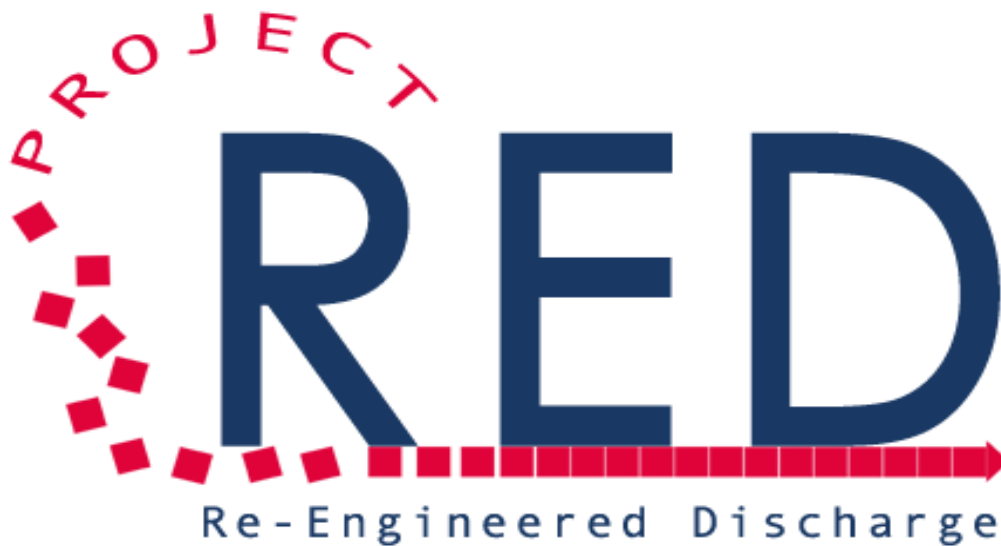


## Final Report

### Re-engineering the Hospital Discharge for Patient Safety Safe Practices Implementation Challenge Grant



Dates of Project: 09/30/03-09/29/04

Federal Project Officer: Deborah Queenan

Project Supported by: Agency for Healthcare Research and Quality  
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Principal Investigator: Brian Jack, MD\*

Organization: Boston Medical Center

\*List of team members in Appendix, section 9.1

## ABSTRACT

**Purpose/Scope:** There is great discontinuity and fragmentation of care at discharge, resulting in a high rate of medical errors. Low-income urban populations are at particularly high risk. We studied the hospital discharge and propose a “re-engineered” process.

**Methods:** An advisory committee of senior Boston Medical Center (BMC) leaders oversaw this project. Our research team characterized the hospital discharge and analyzed its components using five patient safety methodologies: (1) process mapping; (2) failure mode and effect analysis; (3) root cause analysis of high utilizers; (4) qualitative interviews with rehospitalized patients and their families; and (5) probabilistic risk assessment. Pilot studies of post-discharge follow-up were performed.

**Results:** A “re-engineered” discharge was developed. The main elements of the discharge toolbox are (1) discharge portfolio; (2) comprehensive patient-centered discharge plan; and (3) post-discharge re-enforcement for high-risk patients. These products are shown at <http://www.bu.edu/familymed/index.htm>. Post-discharge follow-up appears to be effective. “Embodied Conversational Agents” are being developed to reliably provide key components of the discharge. An RCT of these tools is proposed to ascertain effectiveness. Products were disseminated via three peer-reviewed publications, four invited presentations, three posters at national meetings, and three papers in progress.

**Conclusions:** A study of current activity and best practices related to hospital discharge is long overdue. The products developed can now be tested in a series of RCTs, measuring the rates of medical errors and unnecessary rehospitalization as key outcomes. Our leadership group will continue to set the stage for wide adoption of improvements once their effectiveness is proven.

Words 250

**Key Words:** hospital discharge, re-hospitalization, process mapping, failure mode and effect analysis, root cause analysis, qualitative research, probabilistic risk assessment, embodied conversational agents

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**1. PURPOSE:** This “Safe Practices Implementation Challenge Grant,” RFA (HS-03-005), responded to AHRQ and PSTF goals to (1) assess risks and known hazards to patients in the process of care, leading to preventable injuries or harm, and devise intervention strategies; and (2) implement safe practices that show evidence of eliminating or reducing the known risks and hazards associated with the process of care. The project is rooted in a conceptual framework regarding the coordination of the ambulatory-hospital and primary care-specialty care interfaces.

**2. SCOPE:** According to the Institute of Medicine (IOM) 2000 report *To Err Is Human: Building a Safer Health System*, the number of deaths due to iatrogenic errors of omission and commission in hospitals is between 44,000 and 98,000 per year. More people die in a year from medical errors than from car accidents (43,458), breast cancer (42,297), or AIDS (16,515). The IOM report recommended a goal of 50% error reduction over the next 5 years. In 2001, a second IOM report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, noted, “Effective methods of communication, both among caregivers and between caregivers and patients, are critical to providing high-quality care. Personal health information must accompany patients as they transition from home to clinical office setting to nursing home and back.”

