Enhanced Patient Safety Intervention to Optimize Medical (EPITOME)

Carl A. Sirio, MD
Principal Investigator

Team Members:
Robert Weber, RPh, MS, Co-Investigator
Wishwa Kapoor, MD, Co-Investigator
Mark Roberts, MD, MRP, Co-Investigator
Amy Donihi, PharmD, Co-Investigator
Andrew Peitzman, MD, Co-Investigator
Laurie Rack, RN, Co-Investigator
Edgar Delgado, Co-Investigator

Nichole Ansani, PharmD, Consultant, Pfizer, Inc.
Jayne Jones, MPH, Consultant, PHC4

Project Period: 7/1/05 – 6/30/08 (one year no-cost extension)

Federal Project Officer: Eileen Hogan

We gratefully acknowledge the funding support of the Agency for Healthcare Research and Quality, project # 1 U18 HS015851.

ABSTRACT:

Purpose
The purpose of the research was to evaluate the hospitalwide implementation of a multi-model patient medication education system hereafter referred to as EPITOME.

Scope
EPITOME was evidenced-based program, drawing on the health behavior change theory and utilizing a multidisciplinary approach, including structured medication education, administrative support and staff training, and use of adjunctive or supportive information technology and automated systems, to maximize the impact of medication education provided to inpatients.

Methods
The intervention was designed as a controlled trial involving two campuses of the UPMC Presbyterian Shadyside Hospital. Patient safety outcomes of interest included 30-day hospital readmission, patient satisfaction, and medication adherence behaviors.

Results
Patients responded positively to the intervention with a greater awareness of their medication regimens and greater sense of satisfaction regarding the indications and side effects associated with their medications. Pharmacy and respiratory therapy consultations were the easiest to deploy. Significant work is required to sustain nursing engagement, given workflow. An important unanticipated benefit was identification of medication errors. Improving the intervention requires in-depth workflow assessment and full administrative support. Also, 30-day hospital readmissions were affected, likely a result of the inconsistent implementation by nursing. A full description and tools related to EPTIOME can be found at http://www.ccm.upmc.edu/epitome.

Key Words
Patient safety, medication safety, quality of care, EPITOME

PURPOSE:

The research was designed to evaluate the hospitalwide implementation of a multi-modal patient medication education system hereafter referred to as EPITOME—Enhanced Patient Safety Intervention to Optimize Medication Education.

EPITOME is an evidenced-based program, modeled from the results of a medication education risk assessment conducted at the University of Pittsburgh Medical Center (UPMC). This assessment demonstrated a significant increase in patient-specific medication knowledge and a positive impact on patient medication adherence and patient satisfaction with medication use. EPITOME draws on health behavior change theory and utilizes a multidisciplinary approach, including structured medication education, administrative support and staff training, established quality improvement techniques, and consistent use of adjunctive or supportive information technology and automated systems, to maximize the impact of medication education provided to patients and increase the program's sustainability. The intervention was implemented and tested through a controlled trial involving two campuses of the UPMC Presbyterian Shadyside Hospital. Patient safety outcomes of interest include polypharmacy (commonly defined as the concurrent use of four or more medications), 30-day hospital readmission, patient satisfaction, and medication adherence behaviors. The intervention was designed to be transportable to other health systems and hospitals seeking to improve patient safety outcomes through rigorous medication education efforts that are practical and sustainable.

This study assessed the overall impact and sustainability of EPITOME as outlined below in our three primary aims. The first aim assessed the effectiveness of the proposed intervention and is therefore hypothesis driven; the second and third aims relate to qualitative aspects of the proposed intervention and are therefore more descriptive and process-based rather than statistical. Together, this set of aims created a balance between understanding specific patient outcomes resulting from the intervention, improvements in the processes of care that lead to these outcomes, and the tools and resources that are necessary for sustaining and disseminating the intervention to other institutions.

Primary Aim 1: Assess the impact of implementing a structured, multidisciplinary medication education program on patient safety outcomes
Hypothesis 1A: Patients who participate in the medication education program will have a lower risk of polypharmacy.
Hypothesis 1B: Patients who participate in the medication education program will have fewer medication-related admissions in a 30-day post-discharge period.
Hypothesis 1C: Patients who participate in the medication education program will have improved satisfaction with the medication education process.
Hypothesis 1D: Patients who participate in the medication education program will have improved medication adherence behaviors.

