patients didn’t experience increased cycle times.

**Pediatric continuity of care:**

- After the project’s 90-Day Report, 100 percent of patients, excluding walk-ins, were seen by their primary care provider.
- There was a reduction in missed appointments and a decrease in payment denials by an estimated 70 percent as the result of: 1) calling pediatric patients in advance to verify appointments and coverage; 2) recertification of Medicaid patients with expired coverage prior to the visit; and 3) verification that physicians were on the insurer’s primary care panel.
- Residents’ schedules were obtained 6–8 months in advance, further allowing patients to get an appointment with the same physician.
- Space was made for last-minute appointments with the patient’s primary care provider. Thus, the need to staff a separate doctor just to see walk-ins was eliminated.
- Staff absenteeism rates were lowered and timeliness improved.
- Changes to the patient workflow and scheduling helped ensure that the pediatric clinics started and ended on time.
Two managers in Pediatrics noted that there may be a limit to the amount of efficiency the RIE brings to workflow because the RIE also leads to redesign of processes that increase work (e.g. checkpoints, increased documentation).

**Other Lean projects:**

- A project in the Oncology Department reduced wait times for patients and increased the volume of patients being seen.
- In a perioperative surgery value stream project, a daily meeting, or huddle, was called to improve communication and planning for operating room cases and to incorporated staff from Central Supply into the meeting. Ultimately, this created a central cell for all staff to communicate daily about what went well the previous day and what could be improved, especially with regard to availability of specialty surgical instruments. The BDO reported that, following implementation of the daily operating room huddle with Central Supply, immediate-use steam sterilization in the main operating suite at Heights Hospital decreased from a rate of between 5–8 percent of cases to a rate of 1 percent or fewer of cases.

The Advance Deployment Office encourages project teams that can reduce full-time staff by using process improvements to shift those staff to a value-added activity. However, a hiring freeze at the hospital makes this shift difficult for some, even though it can benefit departments in need. Managers fear that shifting full-time staff to another department will make their own departments short staffed if any of their staff were to leave their department or become unavailable during the hiring freeze.

**Patient Experiences**

Minimal data on patient experience and satisfaction were obtained as part of Lean projects. Information on patient experience data comes from CAHPS® measures used in the inpatient, outpatient, and ED settings. For the Pediatric Continuity of Care project, an executive stated that the project improved patient experience because the department assured patients that they would see the same doctor at every visit, and a pediatric manager reported that patient satisfaction was 90 percent (pre-intervention score not known); however, the primary concern of patients and parents was waiting time.

**Clinical Process or Outcomes Assessment and Patient Safety**

There were no changes in clinical quality indicators reported as a result of Lean projects, other than the scheduling of pediatric patients with their primary care physician resulting in better continuity of care. An executive reported that process indicators for pain assessment and pain management in the ED had also improved, although data on the patients’ perceptions were inconclusive. He also cited more efficient records management as an indicator of improved care.

Patient safety was only discussed by one person, a member of the ED nursing team who said that as a result of Lean, there was a more accountable process of ensuring cleanliness of equipment, which is important to infection control, and of removing expired equipment.
Business or Strategic Case

Heights Hospital attempts to integrate some type of financial component into all Lean projects. In addition, there are corporation-wide projects and value streams that seek to expand cost savings through Lean activities.

Cost savings. From 2007 through 2010, a corporate executive reported that the safety net system had achieved $104 million in cost savings and new revenues as a result of Lean implementation. At Heights Hospital, all executives and high-order managers reported savings as a result of Lean of between $2 million and $6 million, with most reporting $3.5–$4 million. The hospital’s BDO and CFO reported that, through December 2010, heights had realized cumulative cash flow and recurring new revenue of $9.6 million from all hospital-based and corporation-wide Lean projects, including one-time cash flow increases or savings totaling $3.5 million and recurring new revenue estimated at $5 million annually, which was 1.7 percent of Heights Hospital’s $296.3 million revenue budget in fiscal year 2011. At heights, the returns were attributed primarily to major improvements in coding and documentation, reductions in accounts receivable by following up with collections, and reduced errors and turnaround times in the process for assisting eligible acute care patients with Medicaid applications. Gains were also credited to utilization growth and increased rates of collection resulting from patient- and documentation-flow improvements in adult primary care and outpatient mental health services.

For the Pediatric Continuity of Care project, one executive believed that financial returns were immaterial; in other words, they were not the key outcome of the project. Neither the team nor any other entity conducted a financial analysis. However, the process owner reported that he believed payment denials from managed care have been reduced by an estimated 70 percent since the project began, which could represent additional revenue for the department.

Factors that Influenced Success of Lean Implementation

During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to success, as well as the problems or challenges they had witnessed or faced in implementing Lean. Findings regarding facilitators and barriers are based on responses to these questions and on a limited interpretation of findings overall by the research team. As expected, barriers to implementation were identified more often than facilitators. Senior managers and clinic directors provided the greatest amount of information regarding these issues. Given the structure for implementing Lean on a project-by-project basis and differences in the goals for Lean depending on the level of staff within the organization, the results of Lean are viewed differently. Frontline staff, clinical staff, and managers tended to look at project results as signs of success. However, executives tended to view the results of Lean on a broader basis. A reflection of this is that only executives knew about and discussed the “true north” metrics.

All interviewees were also asked to share their insights, that is, their lessons learned based on their experience with Lean at Heights Hospital. More specifically, they were asked whether and how they would change what they had done if they were to do it over again. As expected, these lessons learned were closely aligned with the facilitators and barriers. Lessons learned referred solely to the implementation of Lean, and most often, to leadership and staff engagement.
Senior executives and department leaders provided the most information regarding barriers and facilitators, particularly in terms of staff engagement, resources, leadership, and Lean team composition and size. They also shared the most insight regarding lessons learned about scope, pace, and coordination. Frontline staff provided the most comments on staff engagement.

Exhibit 5.17 lists the most significant factors in facilitating Lean’s success, while Exhibit 5.18 shows the factors deemed the most important in impeding Lean’s success.

**Exhibit 5.17. Major Factors that Facilitated Lean Success**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alignment</strong></td>
<td>• Lean steering committee structures were embedded within the hospital and highly organized.</td>
</tr>
<tr>
<td></td>
<td>• Lean projects were selected based on alignment with criteria; metrics established by top management while balancing frontline interest.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>• Heights CEO’s single-minded commitment to Lean and hands-on approach (e.g., Management By Walking Around) has been pivotal to engaging others, particularly those that were resistant.</td>
</tr>
<tr>
<td></td>
<td>• Leadership understood that Lean was a learning process and, thus, took challenges and setbacks as an opportunity to improve their approach.</td>
</tr>
<tr>
<td></td>
<td>• An executive-level leader who was highly respected and liked by staff at all levels was reassigned full-time to lead Lean implementation at the hospital.</td>
</tr>
<tr>
<td></td>
<td>• Leadership adopted an inclusive approach that allowed staff at all levels to participate.</td>
</tr>
<tr>
<td><strong>Availability of resources</strong></td>
<td>• The corporate offices supported Lean planning and implementation at Heights Hospital by funding consultant services and Advance office positions that provided hospital-wide leadership of Lean and facilitation of Lean projects.</td>
</tr>
<tr>
<td><strong>Project scope</strong></td>
<td>• A series of small projects concentrated in one area had greater overall impact than scattering projects over a number of value streams.</td>
</tr>
<tr>
<td><strong>Staff engagement</strong></td>
<td>• Heights Hospital was able to make progress through Lean despite lack of full engagement by all leaders and staff.</td>
</tr>
<tr>
<td></td>
<td>• RIE teams were extremely diverse, with staff from all levels of the organization and varied departments. “Fresh eyes” on the team provided a different perspective.</td>
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<tr>
<td></td>
<td>• Frontline staff and physicians were more willing to make changes when they participated in finding the solutions to problems or when they had a peer motivating them to change.</td>
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</tbody>
</table>
Exhibit 5.18. Major Factors that Inhibited Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>• There sometimes was a lack of accountability for maintaining changes and tracking outcomes over time.</td>
</tr>
<tr>
<td>Resources</td>
<td>• A hiring freeze during Lean implementation can contribute to staff and manager resistance to work redesign. For example, a manager resisted reassignment of a staff person to a different department, and staff were not willing to assume new tasks.</td>
</tr>
<tr>
<td>Communication about Lean Engagement</td>
<td>• Progress made by Lean has not been effectively communicated to frontline staff.</td>
</tr>
<tr>
<td></td>
<td>• Middle management and frontline resistance remains, particularly among nursing staff.</td>
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<tr>
<td></td>
<td>• Concentrating projects in one clinical area can be overwhelming for frontline staff and department managers.</td>
</tr>
</tbody>
</table>

Organizing the Lean Initiative

In this section, we discuss barriers, facilitators, and lessons learned concerning organization of the Lean initiative. The most frequently mentioned facilitators and barriers discussed by interviewees were engagement and leadership. Notably, there were very few statements related to alignment and routinization.

Alignment of the Initiative to the Organization

Senior executives emphasized that Lean is part of the corporation’s strategic plan to transform the organizational culture, build teamwork, and increase staff engagement. The system recognizes that embedding Lean in the organization will take a long time.

A senior executive indicated that Lean fits with the shared governance structure that nursing at Heights Hospital has had in place for 20 years. Nurses are involved in making their own schedules, creating new policies, and making other types of decisions that impact their work. She indicated that Lean offers additional opportunities for nurses to provide input.

Project Scope and Pace

The scope and pace of Lean activities at Heights Hospital were viewed in a positive light by executives. The focused effort of prioritizing two value streams for launching RIEs, conducting multiple projects within those value streams, and branching out to other value streams over time was seen by senior executives as a productive approach to Lean implementation. One executive commented that maintaining a disciplined focus on the value stream implementation plan can be difficult when something “comes up” outside of the selected value streams. Failure to adhere to the plan by becoming reactive can scatter resources.

Several interviewees noted that the project scope must be clear and include realistic goals or the project can become unmanageable. For example, the wide scope of the ambulatory care value stream was identified as a barrier to successful implementation. At first, the value stream attempted to conduct a series of projects in each area of ambulatory care—women’s health, internal medicine, pediatrics, and an eye clinic. However, the administrative director found that without focus in one specific area at a time, the chiefs of service were not engaged and
committed to Lean. Ultimately, the value stream was revised and the scope limited to just internal medicine at first.

The pace of Lean activities was an issue at the department level, with clinical staff and leadership not always in agreement. An executive and a department manager stated that the key to getting more people to understand Lean is to do a series of small projects in one area. However, the clinical staff interviewed found the concentrated focus in one area to be the most trying aspect of Lean. Multiple projects in one department resulted in a great deal of staff being away from patient care for an extended period of time, sometimes repeatedly.

The corporation and Heights Hospital have not kept up with the aggressive implementation plan they originally developed as they were embarking on Lean implementation. The system had hoped to launch Lean at all 23 of the largest health care delivery sites in 3 years. This time period has been extended to 6 years because of the need to give every process redesign project more attention than anticipated. At Heights Hospital, the BDO noted that a lack of staff resources and the extensive time required for RIE-related work slowed progress. He felt a good pace was one RIE every month in a value stream; an event every 2 to 3 weeks would be preferred if the resources were in place. This same executive reported that 300 different people had participated in RIEs (11 percent of staff). He hoped for a participation rate of 20 percent by the end of the year but was unsure if that would be possible given diversions such as a Joint Commission review and financial constraints.

A clinical director and corporate executive said that Lean can be used for clinical, administrative, and operational processes. Some projects (e.g. clinical projects) are more difficult than others, according to the corporate executive. The decision of which process to focus on is based on organizational need and not the overall applicability of Lean. Lean tools, however, may be appropriate for certain types of projects/focus areas more so than others. The clinical director commented that not everything is an RIE. RIEs are reserved for processes that require a group process to redesign. When a solution is known, a “just-do-it” approach is used.

**Implementing the Lean Initiative**

Although there were a number of factors that aided Heights in implementing Lean or made it more difficult to do so, leadership support stood out as a facilitator to Lean implementation. Engagement and resources were the most frequently mentioned barriers.

**Leadership**

Leadership, both corporate and at Heights Hospital, was very supportive of Lean projects.

**Corporate support.** According to several executives, leadership support from corporate’s board of directors and corporate offices has been an important facilitator to employees’ acceptance of Lean—particularly among the skeptics—and the overall success of Lean at the hospital. The system

“The executive director was a Lean proponent before she came here. She started here, I guess, about 3-1/2 years ago, and the first thing that she did was to make that clear to her senior staff...”