**3. CONTEXT:** Our team studied the transition from the inpatient service at Boston Medical Center (BMC) to community care to identify ways in which we can improve this transition. In our inner city, safety-net environment, we identified the high rate of unnecessary rehospitalization as a major problem. As part of our investigation of rehospitalization, it became clear that the hospital discharge is characterized by fragmented, nonstandardized, and haphazard care. The problems inherent in such care are compounded because the 15-minute post-hospital follow-up visit scheduled by PCPs does not allow adequate time to become familiar with the details of the hospitalization. Most such visits must be added to already overbooked schedules at the time of discharge. Increasingly, as hospitalists provide more inpatient care, it is difficult for PCPs to be aware of all the complexities of a hospitalization. Thus, the transition from hospital care to primary care is a ‘handoff’ that provides an opportunity for a high rate of medical errors. It is also likely that the hospital discharge provides an opportunity to improve care through carefully designed interventions that could successfully reduce medical errors and rehospitalization rates. For several years before this grant, our group had been working on ways to improve the hospital discharge, which we believe is an opportunity to reduce many identifiable errors and to improve patient outcome. We considered organizing an RCT of an improved hospital discharge. The ‘challenge grant’ program came along at an opportune time for us, because we had determined that, in order to implement an intervention program, we first needed to take a step back and better understand the current discharge process through a comprehensive analysis of it. Once we had a better understanding of the current discharge process, we could better design a plan to change and enhance the process.

**4. ADMINISTRATIVE STRUCTURE:** There were two specific groups established to achieve the objectives of this grant: a working group and an advisory committee. The working group consisted of various members of the faculty and staff in the department of family medicine, including several family physicians, a health economist, a behavioral health nurse, the department administrator, a social worker, a post-doctoral fellow, and a research assistant. This group met weekly to discuss the project and address the day-to-day issues involved in achieving the stated

objectives. Members of the working group also participated in the monthly advisory committee meetings. The advisory committee developed for this project was composed of a multidisciplinary group, which included the Chief Medical Officer of BMC and representatives from physician, nursing, pharmacy, social work, case management, human resources, and quality improvement departments. The advisory committee met monthly to advise and make recommendations to the working group; at the monthly meetings, progress toward the goals of the project was presented and developed. During these sessions, work was completed and progress was made on mapping the discharge process, completing the failure mode and effect analysis, and conducting sessions of root cause analysis on patients who had frequent admissions to the BMC inpatient medicine service.

This senior leadership group provided insight into issues and recommendations for safety improvements. The commitment of senior medical center leadership to guide this project from its inception was crucial in order to ensure that project methods demonstrating effectiveness in reducing errors related to hospital discharge would be implemented institutionwide. Personnel involved in this project are listed in the Appendix (see section 9.1).

## **5.0 METHODS:**

The following methods were used to study the strengths and weaknesses of each component of the current discharge process. Using this information, a coordinated redesign of the discharge process was undertaken. This analysis was then used to re-engineer the discharge process through the development of discharge tools that address latent and active patient errors. The methods are (1) probabilistic risk assessment; (2) process mapping; (3) failure mode and effect analysis; (4) qualitative study; and (5) root cause analysis. Each is described below.

**5.1 Probabilistic Risk Assessment:** To improve our prediction model (explained in detail in our grant proposal), we evaluated the utility of adding psychosocial information to the model to improve its predictive power among a high-risk population of patients with prior admissions. We chose eight tools that contain medical, functional and psychosocial information that we anticipated would improve the explanatory model. These tools were (1) the Mini-Mental Status Examination; (2) a patient satisfaction survey; (3) the SF-12; (4) the Patient Health Questionnaire (PHQ); (5) the Nutrition Screening Initiative checklist; (6) the Norbeck Social Support Questionnaire (NSSQ); (7) the Alcohol Use Disorder Identification Test (AUDIT); and (8) the Drug Abuse Screening Test (DAST). We also piloted two instruments that are both well validated to assess health literacy. The first is the Rapid Estimate of Adult Literacy in Medicine (REALM), and the second is the Test of Functional Health Literacy in Adults (TOFHLA). These instruments were piloted, and our group determined that patients were more willing to complete the shorter instrument (REALM), so we discontinued the longer instrument (TOFHLA). Because data on these instruments were not complete for all patients and we added them later in our pilot, those data were not included in this analysis. We do plan to include this data, however, in any future trials using the intake instrument with our study population.

**5.1.2 Methods of Probabilistic Risk Assessment:** All patients enrolled in the study received their primary care from one of the 15 community health centers (CHCs) that form the Boston HealthNet (BHN) and were admitted to the BHN inpatient medicine service. Inclusion criteria were (1) patients hospitalized to the BHN inpatient service within the past 6 months; (2) age over

18 years old; and (3) assigned PCP at a BHN CHC. Exclusion criteria were as follows: (1) admitted to other services at BMC (orthopedic surgery, obstetrics and gynecology, otolaryngology, general surgery, and psychiatry); (2) requiring hospice care; (3) anticipated discharge to nursing home or other institutional settings; (4) death during the admission; (5) rehospitization planned (e.g., scheduled chemotherapy); and (6) previously enrolled. We collected from consenting patients' medical records the following details: (1) demographics (age, gender, insurance, race, ethnicity); (2) admission and other diagnoses; (3) medications; and (4) length of stay. Additionally, we conducted structured interviews with these patients during which we administered the eight tools above. We then followed this cohort and recorded their hospital activity during the next 3 months. We identified rehospitizations both from the hospital administrative database and from phone calls to all participants (to identify rehospitizations to other institutions).