Primary Aim 2: Analyze the barriers to implementing a structured, multidisciplinary medication education program and develop and evaluate strategies for overcoming those barriers that will support and ensure the program's widespread acceptance, sustainability, and generalizability. Multiple, short-cycle time-process improvement interventions were conducted for each participating unit. These short-cycle interventions were designed to 1) improve implementation rates for that unit and 2) identify and

address specific barriers to implementation. The results of Aim 2 will served as part of the foundation for Aim 3.

Primary Aim 3: Develop a “toolkit” resource that promotes a generalizable and sustainable inpatient medication education process, thereby providing the resource base for other health systems and hospitals to promote safe medication behaviors through improved education systems.

SCOPE:

Adherence is defined as “the extent to which a patient’s behavior is consistent with healthcare recommendations.” The term compliance also refers to the extent to which patients follow healthcare provider instructions. Because the term noncompliance frequently has a negative connotation, it will be replaced by the term nonadherence henceforth. Nonadherence to medication regimens can be detrimental to patient recovery and often leads to adverse complications, including inadequate treatment and hospital admission from 5% to 40% of the time. An estimated 11% of all hospital admissions are due to medication complications. Inadequate patient medication education is a common reason for nonadherent behaviors and is an independent risk factor for unplanned 30-day hospital readmission. The overall cost of medication nonadherence to the US healthcare economy is estimated to be greater than $100 billion yearly.

Although medication education is a critical element and a required step in the hospital discharge process, ensuring that patients know how to take their medications properly and understand the importance of adhering to medication regimens remains the most problematic aspect of the discharge planning process. US and Canadian studies have documented inconsistencies in the medication education component of hospital discharge, resulting in poor patient knowledge of their medications.

National and international accreditation organizations have identified the importance of medication education for enhancing patient safety efforts. The 2004 Joint Commission standards require that “the patient receive education and training specific to the patient’s needs and as appropriate to the care and services provided.” Furthermore, the British National Health Service advocates enhanced medication education support in the hospital setting. Recommendations have also been made to individual hospitals to evaluate their discharge planning protocols to ensure patient safety and adherence with the medication education discharge process. Although providing medication counseling at the time of discharge has been shown to be effective in increasing patient knowledge and adherence, it is not an ideal model, as the day of discharge may be stressful and rushed and often includes a plethora of other information and instructions.

A number of preliminary studies of patient discharge processes and related medication education programs have been published, reporting positive results on patient safety outcomes.

Reorganization of discharge planning and transition care to include a patient workbook and an education map stored in a patient-held documentation tool leads to significant improvements at 6 weeks in the quality of life of heart failure patients. A multidisciplinary system for early preparation of diabetic patients for hospital discharge, including medication education and counseling by a multidisciplinary care team, provides effective diabetes care management and is helpful in modifying risks to patients with

diabetes in the hospital setting. Survey results illustrate that coronary artery bypass graft patients' perceived knowledge about adverse effects of medications is inversely associated with length of stay and that their highest learning priorities include possible complications, incision care, whom to call with questions, and medication schedule. An evaluation of the impact of discharge information showed that surgical patients who had received information regarding wound care and pain management from a nurse were less likely to access a health facility than were those who did not receive information. However, at 1 to 2 weeks post-discharge, there was no evidence that patients who believed that they were appropriately educated within 24 hours of discharge still felt well informed. An assessment of patient expectations of and satisfaction with the hospital discharge planning process following total hip-joint replacement surgery demonstrated that patients receiving information at appropriate times had improved satisfaction with their discharge planning processes. However, written information was viewed as restrictive for dialogue with health professionals, limiting patient knowledge and understanding of recovery.

With respect to medication education in particular, prior research has shown that successful programs lead to improved medication adherence behaviors, reduced patient stress, and improved function of daily living. The combination of medication information with pharmaceutical counseling and medication reminder cards leads to a significant increase in patient adherence and decrease in hospital readmission; inpatient counseling was found to be cost effective in light of the decrease in readmissions. There is a significant increase in knowledge of medications among psychiatric patients when educational sheets are combined with clinical discussion, concluding that this practice may be easily replicated in different treatment settings with larger numbers of patients. Finally, it is demonstrated that a multidisciplinary medication education program including continuous verbal and written medication education by nursing throughout the hospital stay improved medication administration. In addition, pharmacist and respiratory consultation was shown to result in a significant increase in specific medication knowledge as well as improvements in satisfaction and adherence among general medicine patients.

Despite the positive patient safety outcomes achieved in these studies, a number of barriers to widespread implementation and expansion of these and similar programs have been identified, including limited funding, lack of generalizable data across all patient units, and inconsistent implementation. Inadequate health literacy has a significant impact on medication adherence, and it is essential to target medication education programming to the appropriate patient literacy level.