—Senior executive

“I think probably the best move she made was to appoint (the former CFO) as the BDO. And he has just taken it, embraced it and has a lot of credibility. (CFO) came into it with a lot of credibility and just flew with it.”

—Senior executive
supported the Lean initiative by providing a structure for implementing Lean and technical assistance to each hospital in the system. This included funding for a consultant. Lean was a corporate, systemwide initiative, yet corporate leaders were not overly directive. Leaders allowed those facilities that were most interested to launch Lean first. Each hospital was given the leeway to select value stream priorities and forge its path.

**Hospital executives.** Nearly all interviewees mentioned the importance of leadership support and commitment to the Lean initiative from the top management at Heights Hospital, in particular the chief executive officer. Many department managers, executives, and frontline staff stated that hospital executives showed their support by promoting Lean, ensuring that the effort was going to stay, participating in the RIEs, and staying informed by participating in monthly steering meetings. Executives communicated that Lean is part of the strategic plan to move the hospital to the next level. One executive mentioned that the relatively small size of the hospital allowed leadership to exert their influence on staff “since in a week I can visit every [employee] in the hospital.”

The executive director and the BDO were highly supportive of Lean implementation. The executive director was a Lean proponent before she came to Heights Hospital. According to one executive, one of the first steps she took was to make clear the importance of Lean to her senior staff. The BDO was viewed by hospital employees from the executive level to the frontline as the right person for the job. The BDO was established and well respected as the former CFO of Heights Hospital. According to two executives, his strong rapport with staff helped to develop staff buy-in to Lean, and his flexibility in solving problems, creativity, and vision gave him the ability to take Lean to another level.

The hospital and the hospital-system interviewees consistently stated that senior leadership supported the development of solutions through bottom-up Lean process improvement activities. An executive noted that selecting the value streams at the senior level—while allowing departments to determine what needed improvement within the value stream—was a good strategy that supported ownership at the department level.

**Departmental leaders.** A corporate executive noted that the executive director and BDO at Heights Hospital selected the “right sort of people” to lead frontline staff—people who facilitated staff engagement through their commitment, enthusiasm, creativity, and visible, active leadership. This was echoed by a middle manager and a frontline staff member who identified individuals in leadership positions participating on RIE teams whose commitment and leadership skills contributed to project success.

Several managers noted the importance of having a solid point of contact on RIE teams to engage the rest of the RIE team. This person is a department
chief, manager, or physician who provides direction, good communication, and enforcement. The chief of service participating on one of the RIEs was well established. He had a small and well integrated team, which helped in achieving successful outcomes. A department director commented on how the process owner for an RIE within her department assumed his role quickly. He closely watched the completion plan and got support from the chief of service and head nurse.

This is not to say that there were no leadership challenges. According to an executive and two department leaders, there were chiefs of service and department directors who were reluctant to support Lean at first. While some department leaders encouraged additional Lean projects and promoted Lean with their staff, others disagreed with the outcomes or were concerned about the time projects took away from patient care. In addition, several interviewees suggested that department leadership did not hold individuals accountable for maintaining Lean changes after a project ended; they commented that processes reverted back to their original state.

**Project leader.** At Heights, the Lean project leader usually comes from outside the department of focus to reduce the potential for department politics and hidden agendas to derail the RIE. A few interviewees—an executive, a department manager, and a floor manager—noted that the Lean leader should have management experience, be a positive thinker, be open to new ideas, and be organized and focused. Interviewees did not mention project leadership as a barrier or a facilitator to Lean implementation or sustainability of the RIEs in which they had participated.

**Availability of Resources**

In general, available resources were cited as key facilitators to Lean implementation, while a dearth of resources was considered to be a barrier to Lean implementation and sustainability.

**Expert consultant.** During the initial 3 years of Lean implementation, the hospital’s BDO had access to a Lean expert consultant. This consultant, funded by the corporation, provided support for developing an infrastructure for Lean and provided training for facilitators and project teams. One executive noted that consultants bridge relationships with internal staff. A corporate executive noted that the system will “wean” itself off of the consultant over a 3-year period. This will be done by accelerating staff training so that they have the capacity needed to carry on independently.

According to an executive and several frontline staff, staff at other locations who had participated on Lean projects similar to their own project served as an additional resource to Lean teams.

**Budgeted positions.** Heights Hospital was able to establish a full-time position for oversight of Lean—the BDO who oversees Lean implementation. With time, two full-time and three part-time facilitator positions were added to the Advance office. The department was able to grow because of monies recovered from Advance projects.
**Frontline staff.** Heights Hospital included staff at many levels in the week-long RIE events; this broad-based involvement facilitated implementation but was challenging to achieve. Hiring freezes with staff reduction through attrition and lack of back-up staff to fill in for frontline RIE participants were barriers highlighted, particularly by clinical managers. Scheduling multiple staff from the same department to participate in an event was difficult, particularly on short notice, since staff schedules are established far in advance. Sick leave, among other issues, added further pressure on staff resources.

Clinical staff noted that the concentrated focus with multiple RIEs in one area was the most trying aspect of Lean because it required a great deal of staff to be away from the floor for an extended period of time, sometimes on a repeated basis. The same staff (including physicians) felt they were repeatedly selected to participate in an event. Although they were generally released from their regular duties, a few frontline staff reported that they attended to their work in the mornings and evenings before and after the RIE event.

**Availability of data.** Limited funds to compile and analyze data meant that data often were not collected in advance of starting a project to inform the RIE team. Outcome data were collected at least in the early period following the implementation of process changes. Some RIE process owners took the lead in tracking outcome data. One executive noted that the data might not be highly reliable, but collection of any data is a step in the right direction. He noted that in many cases there was willingness by staff to collect, publicly track, and use the data for daily improvement. This was true, for example, for one ED Value Stream project in which daily data that tracked the length of time patients stayed in the ED were posted on a public bulletin board.

Because there are so many completed projects (more than 70), the BDO could no longer keep track of monitoring data for all of them. Rather, monitoring in the sustainment phase was highly dependent on the project team. However, when no formal method for monitoring and revisiting the project is in place, the process tended to revert back to its original state, according to several frontline staff.

**Communication About Lean**

The hospital does not have a formal plan to communicate information about Advance in a targeted way. Instead, information about Lean is shared informally person-to-person and at routine meetings, such as monthly department staff meetings. At the end of every event week, a report-out takes place, where the RIE team outlines improvements made and results. However, this meeting is not attended by many frontline staff outside of the department related to the event’s focus. Newsletters and emails about Lean are circulated, in addition to reports at meetings and face-to-face communication. A few senior leaders (including executives and department managers) stated that if staff were asked about Lean using Lean terminology, staff might not recognize the terms. However, when a term is described, a different term is used (i.e., RIE instead of Advance), or when a specific project is described, staff recognize the activity and can provide an explanation of what it is. Even an executive noted that he doesn’t know all of the right terms for types of tools or projects but can describe them. Further, the term “Lean” is not used because of the negative connotation that it has in relation to job retention.

"The most valuable thing [about Lean is] to force people to be together for 4-1/2 days. [This] is something that never, ever...happened regularly to resolve patients’ needs. That's the key benefit of it. And it's also the bad part of it, because it's wasting your whole week."

—Physician, department manager
Engagement

Management. In the first year of Lean implementation, engaging the executive team’s and managers’ support for Lean was a challenge for the CEO. The CEO and COO identified senior staff’s inexperience in Lean methodology and their difficulty in understanding how Lean would benefit the organization as a formidable barrier. The CEO indicated that in year two, senior staff became more supportive of Lean because their involvement in the RIE process allowed them to directly see results.

Some directors and chiefs of service continued to be unwilling to adapt to the Lean culture, according to senior executives and department leaders. One executive described a director whose inflexibility hampered staff involvement in an RIE. The director and chief of service struggled with taking clinical staff away from their regular duties and saw Lean as a waste of valuable resources within their department. In reference to this situation, an executive said that after 2 years, he has come to the conclusion that certain people can be won over, but others can literally be placed on the sidelines.

A director described the benefit of Lean as forcing people to be together for 4-1/2 days to come to a problem resolution. Cloistering employees was also the worst part of Lean since it “wasted your whole week.” One executive mentioned how having nursing and physician department leadership on an RIE team together enabled them to get to know each other better. The experience reinforced their mutual commitment to process improvement and sense of teamwork.

Frontline staff. Comments were not always positive about staff morale and willingness to participate in Lean. The director of pediatrics stated that staff are often very negative because they have only a narrow perception of past failed improvement initiatives and, therefore, are often unwilling to become involved. The COO said motivating some employees has been a struggle. He commented that there has not been an effective way to communicate to all employees about the success/failure rate.

According to one senior executive, some staff resisted Lean because it came from the automobile industry and specifically from Toyota, which is nonunion. He commented that Lean was rebranded as “Project Advance” because “Lean sounded like cutting.” Corporate had to commit to a no-lay-off policy as a result of Project Advance activity. This commitment did not preclude changes to job responsibilities subject to union restrictions. Another executive felt that the initial problems in applying Lean stemmed at first from staff not understanding what Lean was. He added that even 3 years later, there is not a full understanding.

A senior executive indicated that nursing as a group has not engaged enough in the Lean process; she hopes in time they will become more involved. Another executive attributed nursing’s reluctance to the challenges of reaching a compromise with such a large group, both on and off the RIE team. One problem associated with nursing was seen in the Pediatric RIE. Patient care associates (PCAs) saw certain clerical duties to be outside of their job scope as clinical staff. According to a frontline staff person, the PCAs would not assume the new task of calling patients after the RIE was over because it was not a part of their job description. This conflict...
may be rooted in the hiring freeze, which created a shortage of administrative staff in the ED. One executive reported that the hiring freeze had reduced staff confidence and caused people to feel strapped for time.

Despite the challenges of engaging frontline staff, leadership at Heights was able to find approaches to make progress on RIEs. A physician leader set the expectation among new residents that Lean would be part of their work while they are at Heights Hospital. Educating project team members and department staff on the need for a particular Lean project can decrease resistance to change. A few interviewees stated that it is easier to facilitate a project when people understand the background of a problem and the need for change. This knowledge helps those involved to buy-in to the solution.

Two senior executives believed that starting the improvement cycle with employees who were enthusiastic about Lean was crucial to building momentum and staff confidence in Lean. They commented that this strategy helped to set an ambitious pace for future Lean events.

One director believed that staff’s strong commitment to helping an underserved community was a facilitator to Lean implementation because staff were engaged in providing good service to patients prior to Lean implementation. Lean provided a means for staff to better meet patients’ needs by achieving such improvements as reducing wait time and improving care coordination.

Two senior executives noted that having clinical staff on the team was essential to gaining frontline clinical staff support for process changes. A physician leader described how physicians are reluctant to adhere to Lean changes unless there is a peer motivator. A nurse leader noted that involvement of nurses in RIE-related decisions created ownership in support of process changes. A few executives commented that the employment model at Heights Hospital makes it easier to engage physicians because physicians are present at the hospital full-time.

The BDO explained that because Lean is a weeklong activity, it feels like a major investment of time; people feel frustrated when it does not work. He believed it is important that staff persist with a Lean project until they are successful. Some failures are expected, but eventually teams will “hit a home run.” Every time staff members participate in Lean, they learn more, and their expertise increases.

**Lean Team Composition and Size**

Many interviewees of all types mentioned that a diverse RIE team membership with all types of job categories (e.g. hospital police to nurses, housekeepers, schedulers and physicians) relevant to the process at hand yielded powerful results. Staff frequently referred to the fact that being on a project team helped to reduce silos because during the RIE, all perspectives were viewed equally, and staff left their titles at the door. One leader specifically

*“When we have a successful RIE, there’s no better way to get buy-in. Nurses see the process that’s implemented and then want to be part of making a decision that would go into a new process.”*  
—Frontline staff member

*“I’m pleased with the number of doctors who have been on teams. Of all the hospitals, we are really good. I haven’t done numbers in a long time but the last time I looked, I was like, ‘Wow, there are a lot of doctors and chiefs of service.’”*  
—Senior executive
mentioned how pleased he was with the number of doctors and nurses who had participated on teams. Two other executives noted how important it was for clinicians to have their peers on the team in order to motivate them to change behavior and comply with the team’s process redesign.