**5.1.3 Results of Probabilistic Risk Assessment:** In addition to the factors identified previously (age, number of hospitalizations, Charlson comorbidity score, and length of stay), patients who were grouped by 90-day readmission status (not readmitted, readmitted) did not significantly differ between groups except for the physical component score of the SF-12 ( $p=0.001$ ). In a logistic regression using significant variables from the previous analyses and variables described above, the PHQ-Depression was a significant predictor of rehospitization (OR 2.08,  $p=0.02$ ). This study provides a method to identify patients at high risk for readmission at 90 days on a medical service. Social support and substance abuse do not appear to affect risk for 90-day readmission. A manuscript describing this work has been written and will soon be submitted for publication (see section 8.6).

**5.2 Process Mapping:** Process maps are one of the most effective ways of gaining an understanding of existing processes. They are intended to represent a process in such a way that is easy to read and understand, thus providing a visual aid for picturing work processes that shows how inputs, outputs, and tasks are linked. Our goal was to map the entire discharge process at BMC in order to determine what the process actually looks like. From this, we then began to investigate where things seemed to be working, where they were not, and how we could improve the process. To map the hospital discharge process, we utilized time at our weekly working group meetings as well as monthly at our advisory committee meetings. Using an iterative group process over a 3-month period, we explored all elements of the hospital discharge. Then, using ASME process mapping standards, each step in the process was reviewed and modeled to document how that process is currently performed. We then printed the process map on poster-sized paper and brought it to meetings of residents, nurses, and ancillary staff. In each case, the map was reviewed and revised based upon feedback and observations of the groups. Four iterations of the map were printed on poster-sized paper for review. The final process map is attached in the List of Publications and Products (see sections 8.1 and 8.2). It represents the standard care to be received by patients at BMC and will serve as the control group in our future interventional studies (see sections 7.0 and 8.2).

**5.3 Failure Mode And Effect Analysis (FMEA):** FMEA is an ongoing quality improvement process that is carried out in healthcare organizations by a multidisciplinary team. It is a proactive process that acknowledges that errors are inevitable and predictable, and it anticipates errors and designs a system that will minimize their impact. We analyzed the expected and unexpected errors occurring at the hospital discharge using the process map. The project team

scheduled two 4-hour sessions in a space away from the activities of daily patient care to brainstorm the potential errors associated with the discharge process map, with particular focus on initiation events (IEs) and pivotal events (PEs). The team identified and categorized all potential sources of medical error associated with the hospital discharge processes using event and fault trees. Once the failure modes were identified, the staff determined the likelihood of making a mistake and potential consequences of the error. We then identified any pre-existing processes that could help detect the initiating or pivotal events leading to error before they occur and suggested an action plan for each failure mode that could cause significant consequences. Using information from the qualitative and root cause analyses, the working group (with monthly input from the advisory group) studied the process map and developed a list of potential failures and the resulting problems of the current discharge process. The groups then developed a potential solution for each failure mode. Our FMEA analysis is included in the Publications and Products section (see section 8.1).

**5.4 Qualitative Analysis:** A qualitative study was conducted in order to understand the phenomenon of frequent hospitalization from the perspectives of the patients. Learning from the experiences of Boston HealthNet patients who are hospitalized more than once in a 6-month period helps identify their perceptions and beliefs about gaps in the discharge process and additional interventions that could prevent rehospitalization. We had originally planned for Jennifer Carroll, MD, a qualitative researcher in the department of family medicine, to undertake this assignment. During the year, Dr. Carroll relocated to another city, so we then contracted with Lee Strunin, PhD, a qualitative researcher from the Boston University School of Public Health, and Meg Stone, MPH, under the direction and supervision of Dr. Strunin, to further develop and complete the qualitative component.

**5.4.1 Methods of Qualitative Analysis:** Semi-structured interviews were conducted with patients during their hospital stay. The interviewer approached potential participants in their hospital rooms and obtained informed consent at the time of the interview. In order to be eligible for the study, a patient had to receive medical care through a Boston HealthNet community health center and had to have been hospitalized at least once in the 6-month period prior to the date of the interview. Additionally, patients had to be at least 18 years of age and able to participate in the interview in English. The interview script consisted of open-ended questions concerning events leading up to the current hospitalization, any previous hospitalizations, the instructions they received the last time they were discharged, the home situation, the ability to attend medical appointments, and patient feedback on the discharge process. The interviews were analyzed to determine common themes in responses to questions about the discharge process and maintenance of health. Two researchers reviewed the interview transcripts independently (one who conducted the interviews and one who did not), and themes were identified based on patient responses.

**5.4.2 Preliminary Results of Qualitative Analysis:** To date, 13 interviews have been conducted, and seven transcripts are available for analysis. Interviews lasted between 20 and 45 minutes. The respondents ranged in age from 22 to 79. Initial themes concerning difficulties in maintaining health outside the hospital included (1) limited access to transportation; (2) inadequacy of support at home; and (3) gaps in ongoing care. Without ongoing treatment of mental health issues, some patients reported engaging in behaviors that contribute to damaging their condition and to rehospitalization, including drinking and a diet that exacerbates

diabetes. According to the patients who participated in this study, impediments to maintaining health exist not as a result of information that is or is not conveyed at the moment of discharge but as a result of untreated long-term issues that exist in their daily lives that were not addressed during the hospitalization or at discharge. We plan to enroll 25 participants before January 2005. A manuscript describing this work will be submitted (see section 8.6).