The Healthy People 2010 initiative seeks to increase quality and years of healthy life through areas that include educational and health communication. This study addressed this gap by designing a program to enhance specific patient safety outcomes, including polypharmacy, 30-day hospital readmission, patient satisfaction, and medication adherence behaviors.

Ancient Greek teachings state that there are three basic tools of medicine "the herb, the knife, and the word." This project focuses on "the word" as an important tool for providing education and assisting in the promotion of patient safety through decreasing medication errors and improving medication adherence behaviors. The key to improving patient safety outcomes through medication adherence is by providing continuous medication education, beginning with daily medication administration and continuing

through hospital discharge. This ongoing process enables the nurse to assess patient behaviors and understanding and provides the patient with an opportunity to learn, reinforce, and question the importance of the medication education presented. This approach is supported by the health behavior change mode, which advocates for education sessions that are structured to provide exchange of information in an atmosphere that is conducive to learning. Applications of this model have been shown to reduce patient resistance by reinforcing the importance of medication information and building confidence in it, thus supporting patient-centered education efforts. Nursing, pharmacy, and respiratory therapy staff received training via this model and attended at least one health behavior change program, art of active listening program, or patient/ pharmacist communication live or internet-based program. The Health Behavior Change program reviewed the basic principles, including respect for patient autonomy, positive information exchange, ability to monitor readiness for change, and targeting of the importance of information and patients' confidence. This program taught the healthcare provider to better negotiate change (e.g., medication regimen) sensitively and effectively. The Art of Active Listening program taught healthcare professionals to improve their communication and conflict management skills. This program addressed communication needs, including cultural competence, adherence, and delivery of emotionally charged news/information. The pharmacist-patient consultation program addressed the professional concerns of pharmacists by teaching practical and effective communication and consultation techniques that were designed to help expand a patient's knowledge about a prescription. This program helped pharmacists identify functional and emotional barriers to optimal communication in the consultation environment and explain and prepare for potential problems that may arise during a patient consultation. All educational programs were targeted to improve the communication skills of healthcare professionals when interacting with patients and provide a foundation for strong patient-centric communication, with continuous feedback and assessment of knowledge to promote an optimal learning environment.

METHODS:

Over the past years, the UPMC health system has engaged in a multifaceted program designed to reduce medication errors, improve medication delivery system and administration design issues, enhance and improve patient education, and improve adjunctive information and technology support. One of the important steps was the development of a pilot intervention, *Collaborative Quality Improvement of Pharmaceutical Care and Medication Discharge Counseling,* designed to improve the methods by which discharge medication education is conducted throughout the hospital stay. This multidisciplinary effort involved physicians, nurses, respiratory therapists, and pharmacists in evaluating the risk of a medication education program on patient safety outcomes. Specifically, it sought to determine whether a standardized collaborative management approach to patient medication education results in improved quality of pharmaceutical care. The results of this assessment provide further support for the evidence base of the proposed intervention and serve as the foundation upon which the work done herein was predicated.

The results of the review were used to design new methods and processes for a medication education program. In developing the educational program, the project team sought advice, opinions, and assistance from many groups within UPMC. These groups consisted of individuals representing respiratory therapy (for inhalation therapy); the anticoagulation service (for anticoagulation education); the diabetes center (for

education on diabetes); and home care services (for home management, such as oxygen therapy). The input and assistance of these groups were essential in developing the educational intervention, because these services were identified as important opportunities for teaching.

A multidisciplinary team consisting of nurses, pharmacists, and physicians, with input from their respective leaderships, designed the medication education program based on three key concepts: 1) education regarding medications should be continuous throughout the hospital stay and not relegated to the busy time immediately prior to discharge; 2) education regarding medications should be linked with the administration of the medications to reinforce the learning about that specific medication; 3) patients with particular medications or those who need more intensive education regarding specific medications should have automatic referral to informed pharmacists or respiratory therapists with expertise in medication and/or inhalation therapies.

The program focused on continuous education by nursing, including the provision of verbal and written information to each patient. Nurses requested pharmacists to see patients for additional education and review of the medical regimens if patients met one or more of the following criteria: 1) admitted for drug-related problem (patient took wrong medication or wrong dose; patient experienced an adverse drug-related event or drug interaction); 2) more than five medication administrations per day; 3) more than10 total medications or more than five new medications at discharge; and 4) patient not successfully taught by nursing staff. Respiratory therapists provided standardized education about inhalers and associated disease states.