Staff who are not familiar with the process that is the focus of the RIE are considered by some RIE team members to be important contributors to the work of team. A few interviewees believed these “fresh eyes” were critical to helping view the process in a new light and to generate additional suggestions for solutions. On the other hand, one physician felt that “fresh eyes” required too much time consuming explanation about the department processes.

Conclusions

The implementation of Lean at Heights Hospital has been successful, despite the challenges of a hiring freeze, reluctant senior leadership engagement early on, and the resistance of some staff and physicians. Corporate and hospital executives showed continued dedication to strategically using Lean to improve the system and hospital. The corporation has committed to providing system hospitals with a longer period of consultant support than initially planned. The hospital senior leadership has clearly communicated that Lean is a pivotal part of the strategic plan for moving Heights Hospital forward. Positions have been created for additional Project Advance facilitators with the savings incurred through Lean.

Thus far, Heights Hospital’s experience provides evidence that Lean can be successful when applied to administrative and management processes. Lean has been focused primarily on administrative tasks (e.g., scheduling, patient flow, medical records, billing) within clinical settings, with success particularly in revenue management. For example, one project helped reduce the open accounts receivable, yielding more than $2.3 million. Lean’s applicability to clinical processes is not yet demonstrated, since Heights has not yet implemented many projects in this area and has not reported clinical results from the few projects it has conducted. Further incorporation of clinical quality of care measures, other than patient cycle time, into future projects is required to understand if Lean can be successful in standardizing clinical work.

Recommendations for Similar Organizations Implementing Lean

Celebrate success. The staff at Heights Hospital worked hard to improve patient care and financial indicators with many successes. Leadership should take the time to acknowledge and reward those staff who have carried out Lean while continuing their day-to-day work.

Set direction from the top down while generating solutions from the bottom. Heights Hospital engages all levels of the organization in Lean. Steering committees direct organization-wide strategy, identify value streams, and monitor results at the executive level. They set goals and charter projects at the mid-management level and, finally, execute projects at the frontline. This structure led to a well-coordinated effort that yielded results.

Maintain focus. An executive director’s unyielding and public focus on Lean can overcome seemingly overwhelming obstacles, such as widespread resistance to Lean and financial challenges (e.g., hiring freeze). Particularly at first, Lean can be tumultuous, creating considerable conflict. Conflict for some can stem from difficulty ceding the power to make decisions to Lean teams, and for others it can arise from uncertainty and discomfort with change.
**Expect setbacks.** Lean is not easy to implement because it is rooted in a major cultural change for health care organizations, including a new way of thinking about work. It requires considerable skill development and staff time commitments. Organizations should expect that not all Lean projects will be successful and plan that it will take time to develop internal expertise in Lean thinking and techniques.

**Recognize that visible support from management is required to make Lean work.** Hospital executives showed their support for Lean by attending monthly steering committee meetings, actively participating in RIEs, removing barriers to and backing decisions made by RIEs, and seeking opportunities to communicate about Lean to staff face-to-face and in meetings.

**Limit the scope of projects to a manageable size and define realistic goals.** Several interviewees noted that scope is a critical part of the success of Lean projects. The project scope must be clear and include realistic goals or the project can become unmanageable.

**Understand that multiple small projects in one area can result in major gains.** The ED experience showed how concentrating small Lean projects in one clinical area can positively impact a number of indicators and build momentum for success. Leadership must weigh this approach against the risk of overwhelming staff and managers who still have day-to-day operational demands on their time.

**Develop a formal communication plan to engage employees.** Employees lacked understanding of the long-term vision for Lean and its potential contribution to Heights Hospital’s mission. Employees’ lack of understanding of Lean was likely a factor in their reluctance to support Lean. A formal plan of what all employees should know about Lean, and how and when this information should be communicated, is important to aligning staff toward achieving organizational goals through Lean and, ultimately, transitioning to a Lean culture.

**Simplify quality improvement structure.** As Lean becomes more mature, leaders should consider simplifying the complicated structure that may include committees for quality assurance, quality improvement, process improvement, and the Lean initiative. A simplified structure improves efficiency, integration, and communication about the improvement work being done throughout the organization.
Case 6. Horizon Hospital — Lakeview Healthcare

Organizational Background

This report presents the results of the study of Lakeview Healthcare (LHC) and its experiences applying Lean tools and philosophy to designing and moving into a new hospital. Four Lean projects—Bed Flow Value Stream, Outpatient Medical Records and Patient Flow, Outpatient Electronic Health Records, and Surgeons’ Preference Cards—are reported in the first case study on LHC. The case study methods, including the criteria for selection of the projects for analysis, are described in the introduction to this report. For this study, we conducted 67 interviews with a total of 65 individuals overall; 22 individuals were interviewed specific to the Horizon Hospital. Interviewee roles at the hospital varied as described in Exhibit 6.1.

Exhibit 6.1. LHC and Horizon Hospital Interviewees by Type of Participant and Clinical Role

<table>
<thead>
<tr>
<th></th>
<th>Corporate executives</th>
<th>Hospital executives</th>
<th>Department-level leaders or managers</th>
<th>Other support staff</th>
<th>Frontline staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>5</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Horizon Hospital</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Physicians</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-level providers</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other clinical staff (including nurses)</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Nonclinical staff</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>22</td>
</tr>
</tbody>
</table>

Description of the Health System: Lakeview Healthcare

LHC is a nonprofit, comprehensive health care system on the Eastern Seaboard. It comprises four hospitals, an ambulatory care center, physician offices, rehabilitation services, long-term care centers, home care services, physical therapy services, and Mobile Intensive Care Units. It also operates a health and wellness center in one town and plans to open another in second town. LHC was established in 1998 when four hospitals merged (see Exhibit 6.2 for a detailed description). In the same year, a new CEO was appointed and maintained the position through 2011. In 2003, a new executive vice president for health services (now subsumed under the title of president and chief operating officer [COO]) was hired and is credited by several other executives and managers with encouraging the addition of Lean to LHC’s quality improvement toolbox. Nearly 2,000 physicians serve on the medical staff, and 8,000 clinical and administrative staff are employed.

Note that some of the background text presented here is duplicative, at least in part, of similar information presented in Case 1. Because it is central to a discussion of this case, we have elected to present it again. Readers who are familiar with LHC may wish to proceed directly to the discussion focused explicitly on Horizon Hospital, which begins on page 225.
Exhibit 6.2. Horizon Hospital — Lakeview Healthcare

Horizon Hospital is a new hospital within Lakeview Healthcare (LHC) (see Case 1). LHC is a nonprofit, comprehensive health care system on the Eastern Seaboard. LHC consists of four hospitals (1,084 beds), an ambulatory care center, physician offices, rehabilitation services, long-term care centers, home care services, physical therapy services, and Mobile Intensive Care Units. Lean has been implemented as part of a larger set of tools and initiatives to ensure quality and outstanding patient experience. It is viewed as an organization-wide initiative and part of a larger quality improvement strategy that predates Lean.

A new chief operating officer (COO) at LHC was a driving force in LHC’s adoption of Lean as a means to reduce waste. LHC tasked its internal management engineers to launch and implement Lean. The management engineers began to implement projects (or “Kaizen events”) within different areas of the organization. A Kaizen event brings employees together from various departments to examine a problem, propose solutions, and implement changes.

To implement Lean, the leadership at LHC first assessed what tools were missing from their toolbox to be able to achieve their goals in terms of people, process, and strategy. Lean was selected as a complement to Six Sigma to address an identified gap in tools targeting process goals. Senior leaders worked with an external process improvement consultant and LHC’s management engineers to identify potential projects and collect initial data for those projects.

As part of a multisite study of Lean implementation, we conducted a rigorous comparative case study of LHC and several other delivery systems. At LHC, we selected five Lean projects for analysis. This case study concerns one of these projects—the planning and construction of a new hospital using Lean principles. We focused on two specific process changes implemented at the Horizon Hospital to enrich our findings. Overall, 67 interviews with 65 staff members at various levels in the organization were conducted between December 2009 and September 2011. Data were collected during three site visits, through digital diaries recorded by Lean project participants, and through phone interviews.

LHC experienced increased staff pride and considerable cost savings by using internal resources, careful planning, and Lean tools to build the new hospital. A reduced need for change orders during construction meant that LHC saved 2.65 percent—4.65 percent of the total project costs of over $434 million. LHC received multiple quotes of upwards of $2 million to plan and facilitate the hospital move-in process, but instead they were able to use Lean tools to manage the move internally.

The Horizon Hospital case highlights the importance of ensuring that the culture of the organization supports undertaking the building of a hospital using Lean principles. The planning team should carefully select an architecture firm that will support a strong staff role in the planning process. Management engineers are vital to bridging communications between staff and architects and facilitating the overall planning process. Organizations should prepare for contingencies, such as turnover of project leadership. Some unexpected consequences from process changes are likely following the move-in, and leaders and frontline staff should anticipate the need to continue to put forth extraordinary effort in the months following a new hospital opening.
LHC offers numerous specialty services, with a strong focus on obstetrics. There are more deliveries at its hospitals than at any other health care delivery system in the region. LHC provides neonatal intensive care and a wide range of pediatric specialty care through relationships with a children’s hospital in a nearby city. In addition, a cancer program provides cancer patients with access to comprehensive treatment. LHC also has five emergency centers. Exhibit 6.3 illustrates the organized delivery system.

<table>
<thead>
<tr>
<th>Factors</th>
<th>LHC characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational experience with Lean at initiation of study</td>
<td>Some experience</td>
</tr>
<tr>
<td>Geographic location</td>
<td>East</td>
</tr>
<tr>
<td>Region density</td>
<td>Small urban</td>
</tr>
<tr>
<td>Special organization designation</td>
<td>N/A</td>
</tr>
<tr>
<td>Hospital beds (in each location)</td>
<td>Hospital 1: 188</td>
</tr>
<tr>
<td></td>
<td>Hospital 2: 433</td>
</tr>
<tr>
<td></td>
<td>Hospital 3: 368</td>
</tr>
<tr>
<td></td>
<td>Hospital 4: 95</td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>No</td>
</tr>
<tr>
<td>Physician employment model</td>
<td>Mixed (staff/employed and community-based with privileges)</td>
</tr>
<tr>
<td>Use of an external Lean consultant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

LHC has roughly 8,400 clinical and administrative employees and is one of the area’s largest employers. Approximately 2,000 physicians serve as medical staff members, both as employed physicians and community-based physicians with privileges. LHC has been recognized 3 years in a row as the “#1 Best Employer” by a business journal. Staff turnover was only mentioned by one interviewee, a staff person from the Management Engineering Department, who indicated some degree of turnover in the nursing staff and Management Engineering Department. It is interesting to note that nearly all individuals interviewed had been with LHC for 5 years or longer.

In 2009, LHC acquired a series of physician practices and consolidated them into a medical group (in this study, called “LHC Medical Group”), which employs approximately 200 physicians from various specialties, including family medicine, surgery, and oncology. In addition, LHC’s hospitals employ 130 hospitalists (physicians who specialize in treating inpatients) across the four locations. An additional 1,670 community-based physicians who are not employed by LHC receive privileges to practice at its hospitals and other care facilities.

Despite its large size, executives and other interviewees indicated that the structure of LHC was relatively “flat.” Although leadership staff for the hospital, LHC Medical Group, and ambulatory care center report directly to the COO of the organization, individuals at all levels have access to senior staff.

LHC employs an extensive rewards system for staff performance. Hospital leadership bestows “Wow” Awards on individual staff members who go above and beyond the call of duty. When an individual receives five “Wow” Awards, he or she can turn them in for a $25 gift card. Individuals and teams are nominated and awarded “STAR Awards,” which are likened to the Grammy Awards. LHC also offers monetary awards and end-of-year bonuses to staff, including
management, directly tied to performance according to the five points of the cultural transformation initiative. Executives and management can receive a 10-40 percent incentive based on the five points of a cultural transformation initiative, which are the basis for setting management goals and objectives.

**Description of Horizon Hospital**

This case study reports on the replacement of Hospital 3 with a new hospital that opened in May 2011 with 73 additional beds. The new hospital, one of four LHC hospitals (Exhibit 6.4), was designed using Lean techniques.