**5.5 Root Cause Analysis:** Root cause analysis provides in-depth insight into errors that have actually occurred; in our case, this error is preventable readmission to the hospital. The focus is primarily on systems and processes, not on individual performance. We conducted two sessions of advisory committee meetings, for 2 hours each, for root cause analysis. The first session included a presentation by Dr. Manasseh, Director of the Inpatient Medicine service. He researched the admission history of one of our frequently admitted patients and did some added, in-depth analysis into the details of each admission. He also spoke with the patient's primary care physician to obtain additional information that may provide extra insight into the patient's medical and psychosocial status. He then presented the case at one of our monthly advisory committee meetings; as a group, we then discussed the issues presented by the patient and the individuals involved in caring for the patient both in and outside the hospital. We also reviewed the systems and processes that were at work to exacerbate the patients' medical and psychosocial social status and the resulting contact and movement through the hospital system. Our second session included the presentation of four patients by various members of our study team at another of our monthly advisory committee meetings. Each patient was presented to the group and, together, we addressed the patient and their multiple admissions in terms of 1) what happened -- details of the event, when it occurred, what area/service was impacted; 2) why the event happened -- in what context, what are steps in the discharge process that could have been improved; 3) what were the most proximate factors -- what steps contributed to the event: 4) were there any special causes or variations that were relevant to outcome (i.e., human, equipment, environmental, uncontrollable factors); 5) why that happened -- what systems and processes underlie those proximate factors (i.e., human resources issues, information management issues, environmental management issues, leadership issues – culture, communication, priorities, uncontrollable factors); and 6) action plan/s to be developed incorporating specific risk reduction strategies. These sessions were useful and informative in helping to determine what systemic issues and processes could be adjusted and/or improved in order to improve patient health and management of their medical care. It also helped identify and confirm in a very tangible way the specific failures of the hospital discharge system that were developed in our failure mode and effect analysis and help inform our re-engineered discharge.

**5.6 Post-Discharge Intervention:** Complex medical regimens and shortened length of stay are a set-up for inadequate education regarding medical and medication therapies. Literature has demonstrated that calling patients at home after discharge can increase patient satisfaction, resolve medication-related problems, and decrease emergency room (ER) visits. Thus, Gail Burniske, PharmD, and Jeff Greenwald, MD, who are both members of our advisory group, conducted a pilot study of the effectiveness of a post-discharge telephone call to clarify medication usage. Patients were included if they were admitted within 3 months. Although small (n=50 receiving phone call and n=50 not receiving phone call), this study showed a favorable reduction in 30-day all-cause readmission rates when a post-discharge follow-up phone call was implemented. Of those receiving a phone call, 16 (32%) revisited the hospital (10 admissions



and six ED visits) compared with 25 (50%, 13 hospitalizations and 12 ED visits) in the group with no phone call ( $p=0.02$ ,  $NNT=6$ ). This is an important pilot for our future work.

## **6.0 RESULTS: DISCHARGE TOOLKIT**

**6.1 Re-engineering the Hospital Discharge:** With the above analyses fresh in mind, we then brought the advisory group together for three 2-hour sessions to create a new, re-engineered discharge process. We began by printing the process map on cardboard and cutting out each individual component of the map. The pieces were then placed in an envelope. The advisory group was divided into eight groups of two to three, and similar envelopes containing each of the “pieces of the discharge” were given to each group. The groups were instructed to use the knowledge gained by the previous work described above and their creativity to develop a new process map that solves the problems identified in the FMEA. Each of the eight groups then designed a new map and described new themes or principles that they thought important to any new process. These concepts were captured and discussed.

**6.2 Principles of the Newly Re-engineered Hospital Discharge:** Using the process described above, we then captured important elements of a discharge designed to reduce medical errors. The following 12 items summarize this work: (1) There must be explicit delineation of roles and responsibilities. (2) Patient education must occur throughout the hospitalization, not only at the time of discharge. (3) Information must flow easily from the PCP to the hospital team, among the hospital team, and back to the PCP. (4) Information should be captured throughout the hospital course, not only at the time of (or after) discharge. (5) Every discharge must have a written discharge plan that is comprehensive in scope and addresses medications and other therapies, dietary and other lifestyle modifications, follow-up care, patient education and health literacy improvements, and instructions about what to do if their condition changes. (6) Every discharge should have a comprehensive discharge plan completed before discharge. (7) Patients at risk of rehospitalization (determined by our probabilistic risk assessment) should have the discharge plan reinforced after discharge. (8) All information about the admission must be organized and delivered to the PCP. (9) Waiting until the discharge order is written before beginning the discharge process is error prone. (10) Efficient and safe hospital discharge is significantly more challenging if the case management staff works only the 7 AM to 3 PM shift. (11) Discharge processes must be benchmarked, measured, and subject to continuous quality improvement programs. (12) All patients should have access to his/her discharge information in their language and at their literacy level.