The work under this funding represents a collaborative effort between the University of Pittsburgh School of Medicine (Departments of Critical Care Medicine, Medicine, and Surgery) and School of Pharmacy (Department of Pharmacy and Therapeutics) as well as UPMC Departments of Pharmacy and Patient Support Services (i.e., nursing, respiratory therapy), with collaborative assistance from the Pennsylvania Health Care Cost Containment Council (PCH4) and in-kind support from Pfizer, Inc. All the collaborating groups have evidenced a strong commitment to improving patient safety. The proposal capitalizes on information technology implemented through the UPMC Cerner and Bridge pharmacy and medication administration information systems of UPMC.

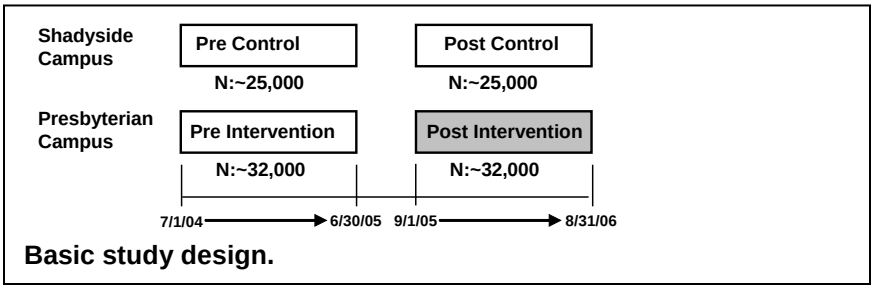
The UPMC Presbyterian campus is an adult medical/surgical 680-bed referral hospital and a site of ongoing collaborative research and graduate programs with the University of Pittsburgh School of Medicine. This campus is a renowned center for organ transplantation and a recognized leader in cardiology and cardiothoracic surgery, critical care medicine and trauma services, and neurosurgery. UPMC Presbyterian also is designated as a Level-I Regional Resource Trauma Center. Founded in 1893, UPMC Presbyterian continues to provide state-of-the-art medical care to patients in the tristate area (Pennsylvania, Ohio, and West Virginia) and throughout the world. On average, 2700 patients are admitted to the UPMC Presbyterian campus each month. The mean length of stay is 6.0 days. Each staff nurse is responsible for a patient assignment, ranging from three to nine patients in the step-down or general floors based on acuity and specialty. A primary nurse coordinates the care of eight to 25 patients.

UPMC Shadyside campus, located in the Shadyside district of Pittsburgh, is an 690-bed adult medical/surgical referral hospital dedicated to improving the quality of life and state of health of the residents of Pittsburgh and the tristate (Pennsylvania, Ohio, and West Virginia) area. This campus is a renowned center for oncology management with the

Hillman Cancer Center, a designated NIH comprehensive cancer care center. On average, 2100 patients are admitted to UPMC Shadyside campus each month. The mean length of stay is 5.2 days. Staffing ratios for nursing at the Shadyside campus are the same as those at the Presbyterian campus.
The study utilized a pre-post, intervention-control design, with the UPMC Presbyterian campus of the hospital serving as the intervention group and the UPMC Shadyside campus serving as the control.

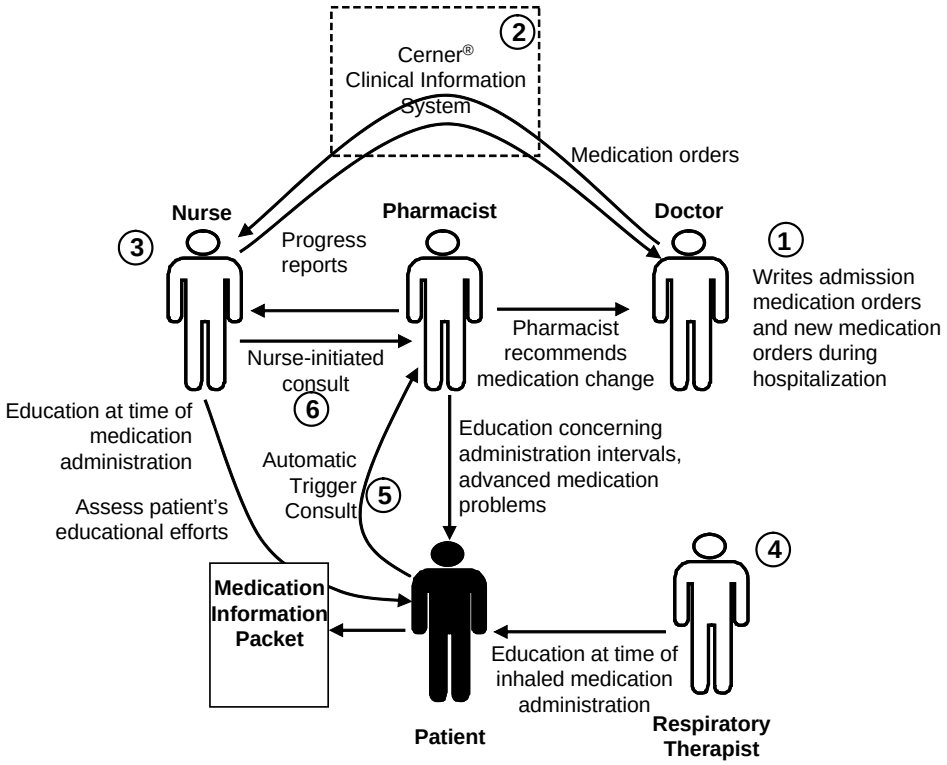
The intervention was performed on all medical and surgical units at UPMC Presbyterian; the control occurred on the medical and surgical units of UPMC Shadyside. Patients in intensive care units (ICU) were excluded from the study. However, patients in ICU step-down units (e.g., cardiac care, neurology/neurosurgery) were included.