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Number of beds</th>
<th>Specialty services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 4</td>
<td>95</td>
<td>Emergency services, surgical services, Acute Care for Elders (ACE), palliative care, wound care, stroke care, diagnostic and treatment advanced technologies (CT/MRI, hyperbarics, teleneurology), gastroenterology, fracture center, rehabilitation care</td>
</tr>
<tr>
<td>Hospital 1</td>
<td>188</td>
<td>Spine care, joint replacement surgery, stroke care, surgical services, cardiovascular care, interventional radiology, orthopedics, total joint replacement, oncology, emergency care, chest pain center, intensive care</td>
</tr>
<tr>
<td>Hospital 2*</td>
<td>433</td>
<td>Stroke care, oncology, radiation oncology, orthopedics, surgical services, total joint replacement, spine care, emergency care, cardiac care</td>
</tr>
<tr>
<td>Hospital 3, pre-May 2011**</td>
<td>295</td>
<td>Family-centered labor, delivery, and postpartum care; Level III neonatal intensive care unit; pediatric intensive care unit (PICU); stroke care through Primary Stroke Center; Children and Adolescent Rapid Evaluation Service (CARES) unit</td>
</tr>
<tr>
<td>Horizon Hospital</td>
<td>368</td>
<td>Family-centered labor, delivery, and postpartum care; Level III neonatal intensive care unit; pediatric intensive care unit (PICU); stroke care through Primary Stroke Center; Children and Adolescent Rapid Evaluation Service (CARES) unit</td>
</tr>
</tbody>
</table>

* Recognized by the Centers for Medicare & Medicaid Services (CMS) as a National Best Practice Hospital for the treatment of pneumonia patients and for excellence in the prevention of surgical infections.

**This hospital was replaced by a new facility in May 2011.

**Other Environmental Context**

**Local Competition**

LHC operates in a very competitive market. However, one corporate executive noted that about one-half of competing hospitals show a negative profit margin. For example, a previous competitor shut down in March, which added business to the Emergency Department at Hospital 4. Many interviewees noted that LHC needs to remain competitive, and that competition increases the need for high patient satisfaction scores and efficient processes, both of which are targets of the Lean projects.

**Funding and Payers**

Nearly 50 percent of LHC’s revenue comes from commercial payers, followed closely by Medicare at roughly 46 percent. Medicaid makes up the remaining 4 percent of revenue. One executive noted that the payer mix has remained stable over time.
Executive-level interviewees noted that outside stakeholders (e.g., payers—including insurance companies—vendors, etc.) understand LHC’s quality improvement initiative, which includes Lean and Six Sigma, and note that it is a positive direction for the organization, but these stakeholders play no other role. Blue Cross Blue Shield attended a report-out of quality improvement (QI) activities (including Lean and Six Sigma) at LHC, and LHC has involved payers in projects related to denials and claims issues. LHC does not receive incentives from its payers for their involvement with Lean.

Lean and Quality Improvement at the Organization

In this section, we discuss the history of both Lean and quality improvement at LHC. Exhibit 6.5 outlines the overall timeline. The specific activities noted in the timeline will be discussed throughout this report.

History of Quality and Efficiency Improvement Efforts at the Organization

LHC prides itself on having an organization-wide focus on quality and performance improvement. It launched a new Initiative in 2000, a blueprint for achieving patient satisfaction that represents the cornerstones of its culture. The cultural transformation initiative came out of a decision made by executives and the Board of Directors to move LHC from being a mediocre-performing organization that was formed with the merger of two provider organizations to becoming a high-performing system. LHC had been in the 50th percentile in quality, safety, patient satisfaction, employee satisfaction, and financial performance. The cultural transformation initiative was launched to shift its culture to one where patient care became the sole center of everything that was done.

The initiative has five points: excellent service, best people, clinical quality and safety, resource stewardship, a caring culture, and—at the center—outstanding patient satisfaction. The initiatives’ goals and accomplishments include transforming the culture to a culture that (1) promotes trust and openness to encourage conversations about performance and (2) removes bureaucratic barriers for employees and physicians in order to create an outstanding patient experience. To implement the cultural transformation initiative, LHC made several practice changes: standardized business practices, revamped hiring practices, improved departmental team building and ownership, implemented proactive communication around information systems, and leveraged technology to communicate more effectively. As LHC worked towards becoming a high-performing organization, they worked with the consulting firm to develop measurable goals and a roadmap for achieving them, which included the use of Six Sigma.

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*Six Sigma is a process-improvement technique that seeks to improve the quality of process outputs by identifying and removing errors and minimizing variability.*
### Exhibit 6.5. Chronology of Quality Improvement and Lean at Lakeview Healthcare

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ramp up</th>
<th>Implementation</th>
<th>Study period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quarters</td>
<td>'00</td>
<td>'01</td>
</tr>
<tr>
<td>Case study data collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of QI and concurrent QI activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural Transformation Initiative commenced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consulting firm partnership forged</td>
<td></td>
<td></td>
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<tr>
<td>Quality Improvement Toolkit introduced, Six Sigma launched</td>
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<tr>
<td>Introduction of Lean</td>
<td></td>
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<td></td>
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<tr>
<td>Negative operating margin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New chief operating officer hired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean initiated, added to LHC’s quality improvement toolkit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean training &amp; projects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizon Hospital and related processes</td>
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</tbody>
</table>
In 2000, LHC began working with a consulting firm on process improvement through Six Sigma projects. The consulting firm, having developed substantial expertise in process improvement in manufacturing began offering consulting services to firms interested in process improvement, particularly Six Sigma. As of 2002, LHC observed gains and attributed them—at least in part—to the use of Six Sigma. Based on those initial results, the organization continued to adopt additional process improvement methods from the consulting firm’s toolbox for quality improvement, including Workout, Change Acceleration Process (CAP), and Lean. All of the process improvement approaches, referred to by staff as “tools,” are centered on the DMAIC principles (define, measure, analyze, improve, and control).

The collective impact of the cultural transformation initiative on the patient experience at LHC has been externally recognized. The organization has been honored twice with the governor's award for clinical excellence and recognized with the Leadership Award for Outstanding Achievement by Voluntary Hospitals of America. LHC is the recipient of multiple Consumer Choice Awards (showcasing hospitals chosen by health care consumers for having the highest quality and best image) by the National Research Corporation.

**Initiation of Lean at the Organization**

Corporate executives reported that Lean was initiated in 2003 and, according to a few hospital executives and managers, did not ramp up significantly until 2006–2007 when a large educational program was launched to inform staff about Lean. In 2006, LHC and the consulting firm cosponsored a week-long International Lean Healthcare Seminar. During that week, five projects were implemented with health care professionals from 18 hospitals and health systems and four countries in conjunction with LHC and other process improvement leaders.

Interviewees noted four factors that influenced the decision to implement Lean at LHC in 2003: Lean was viewed as the right tool for the problem, an organizational culture shift had taken place, there were new staff, and operating margins were negative.

**Lean was viewed as the right tool for the problem.** Many staff at the management and executive levels stated the importance of finding the right tool for the problem at hand. Six Sigma was the only process improvement technique (as opposed to general management tools) in use until the consultant group introduced Lean to management at LHC. Many executives and management engineers noted that Lean is a tool for eliminating waste, whereas Six Sigma is a tool for reducing defects and variations in processes. The introduction of Lean allowed LHC to focus attention on reducing waste at an opportune moment, consistent with changes in the organizational culture and financial imperatives (described below).

**An organizational culture shift had taken place.** In 2003, the CEO set organizational goals of becoming a leader in quality, safety, patient satisfaction, and employee satisfaction. These goals motivated staff to strive for excellence in these areas and reinforced the cultural change

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“It’s not always the hammer that’s gonna fix the problem. Sometimes it’s a screwdriver, sometimes the wrench, and sometimes you gotta use all three, because that’s what the problem dictates.”

—Manager

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*Workout is a gathering of organization stakeholders designed to discuss and take action on major issues.

*CAP is a technique comprising best practices in organizational change management.*
stemming from the cultural transformation initiative introduced in 2000. Respondents felt the cultural transformation initiative provided a coherent approach for organizing LHC’s approach to Lean—each Lean project must fit into one of the five points of the cultural transformation initiative (best people, caring culture, excellent service, highest clinical quality and safety, and resource stewardship).

**There were new staff.** In 2003, a new executive vice president for health services (now subsumed under the title of president and COO) was hired and is credited by several other executives and managers with encouraging the addition of Lean to LHC’s quality improvement toolbox. The new vice president had been exposed to process management techniques in previous positions and as part of his education, and promoted the use of additional tools including Lean. Shortly thereafter, in 2003, the COO hired management engineers to support the Lean work.

**Operating margins were negative.** In 2003, LHC had a negative operating margin for the first time in its history. This development focused the organization’s attention on taking steps to reduce costs, including reducing waste and employing Lean as a tool toward that end.

Motivated by these factors, LHC engaged the consulting firm in a consulting capacity to guide the organization in reviewing what was missing from its toolbox in terms of people, process, and strategy. The result was the adoption of new tools, including Lean as an organization-wide initiative.

**Conceptualization of and Goals for Lean**

To meet its organizational needs and goals, LHC uses Lean as a mechanism to improve efficiencies and patient experience, according to statements by nearly all interviewees.

Interviewees mentioned at least one of the following goals for Lean: improve efficiency and reduce process time (n=19), improve patient experience (n=7), integrate process improvement into the culture (n=4), and increase clinician time at the bedside (n=2). The organizational goals of Lean varied by type of interviewee, as shown in Exhibit 6.6. A handful of frontline staff described the goals of Lean only in terms of the specific Lean projects in which they participated; these goals are discussed later in this Case (see Lean Hospital Project).

**Improve efficiency, reduce process time, and eliminate waste.** Nearly all staff across all levels of the organization indicated some form of waste reduction as an organizational goal for Lean. However, this was a more prominent goal for the process improvement and frontline staff than it was for executives and physicians. Efficiencies included a better organized space,
reduced travel time for staff and patients, efficient patient and staff flow, and reduced process cycle times (e.g., bed turnaround). Notably, none of the participants directly stated that a goal of Lean was to reduce costs or save money but assumed that improved efficiency would lead to that outcome.

Exhibit 6.6. Organizational Goals of Lean

<table>
<thead>
<tr>
<th>Type of Interviewee</th>
<th>Aims of Lean (in order of most frequently mentioned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>Cultural integration: process improvement</td>
</tr>
<tr>
<td></td>
<td>Improved efficiency/eliminate waste</td>
</tr>
<tr>
<td></td>
<td>More clinician time at the bedside</td>
</tr>
<tr>
<td>Providers (physicians and mid-level, nondepartment leaders)</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td>Nurses and other frontline staff</td>
<td>Improved efficiency and reduced process time</td>
</tr>
<tr>
<td>Management engineers and Six Sigma staff</td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>Cultural integration: process improvement, transparency</td>
</tr>
<tr>
<td></td>
<td>Improved patient experience</td>
</tr>
<tr>
<td></td>
<td>Increased clinician time at the bedside</td>
</tr>
</tbody>
</table>

**Improve patient experience.** Many interviewees across all levels of staff described improvement in quality of patient satisfaction and experience as a core goal of Lean. Several executives and process improvement staff linked the importance of patient satisfaction and experience to the cultural transformation initiative at the organization.

**Integrate process improvement into the culture.** Two executives and two process improvement staff members noted that they hope the process improvement activities across the organization—including Lean and Six Sigma—would become a natural part of how the organization does business. As a result, employees facing day-to-day challenges in their work could raise awareness for the need to bring in functional experts in process improvement to help. One hospital executive explained that in this way, staff would participate in and own the changes at the organization. In addition, one process improvement staff member mentioned that awareness of the tools would generate a culture of transparency and reduce blame and judgment.

**Increase clinician time at the bedside.** Finally, two interviewees stated that there is hope that the improved efficiencies could increase clinician time at the bedside, ultimately improving the quality of care provided.

**Alignment of Lean and Quality Improvement Efforts**

At LHC, process improvement and quality improvement are housed in three different corporate departments (Management Engineering/Lean, Six Sigma, and Quality Improvement). The Quality Improvement Department is responsible for the clinical quality outcomes and abstracts and submits the data required by the Centers for Medicare & Medicaid Services (CMS) and the Joint Commission. Data include clinical process and outcomes data, patient safety data, patient satisfaction data, and other data. The Management Engineering/Lean and Six Sigma departments are largely in charge of process improvement, related training, and technical assistance.
The two process improvement departments, Six Sigma and Management Engineering/Lean, are corporate departments and report directly to the president and COO. Management Engineering/Lean began in 2003. The leaders of both departments, together with staff, work in tandem to collect data and identify solutions. Depending on the circumstances, they might also work together to apply a set of tools toward a joint solution. Staff in the Six Sigma Department have varied backgrounds. They spend 3 years in the department and earn a “black belt” before moving on to more senior management and executive roles in the organization. Staff in the Management Engineering Department must have specialized engineering education and/or experience. The CEO stated that staff in this department are also considered for leadership roles in the organization.