**6.3 The Re-engineered Discharge:** We then set about selecting a final set of interventions that would operationalize the principles set forth above and be testable, reproducible, and generalizable. We included key institutional decision makers (the advisory group) in the selection of a final intervention. The intervention was reality tested by sharp-end providers at the weekly working group and at nursing staff, social service, and case management staff meetings. It was reviewed and modified based on feedback of BMC administration, at meetings of BMC senior management (*Leadership for Change* meeting), and at the BHN CHC medical directors and executive directors meetings. This project received buy-in from all these stakeholders. The main elements of the discharge toolbox are: (1) discharge portfolio; (2) comprehensive patient-

centered discharge plan; and (3) re-enforcement of the discharge plan after discharge. Each is described below.

**6.3.1 Discharge Portfolio:** The discharge portfolio is prepared before discharge and is provided to the patient and the PCP. It contains (1) all the information described in section 6.3.2 in the comprehensive patient-centered discharge plan; (2) a compendium of important clinical information (all the items contained in the discharge summary); and (3) a checklist of all information to be completed and all documents included in the discharge portfolio.

**6.3.2 Comprehensive Patient-centered Discharge Plan:** This includes (1) patient education specific to the admitting diagnosis and any comorbidities; (2) a review of diagnosis-specific guidelines (e.g., ASA for CAD, ACE for CHF, etc); (3) a plan for minimizing errors associated with outstanding laboratory or diagnostic tests; (4) a thorough review of indications, administration, and side effects of medications; (5) a plan to address language and literacy barriers as part of the discharge process and in the immediate post-discharge period; (6) a referral to VNA, physical therapy, or other post-discharge services and a plan to ensure that the services are provided; (7) a written plan containing all germane contact information, to be provided to the patient regarding what to do if a problem arises after discharge; and (8) follow-up physician appointments with the PCP and all relevant specialists, made and told to the patient before discharge.

**6.3.3 Re-enforcement of the Discharge Plan:** It is probable (although not yet proven) that some participants will benefit from some type of post-discharge follow up. The goal of our ‘probabilistic risk assessment’ is to improve our ability to identify those patients needing special, more intensive follow up after discharge. We are now continuing to analyze our discharge interview data so that we can improve our risk probabilities. Those at high risk should receive some sort of post-hospital re-enforcement of the discharge plan. This could be either by telephone or via home visit (for those who are very-high-risk patients). Topics covered in the telephone call will be (1) a reiteration of patient education; (2) medical problem-focused follow up; (3) review of outstanding laboratory or diagnostic tests; (4) review of the discharge medication regimen, including appropriateness, understanding, and adherence; (5) coordination of home services; and (6) clarification of the date and time of the patient’s follow-up visits with the PCP and consultants, including assistance with arranging transportation if necessary.

## **7.0 Computerizing and Benchmarking the Re-engineered Discharge:**

In our original grant, we proposed to incorporate ways to computerize the newly re-engineered discharge. What better way to do this than to work with an engineering school! We have successfully developed a relationship with representatives of several laboratories of the “Media Lab” at the Massachusetts Institute of Technology (MIT), particularly David Cavallo, PhD, of the “Future of Learning” lab and Rosalind Picard, PhD, of the “Affective Computing” labs. We met with their researchers and graduate students, and we toured the labs to see how we could work together. We were invited to present our work at their annual “Innovations in Health and Fitness Workshop.” This networking led us to begin working with Tim Bickmore, PhD, who works with “Embodied Conversational Agents” (ECAs). Dr. Bickmore has extensive experience designing and implementing ECAs and running studies on their efficacy and has developed and studied more of these systems than any other researcher. ECAs are animated computer-based characters that use speech, gaze, hand

gesture, intonation, and other nonverbal modalities to emulate the experience of human face-to-face conversation with their users. Such agents can provide a “virtual consultation” with a simulated health provider, offering a natural and accessible source of information for patients in general, but especially to those with low literacy skills, and a low-pressure environment in which patients are free to ask questions and use as much time as they need to understand the information they require. Dr. Bickmore and our group are very excited about the possibilities for adapting the ECA technology to the re-engineered discharge. We envision using such agents in bedside hospital kiosks for patient education prior to discharge. With this new technology, we could effectively address the issues of benchmarking and CQI addressed in our grant proposal. Of course, complete adaptation of the technology is beyond the scope of the budget and time commitments allowed in this current grant. We are actively pursuing a variety of potential funding mechanisms to continue this work.

## **8.0 DISSEMINATION**

**8.1 Tools Developed as Part of this Project:** In addition to the data and new knowledge generated by this project, the major tools produced as part of this project are (1) the process map, (2) the FMEA; (3) the re-engineered discharge guidelines; (4) photographs of working groups; and (4) PowerPoint slide sets describing the work and results of this project. Each of these tools is available on our website: <http://www.bu.edu/familymed/index.htm>

**8.2 Grant Applications:** Three grant applications were generated as a direct result of this grant. They are described below.

*Testing the Re-Engineered Hospital Discharge:* Submitted as unsolicited proposal to AHRQ. Grant No. 1R01 HS14052-01A1. Priority score 253 and not funded. Summary comment: “The reviewers encourage the applicants to address the recommendations below and resubmit this important proposed project. A modest economic analysis is also suggested along with a project evaluation component.”

*Testing the Re-Engineered Hospital Discharge:* To be submitted in response to “Partnerships in Implementing Patient Safety” AHRQ RFA-HS-05-012. Submission date of January 19, 2005. This RCT was designed to test the effectiveness of the re-engineered hospital discharge compared with the standard discharge, as defined in our current project.