LHC has overall objectives for Lean, referred to as “Global Golden Objectives,” that are reviewed by the corporate executives on a quarterly basis. The objectives serve as global metrics for monitoring and tracking the success of Lean activities, both on a micro level (for project-specific indicators) and on a macro level. The Global Golden Objectives comprise positive financial returns, reduced space utilization, optimization of clinicians’ time to see patients, and reduction of travel distance. The objectives are derived from the cultural transformation initiative’s points. For example, one of the objectives is to reduce travel distance for both staff and patients. By better organizing the location of materials and services and planning the flow of patients and staff, a number of unnecessary steps can be eliminated, and the amount of walking can be reduced.

Several interviewees reported that the Lean approach was well suited for use in clinical processes (as compared to administrative processes) because it could reduce waste, offer quick results, and involve frontline staff in finding solutions. Other tools, such as Six Sigma, were described as being more rigorous solutions to reducing variation across the organization but taking 4–9 months to achieve returns.

**Process for Implementing Lean**

Exhibit 6.7 displays the key steps involved in LHC’s Lean implementation process, including project selection, planning, training, project implementation (including how the project and team are structured), monitoring and control, and sustainment of project results. Each of these steps is described in more detail in this section.

**Lean Project Selection Process**

LHC decided to implement Lean using a Kaizen approach. Projects are identified in multiple ways. Hospital executives, managers, physicians, and other frontline staff can raise an issue to be reviewed by the process improvement departments (Six Sigma and Management Engineering). At LHC, a weekly financial, patient satisfaction, and quality briefing brings together the leadership of all of the hospitals and the management engineers. During those meetings, issues are raised and corporate leadership refers staff to the management engineers and Six Sigma Black Belts to help them with any areas in which they are struggling.
When I’m looking at the project, I’m looking at, What is the financial return? What is the impact on patient quality and safety? What is the impact on employee satisfaction? What is the impact in terms of our focus on a caring culture, to support the employees in terms of the individuality of that particular practitioner, who may not be the same as the person on the other side?“

—Corporate Executive

Staff in the Management Engineering Department work directly with the executive vice president of health services (now subsumed under the title of president and COO) to consider how to prioritize projects. To help with this process, the executive vice president and engineers consider the impact that the project would have on the five points of the cultural transformation initiative. It is interesting that none of the interviewees mentioned a project that had been rejected. This might be because of the extensive amount of pre-work and scoping done to understand the root cause of the problem before
Planning Implementation of Lean

Once a possible project is raised for consideration, management engineering or Six Sigma Black Belt staff might spend 3 to 5 weeks studying the problem to understand the underlying issues. Pre-work often involves reviewing data and/or observing processes within an area. A few members of the departmental staff are identified by the departmental leadership to support data collection and the planning process. From this information, an assessment template—a tool created by the organization to track the findings from observation—is completed. Included within the assessment template are:

- Vision/goal statement.
- Potential process owner.
- Stakeholder departments.
- Alignment with strategic imperatives or points of the cultural transformation initiative.
- Problem statement.
- Data available.
- Scope/boundaries.
- Key performance indicators.
- Consequences of doing nothing.

Notably, there is no analysis of cost-benefit estimates included within the assessment template: management assumed that improved efficiency would naturally lead to financial benefits. Based on the results of pre-work and information in the assessment, targeted interventions are proposed to solve the problem. Tools may include CAP, Workout, Lean Kaizen, or Six Sigma. Or the process change might simply be implemented without using a formal project to do so. A meeting is held with the hospital leadership to discuss the recommended approach.

Lean Training

**General Lean Training**

LHC demonstrates commitment to introducing staff to Lean principles and other process improvement tools. For example, orientation training for new staff includes information about process improvement. In addition, new staff members are made aware of the combined Lean-Six Sigma curriculum and the training available to all staff.

New managers—both those new to the organization and those promoted from within—are provided with training called Great Beginnings. As part of the training, management engineers and Six Sigma Black Belts teach a segment on the process improvement toolkit. Managers are expected to earn a Six Sigma yellow belt at a minimum.

**Project Team Training**

Training at LHC is conducted by internal staff in the Management Engineering Department, sometimes with support from Black Belts in the Six Sigma Department. Training on Lean principles and initiation of Lean projects are fully intertwined.
A new project begins after project planning is completed. Senior leaders at each hospital, including the hospital CEO and vice president of operations, work with department managers to select the team for the Kaizen event. Management engineers and Six Sigma Black Belts can make recommendations about the type of staff to include on the team based on their observations and assessments during the project scoping process. The project team of 5–10 people convenes for a Kaizen event that begins with training. The first few hours of the event are spent on Lean education and introducing staff to Lean and how the Kaizen is going to be run. The rest of the Kaizen event is customized based on the scope of the project, the type of staff participating, and the level of exposure to Lean that the project team has had. The tools to be used are identified in the assessment that is completed as part of planning and pre-work. Training on the tools is provided as needed while the Kaizen is taking place; in other words, it is “just-in-time” training.

Other Training

In addition to Lean, there is also training available for staff to become certified in Six Sigma at different levels identified with green, yellow, and black belts. Senior managers must become certified in Six Sigma. The Process Improvement Department managers provide the management engineers and black belts with advanced training on optimizing Lean techniques and combining techniques on a single project.

Lean Project Implementation

Event Week

At LHC, the Kaizen approach is used to implement Lean when focusing on the work systems or processes that need to be improved. The Kaizen event is, in essence, the Lean project kickoff.

At the Kaizen event, the management engineer introduces applicable tools and concepts to help achieve a successful project. Sample tools and activities are shown in Exhibit 6.8.

The length of a Kaizen at LHC ranges from 1 to 3.5 days, and can be broken into smaller portions, such as 2 hours per day over 5 days. The duration of the event varies depending on the scope of the project and availability of team members. For example, in a small outpatient clinic, the number of staff involved on the project team would require that the clinic shut down. Thus, having 2-hour sessions each day for 5 days ensures that patient care services are not interrupted. One or two management engineers and/or Six Sigma Black Belts lead the Kaizen week. At the end of each day, the team reports to the local hospital leadership (e.g., hospital CEO, operations manager, department chiefs) to share the results of the event, including information on initial outcomes and how the project has affected process.

Exhibit 6.8. Kaizen Activities

<table>
<thead>
<tr>
<th>Collect information on the voice of the customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use tracer methodology to track how a patient moves through the process and aid in the development of value stream mapping</td>
</tr>
<tr>
<td>• Map out the future state of the process</td>
</tr>
<tr>
<td>• Remove non-value-added steps from the future-state process</td>
</tr>
<tr>
<td>• Create spaghetti diagrams to show the pathways staff and patients take to move through the process</td>
</tr>
<tr>
<td>• Prepare a fishbone diagram to examine cause and effect*</td>
</tr>
<tr>
<td>• Use the workout concept to brainstorm problems, and discuss and vote on solutions</td>
</tr>
<tr>
<td>• Implement visual management techniques**</td>
</tr>
</tbody>
</table>
Apply the concept of push versus pull (level loading)
Learn data-collection techniques and statistical analysis
Visit the units where the process will be implemented
Create project-specific tools such as Excel spreadsheets to track bed availability or color-coded systems to indicate patient load
Make an action plan for implementing in the department
Report the results of the project at 30 days
Report the sustainment of the project at 90 days

*A visual display of the many potential causes for a problem or effect.
** Visual aid or device that promotes safer, more efficient, and less wasteful processes and creates a "status at a glance."

Immediately following the Kaizen, the project team process owner is responsible for implementing the action plan, communicating changes to other staff members in the department who are on the project, and overseeing the changes.

**Lean Teams**

LHC has identified several formal roles for projects as depicted in Exhibit 6.9 and described below.

**Executive sponsor.** An executive sponsor is assigned to each project team. Generally, the executive sponsor is the CEO of the hospital or the vice president of operations. The sponsor’s major responsibilities include reviewing progress, removing barriers (e.g., getting approvals and resources), introducing the project at report-outs, helping select project team members, and keeping the team focused.

**Management engineer/Lean leader.** Staff from the Management Engineering Department serve as project team facilitators and trainers. In addition, they conduct the pre-work for the project, collecting data and developing an assessment which includes: project goal statement, potential process owner, stakeholder departments, alignment with strategic imperatives or points of the cultural transformation initiative, problem statement, any data available from observation or records, scope/boundaries of the project, key performance indicators, and consequences of doing nothing. They educate team members on Lean tools and measures and on monitoring. Further, they follow up with team progress in the initial months of implementation and may also assist with monitoring activities.

**Process owner.** The process owner is responsible for managing the day-to-day aspects of his or her Lean project, including overseeing implementation of the action plan, managing data collection, reporting on outcomes to the team, and ongoing monitoring.

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<table>
<thead>
<tr>
<th>Lean project role</th>
<th>Typical job title/role(s)</th>
<th>Number staff interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive sponsor</td>
<td>Hospital COO, VP of operations, or VP of patient care</td>
<td>n = 9</td>
</tr>
<tr>
<td>Management engineer/Lean</td>
<td>Management engineer, Six Sigma Black Belt</td>
<td>n = 3</td>
</tr>
<tr>
<td>Process owner</td>
<td>Director or the manager of operations in the department</td>
<td>n = 3</td>
</tr>
<tr>
<td>Team members</td>
<td>Department managers, nurses, physicians</td>
<td>n = 5</td>
</tr>
<tr>
<td>Other</td>
<td>Architects</td>
<td>n = 2</td>
</tr>
</tbody>
</table>
**Team members.** In addition to the sponsor, Lean leader, and process owner, each team has approximately two to seven members. Staff at every level, including both clinical and administrative, may participate in a Lean project. In particular, representatives from all departments affected by a project are included on the project team. Further, a few interviewees noted the importance of including proponents and skeptics on the project team for balance. Notably, LHC does not prioritize participation by physicians. The majority of physicians who provide patient care at LHC hospitals are affiliated through a contractual rather than an employment relationship, and LHC does not compensate them for the time that would be required to participate. As a result, relatively few physicians are on Lean project teams; instead, physicians are consulted at critical points in the project.

**Monitoring, Control, and Sustainment**

After the Kaizen event, including training and project implementation, the management engineers work with the project team for 30 days. Over this period, the team rolls out the change to the department and implements the action plan. The action plan serves to keep the team accountable; the process owner is responsible for ensuring that the items in the action plan are completed. Many project teams continue the Kaizen week routine of reporting progress to local hospital leadership at the end of each day. Adjustments may be made during this time as part of continuous improvement. At the end of the 30-day period, a corporate report is sent to all senior leaders across the system.

Monitoring activities vary widely by project, but the most successful include ongoing daily meetings or communication about the project. For example, for a project tracking bed flow, an email to all of the nursing floor, housekeeping, and emergency department managers goes out every morning and afternoon announcing the “state of the house” or number of open beds.

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“If the process owner is not there during the Kaizen, we will walk out...Because at the end of the Kaizen, that person is responsible and accountable for managing the change.”  
—Management engineer

After the 30-day report, the project enters what LHC terms the “control” phase, the goal of which is to sustain the changes brought about through the Kaizen. Then, 90 days after the Kaizen week, the team presents the project and outcomes to the senior leaders across the corporation. At this point, the project is officially completed; some projects will continue to be reported on for as long as 6 months to provide information on how outcomes have been sustained. To allow Six Sigma and Management Engineering staff to support ongoing implementation of new Lean projects, there is a clear handoff to the process owner who must continue to monitor progress. Several interviewees at all levels noted that projects incorporating physical changes, technological changes, and changes to the communication process that require daily meetings and/or emails are more likely to be sustained than are projects that do not employ any of these changes as part of their process. To help keep staff motivated after the formal project process has ended, some project team members planned to hold a 1-year anniversary party.

**Dissemination and Spread of Findings**

**Spread of knowledge and findings across LHC.** More than 40 Kaizen events have occurred since 2006. Given the level of Lean spread within the organization, executive staff and process improvement staff noted that they have seen Lean and other process improvement activities
occurring in a more organic fashion across the hospital. LHC disseminates and promotes findings from Lean projects across the organization by sending monthly reports of process improvement activities and projects to corporate and hospital executives. Process improvement staff also share what they learned from similar projects or activities when a process is being replicated, furthered, or customized at a new location.