## **8.3 Peer-reviewed Publications**

David Anthony, MD, MSc, VK Chetty, PhD, Anand Kartha, MD, Kathleen McKenna, MPH, Maria Rizzo DePaoli, MSW, and Brian Jack, MD. Patient Safety at Time of Discharge – An Example of a Multifaceted Process Evaluation. Published in *AHRQ Patient Safety 2-volume set*. Washington, DC, 2004.

Anthony D, Jack B, Chetty VK. Does Weekend Discharge Result in More Frequent Rehospitalization? Submitted in November 2004.

Anthony D, Jack B, Chetty VK, Culpepper L. Prediction of Rehospitalization Among Urban Underserved Medical Patients. *Medical Care*. In progress.

#### **8.4 Invited Presentations**

Jack B, Anthony D. "Re-engineering the Hospital Discharge for Patient Safety." AHRQ Second Annual Patient Safety Conference, Arlington VA, September 26-28, 2004.

Martin SA, Frutiger E, Jack B. Fostering Inpatient Quality of Care. Society of Teachers of Family Medicine Northeast Regional Meeting. Pittsburgh, PA, October 2003.

Jack B. "Hospital Discharge: A Problem Seeking an IT Solution." Innovations in Health and Fitness Workshop, Massachusetts Institute of Technology Media Center. Conference on Information Technology at the Point of Care. Boston, MA, October 20, 2004.

Jack B. "Re-engineering the Hospital Discharge for Patient Safety." Perspectives of Patient Safety: Five years After the IOM Report. The 1<sup>st</sup> Annual Betsy Lehman Center for Patient Safety and Medical Error Reduction Symposium. Massachusetts Medical Society. Waltham, MA, December 2, 2004.

#### **8.5 Posters at National Meetings**

Burniske G, Trujillo T, Burnett A, Greenwald JL. Post-discharge follow-up phone call by a pharmacist and impact on patient care. Poster 375. 2004 Annual Meeting of the American College of Clinical Pharmacy. Dallas, TX, October 26, 2004.

Anthony D, Chetty VK, Jack BW. Readmission to an Urban Medical Service. Society of Teachers of Family Medicine. San Francisco, CA, April 2001.

Psychosocial Factors and Functional Status as Risk Factors for Hospital Readmission  
Kartha A, McKenna K, Chetty VK, Jack B, Anthony D, Manasseh C, Rizzo DePaoli M, Walsh C, Bowen S, Greenwald J. Poster Presented at the North American Primary Care Research Group meeting. Orlando, FL, September 2004.

#### **8.6 Papers in Progress**

Greenwald J, Manasseh C, Anthony D, Jack B. What is the Best Hospital Discharge to Prevent Medical Errors: A guideline. (in progress)

Anthony D, Kartha A, Chetty VK, Jack B. Who is Likely to be Unnecessarily Rehospitalized within 90 days? (paper in progress; MSc thesis for A. Kartha)

Strunin L, Stone M, Anthony D, Greenwald J, Manasseh C, Chetty VK, Jack B. Qualitative Analysis of Patient Frequently Rehospitalized in a Medically Underserved Setting. (in progress)

## **9.0 Appendices**

### **9.1 Personnel Involved/List of Team Members**

### **9.2 The Process Map**

### **9.3 Failure Mode and Effect Analysis**

## **9.1 \*Personnel Involved/List of Team Members**

Brian Jack, MD  
Principal Investigator

David Anthony, MD, MSc  
Assistant Professor, Family Medicine  
Brown University Medical School