External dissemination. The executive leadership of the organization, particularly the CEO, stated that they felt an obligation to share their findings and experiences widely, not only so others can learn from their experiences, but also so they can get different viewpoints. A number of avenues have been used to share findings externally:

- In 2006 a week-long International Lean Healthcare Seminar implementing five projects with health care professionals from 18 hospitals and health systems and four countries.
- Meetings for outside organizations to hear reports from LHC executives on different process improvement projects.
- Travel by executives to Scotland to share Lean activities with the National Health System.
- Promotion by the architecture firm that worked on Lean to disseminate how the firm uses the Lean tool.
- Presentation by a management engineer and two frontline staff (at the suggestion and with the support of executive hospital sponsors) on the Bed Flow Value Stream project at the Institute for Healthcare Improvement (IHI) and the GetWellNetwork Users Conference.

Lean Hospital Project

Horizon Hospital

Brief Description of Project and Project Goal

The goal of this project was to build a new hospital designed around process with a focus on improving care for patients and their families. To design the building around work processes, LHC used Lean concepts, tools, and techniques.

Description of Department/Unit Where Implemented

In October 1998, a health system that included Hospital 2 and a second health system consisting of Hospitals 1, 3, and 4 merged to create LHC. Senior leadership felt it was important to build a consistent culture and strategic plan for the newly formed organization. In 2002, an external consulting group developed an overall strategic plan that called for developing an LHC North and a combined LHC South. However, a financial assessment of the plan indicated that sufficient
financial capital was not available to consolidate the three hospitals and create an LHC South. Instead, the organization planned to replace or renovate individual hospitals, beginning with Hospital 4. It was chosen to be first because it was at full capacity; the site was landlocked, limiting opportunities for expansion; it had only semi-private rooms; it lacked the technological infrastructure to support digital medicine; and the existing infrastructure was considered costly and inefficient.

**Project Staffing**

The Horizon Hospital project was staffed very differently from typical Lean projects given its size and scope. Support from employees at other LHC hospitals and at the corporate level helped the processes and leadership of Horizon to remain internal, since they had to continue to meet the demands of their usual jobs in addition to Horizon Hospital activities. LHC’s corporate executives provided overall support of the project. A hospital steering committee led by Hospital 4’s COO was created. Hospital 4 executives, a Six Sigma Black Belt, and a management engineer were identified as the point persons to lead the overall Horizon construction and transition.

The overall Horizon construction and transition was divided into nine management areas. The leadership structure for the Horizon project and each of the nine management areas is shown in Exhibit 6.10. Our focus is on the process transformation aspect of the transition. The major process transformation projects (i.e., NICU, emergency room, labor and delivery triage, short stay or “hotel space,” and equipment depot) were housed under the process transformation management area. Process transformation was led by a management engineer and a Six Sigma Black Belt. Larger process transformation projects were staffed by a management engineer and members of the department where transformation was taking place.
Exhibit 6.10. Leadership Structure for the Horizon Hospital Project

**Project Managers**

- Hospital 4 Chief Operating Officer

**Replacement Hospital Steering Committee**

- Hospital 4 Chief Operating Officer

**Project Managers**

- Hospital 4 Vice President, Operations
- Management Engineer
- Six Sigma Black Belt

**Physician Orientation**

- Hospital 4 Medical Director of Operations

**Information Technology**

- Information Systems Project Manager and Information Systems Director

**Equipment**

- Hospital 4 Vice President, Support Services

**Human Resources**

- Hospital 4 Human Resources Executive

**Process Transformation**

- Assistant Vice President, Management Engineering

**Move Day Logistics**

- Hospital 4 Vice President, Operations

**Communication**

- Manager, Marketing Communications

**Construction, Mechanical, Electrical, & Plumbing**

- Assistant Vice President, Facilities Development

**Legal & Regulatory**

- Hospital 4 Medical Chief Operating Officer and Hospital 4 Vice President, Operations
Planning, Implementation, and Project Selection

Planning for Horizon Hospital and implementation spanned several phases, including design and building, process improvement preparation, and move-in. Several tools were used throughout the process as shown below in Exhibit 6.11.

Exhibit 6.11. Lean Tools for Horizon Hospital

- Photojournaling
- Voice of the customer: focus groups with staff and patients
- Process mapping
- Spaghetti mapping to show pathways of staff and patients through different processes
- Current and future-state mapping
- Critical patient clinical pathways
- Quality Function Deployment*
- Department-specific process improvements: Kaizen events/Lean projects, Six Sigma projects, Workouts, and Just-Do-Its
- Simulation

*A systematic method to incorporate customer wants into process design to improve efficiency early in the design phase.

Design and building. Senior leadership visited nine hospitals across the country to learn how they approached building new or replacement facilities. A steering committee of board members, senior leaders, and physicians was established to select an architectural firm. Working with the consulting firm, the steering committee prepared a request for proposal in 2005, which included a “test” or sample project that asked the architecture firm to apply Lean tools to a workflow assessment. LHC provided data to the firms to help them determine sizing and capacity. Responses from the firms ranged from 6 million to 12 million square feet and 291 to 396 beds. Firms that effectively used Lean tools found that fewer beds and less physical space were necessary to meet demand. This scenario analysis was used as part of the overall selection process. In March 2005, an architecture firm was selected.

Between June and September 2005, LHC studied patient and staff experience and current-state mapping and technology roadmaps. Approximately 400 physicians, staff members, and patients participated in focus groups to identify concerns with the current hospital that could be addressed in the new hospital, as well as to identify the hopes and desires for the new facility. During the summer of 2005, frontline staff and patients were given disposable cameras and asked to use photojournaling to document issues they saw in their areas.

Next, to identify areas for process improvement teams from each clinical area including a physician representative; if appropriate, a department leader (usually the nursing director); and an assistant nurse manager worked with a management engineer or Six Sigma Black Belt on process mapping. The process maps developed by teams from each clinical area helped inform the architecture firm as they drafted the design for each department. The teams viewed options for the designs and, together with the management engineers, evaluated the floor plans between October 2005 and January 2006 using current-state, future-state, and spaghetti maps. Key considerations for the design options were:

- Optimizing space utilization.
- Reducing staff movements or distance traveled to increase time at the bedside.
Improving clinical quality and safety by building workspaces that facilitate the delivery of effective care.

Traditional hospital structures and layouts were altered to better serve patients and to employ a process-focused Lean design. One example of the process-focused Lean design that encouraged a move away from traditional hospital design was observed in the location of the pharmacy and equipment depot. Typically, these frequently used services are on the first floor or basement of a hospital, but to reduce time and distance traveled, the new facility located these services in the middle of the hospital on the fourth floor. In some cases, the focus on serving the patient superseded staff desires.

Serving the patient went beyond patient satisfaction. Another key consideration in approaching the design was the integration of evidence-based design into the planning of the building. Shifting from a traditional, large, one-room nursery layout to private patient rooms in the NICU is an example where the evidence showed potential benefits to the patient (e.g., reduced infections, individualized and customizable environments) and superseded the staff’s desires. The traditional nursery layout was more efficient for staff, since it allowed the nursing team to work together in one large room. Nonetheless, senior leaders made the decision to build private rooms using the evidence on hand and information from site visits to similar hospitals that used the proposed layout. The staff was asked for their input on the layout, but the decision to build private rooms was not changed. Other applications of evidence-based design were also evident: to reduce noise in the halls, LHC installed carpet in the main hallways. LHC also explored with their architecture firm the most effective products to prevent spread of infections.

Sample rooms were built in the existing hospital for staff to experiment with and provide feedback. Based on feedback from the staff, a pocket door connecting adjacent NICU rooms was added to the design of the unit so that parents of twins could visit with both babies at once. Based on current safety design practices, LHC determined that each room should have a window onto the internal corridor, which would be visible from a nursing station so that nurses could observe patients better. However, the use of sample rooms and feedback from patients enabled designers to determine that this feature was not appropriate for postpartum rooms, because it reduced the mother’s privacy. Thus, the postpartum rooms were altered from the standard medical-surgical design to move the bathroom to the front of the room, even though it would impede clinical staff visibility from the hallway and nursing station.

**Process improvement/project selection.** Teams from each clinical area identified areas for process improvement. Management engineers, Black Belts, and executives each reported a different number of processes across the hospital, with reports ranging from 60–200 processes. Most processes did not require extensive Lean or Six Sigma projects; rather, simple process changes required only a quick decision by management or a 1- to 2-day Workout with a small team of staff. The management engineers and Black Belts worked with the then executive vice president of health services to prioritize the identified projects. Priority was given to major projects, which required more resources from the process improvement department. As part of process transformation, major projects mentioned by interviewees were:

- **Neonatal intensive care unit (NICU).** Additional beds were being added to the hospital, and there was a shift to individual rooms from a large, centralized nursery format.
The adult and pediatric emergency rooms were separated in the new hospital and required patients to use separate entrances.

Women thought to be in labor would be evaluated in a new triage space adjacent to the ER, rather than being brought up to the labor and delivery floor.

To save space and beds, LHC created an intermediate, distinct space for patients who were either placed under observation in the ER or were recovering from outpatient services and needed to stay in the hospital for just a few hours before being discharged.

Centralized equipment management space was created in the new hospital. Previously, the equipment was decentralized.

As part of this study, we also looked closely at the NICU and at the changes in how nurses on the medical–surgical units had to work given the structural changes in the hospital.

The Management Engineering Department was charged with planning the move-in process instead of using outside consultants. The move-in was planned using an electronic program built by the management engineers. In the weeks prior to the move, internal staff from every department ran three table-top simulations and then conducted three live dry runs with staff and volunteers acting as patients.

The final two live dry runs included outside vendors, such as the ambulance services that transported patients to the new hospital. Several issues were identified and solved as part of the simulation process: improving communications among staff and emergency service technicians; identifying the best tools for communication given a lack of cell phone coverage; and making sure that emergency medical services and ambulance staff felt comfortable navigating the new hospital.

In the first live dry run, radios were put on the same channel, and communications broke down, leading people to “chase” each other around to communicate. They were able to correct this in the second dry run. This final live dry run, conducted a week before the move-in, went smoothly and was described by process improvement leadership as “a morale booster,” giving staff the confidence that the move-in process would go smoothly.

LHC planned to reduce the patient census to 225 patients to ensure the move could be completed in 8-9 hours, but because of careful planning, only 149 patients had to be transported to the new hospital. The move was completed on May 22, 2011 in less than 4 hours. All interviewees, representing all levels of the hospital, reported that the move-in process went smoothly, and nearly all stated that there were no problems. One management engineer reported that a woman began labor during the move, and an ambulance had a flat tire; but, because the team had planned and practiced for these contingencies, the move was not affected in any way.

Although quality improvement data have been collected in the new facility, the management engineers have only just begun to identify the measures for evaluating performance specific to the new hospital. Management engineers and two hospital executives stated how important it was
to allow staff to settle in to the new facility and become comfortable with the new processes before assessing performance.

As of the final site visit in September 2011, the new facility had been open for just over 4 months; since the monitoring phase had only just begun, no information on sustainment monitoring is available. Currently, there are no plans for additional process improvements or Lean projects at the hospital. However, some design changes had to be made to processes that were found not to work immediately after the move-in. For example, the supply rooms were not all the same size—there were two sizes—thus, they could not be standardized as planned. Four supply rooms were built into a 24-bed unit with supplies for six patient rooms per supply room. All the necessary supplies could not be accommodated in the smaller rooms. Rooms were standardized by supply type so that there were two distinct linen rooms and two distinct rooms with all other patient care supplies. The distance nurses walked was minimally impacted.

### Outcomes of Lean

Given that the evaluation is just beginning, information on outcomes in the Horizon Hospital initiative is limited to primarily qualitative data. Information on culture, employee satisfaction, efficiencies, clinical process or outcomes assessment, patient safety, and patient satisfaction is presented. As shown in Exhibit 6.12, intermediate outcomes include culture change, employee satisfaction, change in Lean knowledge and skills, Lean routinization, and dissemination. Ultimate outcomes include impacts on efficiency, patient satisfaction and experience, clinical process and outcomes assessments, and patient safety.