Gail Burniske, PharmD  
Internal Medicine Clinical Pharmacist

Kevin Casey, MPH  
Director of Administration, Department of Family Medicine

John Chessare, MD  
Chief Medical Officer, BMC

VK Chetty, PhD  
Statistician and Health Economist

Mary Chin, MSW  
Director, Social Work Services

Maureen Colton, RN  
Director, Case Management

Allyson Correia, RN  
Registered Nurse on Medical Unit, Inpatient Ward

Larry Culpepper, MD, MPH  
Chair of Family Medicine and PI of DCERPS

Jeffrey Greenwald, MD  
Chief of Firm B of the Inpatient Service

Anand Kartha, MD  
PCP from BHN and Research Fellow, GIM

Christopher Manasseh, MD  
Medical Director of BHN Inpatient Service

Diana Marsh, RN  
Case Manager in the Inpatient Service

Kathleen McKenna, MPH  
Research Assistant

Denise Mehegan  
Director of Quality Improvement/Risk Management

Maria Rizzo DePaoli, MSW  
Social Worker and Project Director

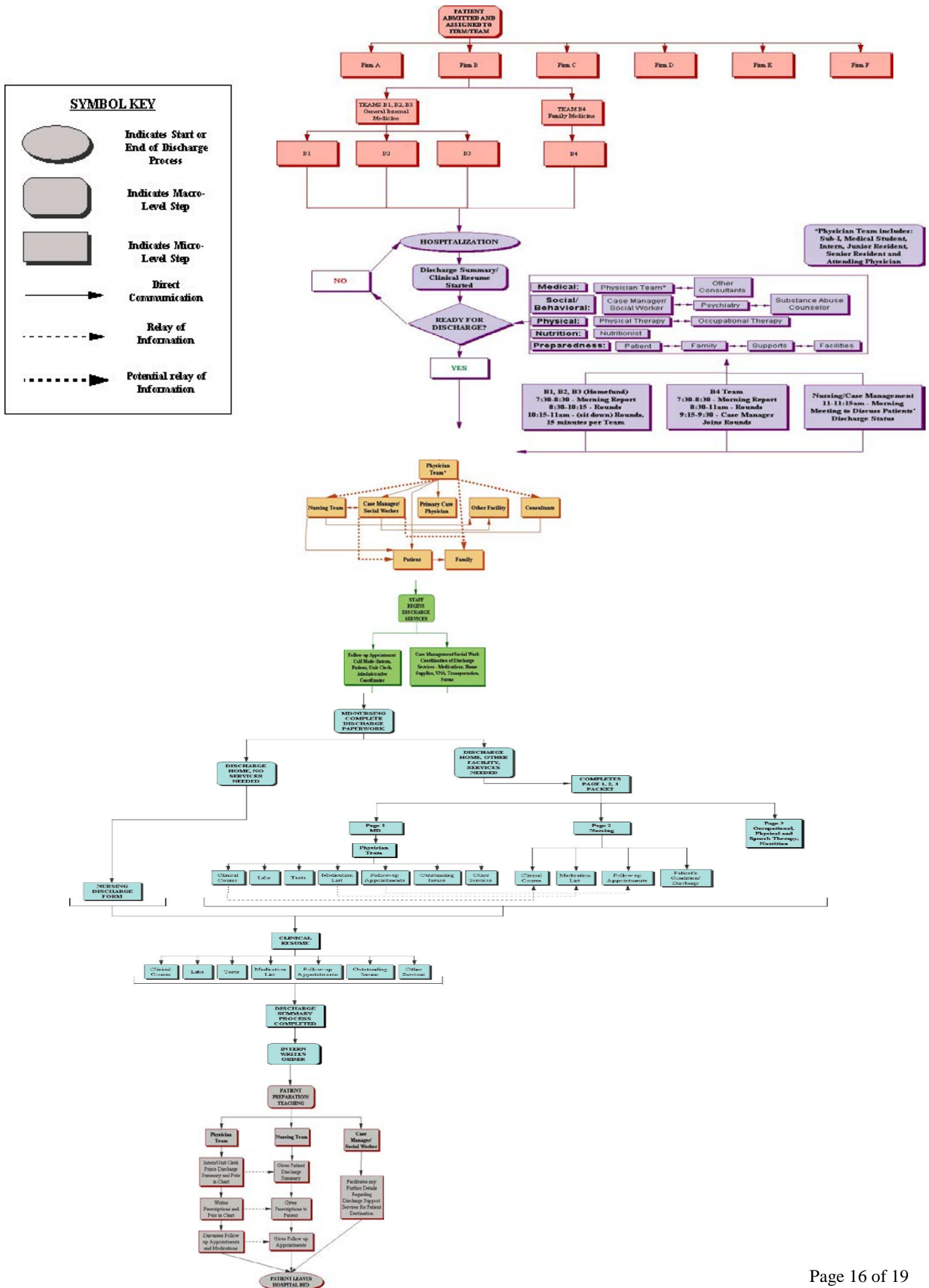
Amy Rosen, PhD  
Senior Health Services Researcher

Nancy Torres-Finnerty, MD  
Hospitalist, Firm A Inpatient Service

Cornelia Walsh, RN  
Substance Abuse Counselor on the Inpatient Service

## 9.2 The Process Map

# Process Map of the Hospital Discharge Boston Medical Center: Firm B March 2004





### 9.3 Failure Mode and Effect Analysis

Potential failure mode	Resultant Problem	Possible Action Steps
1. Patient not assigned to same inpatient team for each admission	Discontinuity	Work with Admitting/Residency Office: Readmit to same physician team Readmit to same nursing team/unit Talk with administration regarding ways to work with problem patients (i.e., in ER, problem patients are readmitted to the same nursing unit)
2. Incomplete information on transfer between services	Poor communication and poor follow-up care	Co-authors on discharge summary Standardize transfer summary
3. Too many people involved in discharge decision	Prolonged hospitalization	Develop process to streamline voices instead of eliminating them Electronic checkout form to coordinate discharge readiness decision Need correct information and patient knowledge
4. Too many people involved in discharge notification: Chaotic, repetitive process with various gaps; excludes any input from patient regarding their perceived readiness for discharge	Everyone involved in patient care is not always informed of discharge decision; no patient "voice," no say in discharge care, which can lead to inappropriate placement; delays in discharge process	Create centralized electronic service for communication Develop appropriate, clear assignment/delineation of responsibilities On centralized electronic form, clarify who's responsible with checklist as each team member completes components they are responsible for Discharge coordinators can serve as liaison between patient and various providers of patient care
5. When making PCP follow-up appointment, no one checks with patient to see if time is convenient/possible	No appointment New system is having patient schedule their own appointment if they're able	Patients not capable, need quick appointment, etc. Coordination between unit clerk and patient regarding availability/ability to make appointment All appointments to be made other than by patient are made by unit clerk Dedicated schedulers to make follow-up appointments efficiently Give coupon, go to "schedulers," and make all appointments before leaving Have access to computing systems to ACC and other outpatient clinics to make appointments directly Laptops available to make appointment process more efficient Have office on inpatient floor to schedule appointments
6. Support services not set up Currently, all VNA referrals are done by CM	Readmission	VNA personnel are based here at BMC and write notes in chart: Include VNA personnel in discharge meetings Conduct routine follow-up (from hospital to home) phone calls within 48-72 hours • Have dedicated person to follow up: "long-term case management" Get people involved in the process who knew patient prior to hospitalization Provide Boston HealthNet PCP's an incentive to be involved in this process Incentive to physicians (PCP) to see patients within 5 days of discharge Required PCP notification of hospitalization at admission and discharge Electronic links of notification to PCP Get all health centers on Logician (electronic, outpatient, medical record)