#### Intermediate Outcomes

**Organizational Culture Change**

**Application of Lean techniques.** In referring to the Horizon Hospital, a senior executive noted that Lean and Six Sigma have been engrained in the staff over 9 to 10 years, making them an integral part of the culture. Staff may not know the Lean vocabulary, but they are able to exercise Lean techniques when “attacking problems,” according to two other senior executives. A frontline staff person further explained that prior to the move, staff were entitled to speak out and make suggestions for modifications of processes. Each offered an example of how staff improved processes of their own accord; one described a process related to equipment maintenance, and the other referred to patient discharge. In an example that occurred following the move, an executive described how staff recognized, despite their best planning efforts, that the supply rooms were not laid out exactly the same way in the new hospital. Groups quickly worked on standardizing the supply rooms, essentially applying 5S\(^\text{ii}\) to make their jobs easier and

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\(^{\text{ii}}\) 5S is waste elimination through organizing workspace by sorting, straightening, scrubbing, systematizing, and standardizing.
more reliable. A management engineer noted trust in Lean has created a process driven facility and attributes the trust in the Lean process to experiences with good outcomes.

**Improved teamwork and camaraderie.** The Horizon Hospital project has brought about a sense of shared pride among staff, as reported by a management engineer. Researchers observed excited staff touring the new hospital proudly wearing “Extreme Hospital Makeover” T-shirts. Because the hospital move involved every staff person at the hospital, there was increased exposure to the process improvement and Lean tools and concepts that were incorporated into the design of the building. All of the interviewees at all levels of the organization were able to discuss elements of the design that improved efficiencies or reduced waste, as intended by the Lean design.

**Employee Satisfaction**

Only anecdotal evidence is presented on employee satisfaction, since the latest annual employee satisfaction survey was administered just prior to the move. (According to one executive, this most recent survey found overall employee satisfaction to be at 93 percent.) Anecdotal reports on employee satisfaction were most often in reference to the physical layout of the new hospital.

Reviews of the decentralized unit layouts have been mixed, with physical isolation of frontline staff being the source of most comments. An executive noted that the patient care unit design isolates both staff and patients using the example of a U-shaped hallway that prevents staff from seeing end-to-end. Two frontline staff felt that the nurses are still getting used to the decrease in communal workspace, with phones replacing face-to-face contact as the means of communication. Although interviewees from the NICU did not express dislike of the redesign placing each neonate in a separate room, they were less enthusiastic about their work environment compared to other staff.

The NICU’s higher census (more than 40 neonates) and workload have contributed toward the slow adjustment, according to two frontline staff. These two frontline staff had the toughest critique of the new hospital, stating that a number of their peers left the new, more physically-isolating work environment. They estimated a 10 percent turnover in staff following the move, with some nurses leaving who were close to retirement, while others sought employment elsewhere. One of the frontline staff knew of five per diem nurses who left in anticipation of the move. The layout was said to be one factor in their decision to leave, but other changes such as a new electronic medical record, new bar code scanner system, and added educational requirements were also mentioned.

On the other hand, another frontline staff person saw the new floor design as favorable because the natural segregation of space provided room for everyone, from nurses to physicians; physicians now had their own documentation room. One frontline staff person believed that her peers had a better understanding of Lean processes and, in understanding the purpose of the unit setup, they were able to propagate Lean moving forward.

“They said they had a 10 percent turnover rate after they moved. There are some people that are just not meant to work in this environment. We had so much going on… and now the move on top of it. They just couldn’t keep up.”

-- Frontline staff person
Some hospital leaders believed staff were accepting of the new layout. A senior executive commented that the nursing manager and staff are happier because the new layout reduced chaos, creating a more conducive “staff experience.” A Six Sigma Champion/Mastered Black Belt echoed this, noting that a quieter work space facilitates more focused thinking.

A management engineer commented on physicians’ mixed feelings about the layout; they were used to one big gallery where staff are centralized at the nurses’ station. A senior executive stated that physicians now have greater access to computers and are incorporating technology into their workflow to optimize their work. Although they may be covering more distance due to the new layout, they are able to complete their rounds in the same time as before because of the efficiencies gained from technology.

Despite the concerns about the patient care unit layout, one senior executive described the increased sense of staff pride from those involved with the design of the new hospital; he noted how everyone seems to love the technology being located in the patient’s room, so they no longer have to push mobile computing devices around. He believed the NICU staff have embraced the new model of care.

Soon after move-in to Horizon, staff representing all levels reported that a major complaint of frontline staff was the distance from the staff parking lot to the hospital. In subsequent interviews, a management engineer reported that the complaints about parking have “settled down,” and parking is no longer a problem.

**Lean Knowledge and Skills**

The hospital move involved all hospital staff, and there was widespread exposure of staff to process improvement and to the Lean tools and Lean concepts that were used to design the building. This immersion into Lean was designed to give staff the opportunity to apply Lean over a period of time, deepening their understanding of how to put Lean into practice. Although staff were not necessarily articulate in using Lean terminology, they were able to independently apply Lean techniques to solve problems that arose in their daily work.

**Lean Routinization**

Although there were few specific comments in regards to the Horizon Hospital and routinization, a management engineer did cite the Horizon Hospital in the context of standardizing practices across all of LHC’s hospital campuses. Practices will be standardized to match the most efficient campuses, with Lean events prioritized and implemented to support this strategy.

**Ultimate Outcomes**

**Efficiency**

In building Horizon Hospital, executives (both corporate and hospital level) and process improvement professionals reported that they were able to efficiently use internal resources,
thereby saving considerable expenditures. As a result of having management engineers and Six Sigma Black Belts in-house, no consultants were hired to support the overall planning process related to work area layout. In addition, according to respondents, careful planning of the building and frequent and early check-ins helped keep change order costs during construction to a minimum. Clinical flow change orders typically occur when changes are made that impact the design significantly. Often, the change orders occur when the clinical flow processes are determined retroactively, after the design work has been completed. LHC used this savings to fund Horizon Hospital projects that were scheduled for a future date.

Executives and engineers reported that the hospital move-in went smoothly and took nearly 2 hours less than expected. Frontline staff agreed that there were no major issues with move-in.

**Patient Safety**

At Horizon Hospital, managers expected that the use of private rooms, including the NICU rooms, would lead to a reduction in infection rates. However, in the first few months after opening, the NICU reported higher infection rates than expected. Frontline nurses and department leaders believe this could be attributed to increased patient volume and changes to the care processes. For example, the staff frequently communicated with each other using face-to-face and non-verbal signals at the old hospital, but they switched to cordless/portable phones at the new hospital. This practice may have led to the transmission of infections between patients. Two frontline staff mentioned that in the new NICU, visitors were asked to scrub before entering the baby’s room rather than when entering the unit, as was done before. Scrubbing by visitors could not be monitored by staff with the use of private rooms because nurses may be in another patient room. To remedy the problem, visitors are now expected to scrub before entering the NICU, and then, they are asked to apply sanitizing gel to their hands before entering the neonate’s room. A script was developed for unit secretaries to enforce this process as they let visitors into the NICU.

Another issue brought on by the new decentralized layout relates to team work. A nurse manager pointed out that in the old unit, nurses could look over and see that a colleague needed help. Since babies are now kept in separate rooms, nurses have to adjust to using the phones and asking for help. The separation of staff reduced the opportunity for nursing staff to talk with colleagues and ask questions or discuss difficult patient problems.

**Patient Experience**

A few executives reported that the patient experience survey showed improved patient experience in the initial months after Horizon Hospital opened, particularly in the reduction of hospital noise. Several staff at all levels of the organization reported how quiet the hospital is and that patients had expressed concern over the lack of noise indicating that people might not be nearby. A management engineer discussed how the hospital structured the individual rooms to have a distinct area for visitors as part of a greater focus on family-centered care, which may have contributed to the reduction in noise.
Business or Strategic Case

Executives (both corporate and hospital level) and process improvement professionals reported that in building Horizon Hospital, they saved substantial amounts by using internal resources, careful planning, and Lean tools. A typical health care construction project of Horizon’s size incurs clinical flow change order costs in the range of 3-5 percent of project costs, usually built into the total project costs. The change order cost for LHC was only 0.35 percent of total project costs and 0.50 percent of total construction costs. Given these figures, the savings at Horizon Hospital accounted for 2.65-4.65 percent of the total project costs of over $434 million.

Other savings came from the use of in-house staff. Corporate executives and management engineers reported that they received multiple quotes of upwards of $2 million to plan and facilitate the hospital move-in process; instead, they used internal process improvement staff resources to plan the move-in, with internal staff and a limited number of contractors executing the plan.

There were no expectations of a reduction in the hospital’s ongoing operational budget from increased operational efficiencies because of the larger size of the facility (three times the space of the old hospital), and the anticipated increase in patient volume. Cost per discharge remained unchanged; the increased patient volume compensated for the additional costs associated with running a larger facility and hiring more staff. The increased patient volume was the result of patients from areas outside of the original hospital’s usual market now being seen at the new facility.

Factors that Influenced Success of Lean Implementation

During site visits and interviews, staff at all levels were asked to name the two or three greatest contributors to success, as well as the problems or challenges they had witnessed or faced in using Lean processes and tools to design, build, and ultimately work in a new hospital (see Exhibit 6.13). Findings regarding facilitators and barriers are based on responses to these questions and on interpretation of findings overall by the research team. Unlike other cases, barriers and facilitators were mentioned equally, and no real barriers or facilitators stood out as prominent themes across interviewees. In our other case studies of Lean, barriers were usually mentioned much more often than facilitators. Senior executives, management engineers, department leaders, and other hospital leaders provided the greatest amount of information regarding these issues.

Here, we discuss the factors mentioned by interviewees, noting how they operated as facilitators and/or barriers in designing and executing the Horizon Hospital project. We also link lessons learned to these facilitators and barriers.

Exhibit 6.13. Key Facilitators and Barriers to Designing and Implementing Horizon Hospital
(From Conceptual Framework)

<table>
<thead>
<tr>
<th>Organizing Lean</th>
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<tbody>
<tr>
<td>• Alignment of Lean to organization</td>
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<tr>
<th>Implementing Lean</th>
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<tbody>
<tr>
<td>• Staff engagement and resistance</td>
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<tr>
<td>• Lean team composition and size</td>
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<tr>
<td>• Resources</td>
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<tr>
<td>• Leadership qualities and activities</td>
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</tbody>
</table>

Overall, only a few key barriers and facilitators emerged in the Horizon case. Using the categories identified in the conceptual framework, alignment of Lean to the organization,
leadership, resources, and staff engagement were the most frequently mentioned facilitators. Employees mentioned barriers that were related to resources, communication, and staff engagement. We have organized this section by first providing a summary table of Major Factors that Facilitated Lean Success (Exhibit 6.14), followed by Major Factors that Inhibited Lean Success (Exhibit 6.15).

### Exhibit 6.14. Major Factors that Facilitated Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment with organization</td>
<td>• Designing a new hospital using Lean was greatly facilitated by Lean thinking already being engrained into the organization.</td>
</tr>
</tbody>
</table>
| Leadership              | • Leaders enforced and engaged the use of Lean, visibly showing commitment to the process improvement toolkit. This solidified staff’s confidence in the improvement process.  
                          | • Process owners and department leadership held other staff accountable for making changes and ensured sustainability of the Lean successes. |
| Resources               | • The availability of other leaders to fill in when project leaders left was critical for project success.                                          
                          | • The management engineers were a resource that greatly facilitated the design and move into Horizon Hospital.                                  |
| Staff engagement        | • Involving staff in designing the new processes garnered more ownership in processes designed into the new hospital.                           |

### Exhibit 6.15. Major Factors that Inhibited Lean Success

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lessons Learned</th>
</tr>
</thead>
</table>
| Resources               | • Getting release time for staff and management engineers to work on the new Lean Hospital process was difficult due to competing responsibilities.  
                          | • Increased patient volume and staffing needs were not adequately planned for in the new hospital.                                             |
| Communication about Lean| • Because the organization is so large, changes or best practices from one unit are often not translated to another unit.                        |
| Staff engagement        | • Major changes to the work environment to increase efficiency can have unintended effects on staff satisfaction, at least in the short term.        |

### Organizing the Lean Initiative

In this section, we discuss barriers, facilitators, and lessons learned related to organizing the Lean initiative. The most frequently discussed facilitator was related to alignment of Lean to the organization. A key barrier involved difficulty in staff understanding how to use Lean to design processes in a facility that had not yet been built.

### Local Environment and External Context

One senior executive indicated that increase in demand for patient services played a role in the need for hospital enabling efficient processes. This interviewee stated that efficiency is required
for the new hospital to meet the anticipated increase in patient demand. However, this interviewee also warned that the new hospital could pull patients away from other LHC hospitals.

Upon opening the new Lean Hospital, patient volumes did increase much more than anticipated. Consequently, LHC had to reallocate and hire additional staff to meet this demand. One physician manager noted how adding the additional staff and moving away from planned processes was a juxtaposition to being “Lean and mean.”

**Alignment of the Lean Initiative with the Organization**

According to many interviewees across all levels of the organization, process improvement is ingrained in LHC culture. Embracing this type of culture was critical to the successful design and execution of the Horizon project. Senior executives noted that many frontline staff are using the Lean tools, such as checklists and standardization, on a daily basis. Senior executives noted that staff may not even realize these tools are part of the Lean methodology. Senior executive interviewees also emphasized that Lean thinking is ingrained into the organization. Alignment of Lean to the organization’s culture was only mentioned as a facilitator by interviewees; none of the interviewees indicated that alignment of the Lean initiative was a barrier to success.

**Scope, Coordination, and Pace of Lean Activities**

Management engineers suggested that the rapid pace of Lean projects in designing Horizon Hospital may have facilitated the move in to the hospital. The project plan required that the design projects be completed by 2011, allowing nearly 6 months to test new processes in the current (old) hospital before the move. This additional time was provided to eliminate the stress of simultaneously trying new processes, moving into the hospital, and adjusting to the hospital post-move-in.

**Applicability of Lean to Processes and Loci of Activities**

One department leader who played a role managing the Horizon Hospital project noted that staff were particularly challenged in designing Horizon. This interviewee noted that it was difficult for staff to envision building a space around processes instead of traditionally building the processes to fit the existing spaces. These challenges also required the use of additional tools outside of the Lean toolbox. These challenges also required the use of additional tools outside of the Lean toolbox. In particular, a frontline staff member and a physician manager indicated that design of the new NICU required use of a Six Sigma tool, known as “design for Six Sigma.” This tool helped guide staff in the creation of a NICU with private patient rooms, in lieu of a central nursery.

“When we talk about the culture at LHC, the culture is really one that states that we embrace change as an organization. We look for opportunities to change in a positive way.”

—Senior executive

“I have had CFOs come to me and say, ‘Okay what’s the bullet point for your financial success in your ability to build a $463 million hospital?’ It’s almost like they just want a bullet point outline that they think they can take back and implement. It doesn’t work that way. First of all it starts with culture. Everybody has to be on the same sheet of music...you’ve got to have a cultural alignment. ... For us, it is the cultural transformation initiative—that people mean everything.”

—Senior executive
Implementing the Lean Initiative

Major facilitators and barriers to implementing Lean were related to leadership qualities and activities, level of staff engagement, resource availability, and Lean team composition and size.

Leadership Activities and Qualities

Leadership activities and qualities were mentioned by numerous interviewees across all levels of the organization as facilitators to designing and executing the Horizon project. Despite being asked explicitly, none of the interviewees suggested that leadership at the senior or project level was a barrier to using Lean to design Horizon Hospital.

Nearly one half of interviewees, mostly senior executives, management engineers, and department leadership noted that “Lean starts at the top.” These individuals indicated that senior executives at LHC enforce and engage the use of Lean, visibly showing commitment to the process improvement toolkit. This support, in turn, gives staff confidence to try something new and trust that the data presented to them means that what is being proposed will work or is working. A department director commented that if employees “have their information and ducks in a row, they are given support including the needed resources to figure out a solution to a problem.”

A few interviewees also noted that project-level leadership facilitated successful implementation of new processes at Horizon. These project leaders—specifically process owners and department leadership—held other staff accountable for adherence to the changes and ensured sustainability of the Lean successes. This accountability and commitment to the Lean changes was critical to ensure the new processes were maintained. An executive commented that having high performing staff on the team to role model implementation of a new process was critical for achieving uptake among other staff.

Communication About Lean

A process improvement department lead noted that building the facility required considerable communication between architects and medical staff. Management engineers served as translators because they understood the organization and had an engineering background that was useful in communicating with the architects. Both department leadership and management engineers noted that this ability to communicate between the architects and staff was critical to the successful design of Horizon.

Another department leader noted that communication of best practices is sometimes a struggle across the organization. Because the organization is so large, changes or best practices from one
unit are often not translated to another unit. According to this interviewee, the size of the organization also results in a struggle to keep all staff informed of Lean changes.

**Staff Engagement**

Nearly all senior executives and management engineers provided insights on staff engagement in the Horizon process. A few senior executives and management engineers indicated that getting more people involved in designing the new processes garnered more ownership in processes designed into the new hospital. Personal involvement did not always result in support of changes. One frontline staff person indicated that some NICU staff did not see the benefits of private nursery rooms. However, by the time the new hospital opened, a manager reported that some NICU staff who were resistant accepted that there were theoretical positive improvements in the design for patients and their families. Shifting of sentiment continued after move-in with other staff who were positive in the planning phase becoming less so as they experienced the new layout first hand.

Senior executives also indicated that flexible structures were necessary to ensure all types of staff, particularly community physicians, could be involved in the design of Horizon. Because community physicians were not involved in the longer Kaizen activities, LHC created ways for physicians to provide input in processes outside of the traditional Kaizen. As described by LHC executives, physicians were involved at key junctures in decisionmaking, giving the sense of physician ownership. This flexible process allowed for input but also was respectful of the physicians’ time away from patient care. One executive noted that involving physicians required judgment, since a balance had to be achieved between using their time judiciously while being sure to include them. An important piece was to make sure physicians were aware up front of what LHC was trying to accomplish.

Finally, a few executives indicated that the excitement of the new facility “recharged” individuals and made them excited to participate and be a part of the Lean hospital design process.

**Education and Training**

None of the interviewees mentioned education and training as a barrier, facilitator, or lesson learned.

“Staff were probably 50/50 with mixed feelings about the new NICU. As we started with our work out and [were] getting closer... we were probably about a 60/40 ratio of staff eager to go and staff not very ready to go. And it has flipped... some NICU staff have been a little more negative, not about the private rooms, per se, but just the layout itself, not that many... maybe 10 percent now.”
—Nurse Manager

“In the planning process, the physicians were very engaged. They had input right from the very beginning even to the point of taking field trips when we were looking at other new hospitals... They felt like they had had a significant amount of input.”
—Executive

“I think the excitement of the facility definitely helps. Staff wanted to be a part of it and most of these guys, even if they’ve been working for 50 years, have not been involved with a new building being built and moving.”
—Management Engineer
**Lean Team Composition and Size**

Nearly one half of interviewees across all levels of the organization noted that each Lean team must have the “right” people. Interviewees described the “right” people as individuals who are most involved in the process, including team members from different disciplines. The notion of having the right people on the team was particularly important in the design and execution of the Horizon project; several interviewees indicated that partnership between the architects and Lean team members was a critical facilitator for success. Two interviewees described a project where all critical parties weren’t represented at the table. Communication between the LHC Lean team and the architects failed, resulting in equipment distribution problems to the NICU when Horizon Hospital first opened.

Finally, in designing Horizon, executives also indicated that staff, physicians, and even patients must play a role in designing the new hospital. As noted above, these interviewees believed that Horizon was successful because of the partnership between the architects and other critical stakeholders who were part of the Lean teams.

**Availability of Resources**

Barriers related to the constraints on staff time were mentioned by nearly all interviewees. Nearly one-half of interviewees across all levels of the organization mentioned that getting release time for staff and management engineers to work on the new Lean Hospital process was difficult due to competing responsibilities. One executive noted that the demands on the leadership team were more than expected; this may have led to a decrease in patient satisfaction but not quality in the last year of the project. As the intensity of planning for Horizon and move-in increased, managers were not able to round on patients as frequently and work with staff.

An executive even noted that designing Horizon was sometimes marked by “periods of meltdown behind closed doors” because employees were overwhelmed. Additionally, while resources were already strained, leadership turnover exacerbated the issue. During the design of Horizon, two management engineers and one administrative leader left the organization. Work teams were able to recover because of the ability of other management-level employees to fill in. In addition,
much of the process design work had already been done. Replacements were always found with someone internal who understood Lean.

Several senior executives indicated that the management engineers were a resource that greatly facilitated the design and move-in to Horizon. Management engineers brought unique skills and a different lens for viewing process issues. This lens came from having an engineering background as opposed to “growing up in health care,” as most other employees of LHC have done. Retention of management engineers was becoming a problem, according to the engineering department leader. Competitors were developing management engineering programs and offering attractive salaries and management positions. Unlike the LHC case study (see Case 1, Lakeview Healthcare), frontline staff did not mention the management engineers as being an important asset to the design and move-in process at Horizon Hospital.

Finally, resources emerged as a barrier after Horizon was opened, as staffing resources were not adequately planned for in the new hospital. Several interviewees noted that the census in the NICU was much higher than anticipated after the opening of the new Horizon Hospital. Instead of the planned census of 32 patients, there were 44 patients. Accordingly, the NICU was understaffed, creating challenges in the management of the department as a whole. New staff had to be hired to orient and handle the unanticipated volume. Plans to have staff run a new room for stabilizing neonates, which would facilitate moving babies into NICU beds as they improved post-delivery, were scrapped. Instead, stabilization room nurses were assigned to staff NICU beds.

**Conclusions**

LHC uses Lean methodology as a process improvement tool; as Lean became core to LHC culture, the methodology became a way of thinking, empowering staff to continuously improve. Since Horizon was still quite new during the last set of interviews and adjustments were still occurring, fully assessing outcomes from the Horizon planning process was premature. Overall, in the process of designing the new hospital using Lean principles, interviewees seemed to be concerned with the strain on staff time and with ensuring all necessary staff and patient voices were being involved in the design process. Further complicating matters, LHC experienced turnover of key management engineers and administrative personnel during the latter half of the process redesign process. LHC was able to adjust staff to keep the planning process moving forward. Since opening Horizon, meeting the demands of a growing number of patients and services is a top priority. Applying Lean tools and Lean thinking to unexpected problems has helped staff manage change.

Recommendations suggested below emphasize LHC’s experience in designing Horizon Hospital and also address strengths and barriers faced.
Recommendations for Similar Organizations Using Lean Principles to Design a Hospital

- Ensure the culture of the organization supports readiness to undertake building a hospital on Lean principles. Interviewees indicated that designing a hospital around processes was a challenge for staff. However, LHC was able to meet these challenges because of the strong cultural underpinnings in process improvement and Lean thinking. According to LHC management, the culture supported the readiness to undergo this massive endeavor.

- Engage a team of architects who will open lines of communication to staff. LHC put extensive effort into the selection of their architecture firm. In turn, the architecture firm ensured that LHC staff were involved in designing processes, which led to the final hospital design. A key tenet of success involved the open communication between architects and staff.

- Engage management engineers to facilitate the process. The availability of in-house management engineers was central to the successes experienced at Horizon, including the cost savings that occurred. They served as a bridge between the architects and Lean teams, planned the move-in, and facilitated the process redesign work.

- Do not allow the Lean process to depend on any one person. During the planning and designing of Horizon, LHC lost several critical leaders supporting project teams. However, according to LHC leadership and management engineers, the planning was transparent and clearly laid out, allowing existing staff to continue with the planning process.

- Create flexible structures that allow physicians to engage in the Lean process. LHC ensured that community physicians were able to provide input throughout the process. Even though these individuals could not participate in lengthy Kaizens or other Lean projects, LHC obtained physicians’ input ad hoc and at critical junctures. Physicians were kept informed about the project by LHC’s leadership throughout all stages of the process.

- Allocate sufficient time for practice. Management engineers and managers put in a significant amount of time simulating the move into the new Lean Hospital and educating staff on the move-in protocol. This planning and training ensured a relatively smooth move-in to the new hospital and increased staff confidence in the move-in plan.

- Understand that more efficient processes may lead to unintended consequences. After the move into Horizon, nurses in the NICU were still struggling to adjust to the redesign of their unit and the increased patient load. The new layout improved efficiency and patient care, but it created unintended consequences on staff communication and infection control.

- Listen to frontline employees’ concerns and offer strong support in the months following a move into a new hospital. Moving into Horizon was a major change for nursing staff that was not always positive. Some processes did not work and needed to be redesigned. Loss of staff coupled with increased patient volume resulted in staff shortages and the need to continue putting forth extraordinary effort. Leaders should recognize frontline staff for their commitment and be particularly attentive to their concerns in the months following the opening of a new hospital.

- Provide resources to support ongoing continuous improvement. Although staff report that Horizon Hospital has shown success in the initial months since opening, continuous
improvement must occur as soon as possible. This is especially true in areas where the greatest changes occurred and where staff are facing unexpected challenges.