Potential failure mode	Resultant Problem	Possible Action Steps
7. Lack of appropriate training regarding components of discharge paperwork and responsibility of each component/step in the process	Discharge summary not complete or not correct	Shift responsibility for discharge summary/paperwork from interns to residents <ul style="list-style-type: none"> <li>• Include appropriate training for interns and residents, clarifying whose role each component is</li> <li>• Automating the process and discharge summary will help with this shift of responsibility, because lots of work will automatically be completed by transferring information/data from one area of system to the discharge summary</li> </ul>
8. Patients leave hospital without prescriptions (meds) Discharge medications: <ul style="list-style-type: none"> <li>– If changes are made during hospitalization, are these changes incorporated into discharge instructions by nursing team?</li> <li>– confusion between admission and discharge medication (reconciliation) duplications/gaps</li> </ul> Nursing team not notified regarding changes in medications/prescriptions at discharge	No medications; wrong medications given to patient at discharge; wrong medications taken by patient upon discharge; delay in discharge process	<u>Med Teach</u> – provide training on how to use this Prescriptions computer-linked to outpatient pharmacy (VA does this now) Develop contact at pharmacy, both inpatient and outpatient Have prescriptions filled and delivered to nursing team Conduct patient education with actual medications, pillbox filled Have designated window at pharmacy for hospital discharges Have pharmacy involved in patient education Add “changes from admission” section on discharge summary with details regarding admit and discharge medications and notes regarding all changes made during hospitalization
9. Too many people involved in patient education but not assigned or defined to a particular role; therefore, no one accountable for the outcome	Patient gets mixed messages while discharge education is either missing or incomplete	Make someone responsible for patient education
10. There is not time for patient education	Patient education either missing or not complete	More in-service training regarding patient education Allow time for this!
11. No clear mandate/system for discharge education No system to identify degree of need for discharge education so education can be tailored Patient education and literacy not adjusted according to patient’s level of literacy/health literacy Patient education about <u>disease</u> is not part of discharge	Poor patient discharge education, lack of patient understanding of disease, treatment, and follow-up care	Assign some type of responsibility for which patients: <ul style="list-style-type: none"> <li>• need/require patient education</li> <li>• what type of patient education would be best suited</li> <li>• assess patient’s literacy level and tailor education to that level; electronic checklist can help with this</li> <li>• develop “education sheet” as part of electronic hospitalization documents</li> </ul>
12. No discharge plan given to patient Patient not told about pending lab/tests Literacy level of patient medication sheets too high	Lack of understanding of what to do next Missed appointment, lab not followed up Patients don’t understand medications	Develop discharge plan for each patient, which includes: Information regarding inpatient hospitalization All changes in medications, with clear details regarding what and how to take upon discharge clear follow-up instructions for patients, written at a level that patient can read and understand regarding appointments, nutrition, exercise, lifestyle changes, when to follow-up with PCP, etc.

Potential failure mode	Resultant Problem	Possible Action Steps
13. When does the discharge process start? In order to have timely discharge, often rushed at end when much detail needed	Rushed discharge causes errors	Involve Emergency Department in discharge process: Begin online data collection and discharge planning form in ED and have linked to inpatient record and/or discharge summary paperwork Include section on discharge plan with details of significant psychosocial issues that have led to admission
14. No in-service on how to do discharge	Incomplete discharge	Quarterly reviews for interns and attendings, nursing personnel, and other providers as needed
15. PCP unaware of hospitalization and issues during inpatient stay and outstanding issues upon discharge	Poor follow-up by PCP	Link computerized records to Logician and autofax of discharge summary to outside physicians Dedicated discharge personnel to work with PCP
16. Patients cannot get medications from pharmacy days/nights/weekends	Patients don't get medications	Organize system to get medication to patients upon discharge
17. No standard process for who gets narcotics	No consistent policy about discharge medications	Create centralized narcotics registry/database
18. Many assumptions about who does what but lack of accountability	No checklist or toolbox or patient discharge "guru"	Need centralized discharge facilitator
19. No follow up with patient post-discharge: "Did you get medications, etc?"	No medications/implemented 48-72 hour pharmacy telephone call	Follow-up by member of inpatient staff within 48-72 hours
20. No auditing system for discharge processes	No improvement	Linked to item #37: person can track outcomes/issues identified
21. No organized way to get discharge resume to PCP	PCP lack of info	Should be automated
22. No system of sending labs/tests to PCP (pending labs/tests)	Lack of follow up of labs	Should be automated
23. Medical mistakes	No process to discuss and fix	Increase ease of error reporting with formal review