Inclusion criteria were patients on medical and surgical units, patients >18 years of age, and patients on at least one non-prn (prn = as needed only) oral medication. Exclusion criteria were patient to be discharged to a long-term care or skilled nursing facility. Patients who were not to be responsible for their own medication administration at home (e.g., senile dementia, severe neurological disease, other significant cognitive impairment) were also not included.



Basic study design.

Intervention process: The following figure outlines the process and workflow of the intervention for nursing, pharmacy, and respiratory staff, delineating educational procedures as well as patient involvement. Initial medication education (i.e., distribution of medication information leaflet; review of drug, dose, regimen, indication, and side effects) occurred with the first medication administration for each drug ordered. With each subsequent medication administration, the drug name, dose, regimen, and indication were reviewed along with specific pieces of information from the medication administration system. Pharmacy and respiratory consults will occur during the daylight shifts and within 24 hours of receipt of a request for consult. The capacity to interact with patients will exist 7 days a week.



Patient-centered medication education and process flow. After a medication order is written on admission or during the hospital stay (1), the information system (2) alerts the nurse and/or respiratory therapist of the medication and prints the required documents to be placed in the educational folder at the patient's bedside. During administration, respiratory therapists and nurses teach the patient about medication from the medication information packets (3) and (4). Automatic triggers (5) may prompt a pharmacy consult, which also may be requested by the patient's nurse (6).

Nursing: All patients admitted to medical and surgical units who met the above-stated criteria were included. On admission, a personalized patient education folder was printed by the clinical information system and compiled by nursing. This folder contained1) "medication helpful hints" sheets; 2) "Questions I Want to Ask My Doctor"; 3) telephone number contact for the UPMC Drug Information Center (DIC) for medication-related questions; and 4) specific medication information sheets (MedAdmin, www.efactsonline.com, part of Facts and Comparisons, Inc., St. Louis, Missouri) detailing each non-prn medication that the patient was currently prescribed. Similarly, upon receipt of a new medication order or therapeutic substitution, as standard of care, the nurse reviewed the order and transcribed it to the electronic health record. Upon receipt of new medication orders from the Cerner PharmNet system used within UPMC to the medication administration health information technology application, the nurse reviewed for accuracy and confirmed those that were available for administration. Through an internet link in the medication administration system, the nurse printed the appropriate medication education leaflets; one-time doses, doses with predetermined stop dates, and intravenous infusions were excluded. The nurse who provided medication education initialed the Facts and Comparisons medication sheet, indicating that education was received. Also at each administration, the nurse picked one specific

item to teach about and indicated with his/her initials that that piece of information had been discussed. This process was designed to account for the capacity of sick individuals to accept only small amounts of information at a time and to ensure that nursing staff did not duplicate education efforts, while allowing multiple nurses to both reinforce what had been taught and ensure that new information was presented at each administration regarding the particular medication. When medications were discontinued, the nurse informed the patient and removed that Facts and Comparisons drug information leaflet from the folder. Nursing continuously assessed the patients' medication education knowledge and encouraged questions using the health behavior change model. Nursing had the ability to request pharmacy consult for further medication education information if the patient did not appear to have been successfully taught. On the day of discharge, the nurse reviewed the patient's folder to ensure that all medication education leaflets were current and complete and provided verbal education. A medication information card was given to the patient, and nursing staff encouraged the patient to complete it, present it to outpatient pharmacy for review, and maintain it for future physician visits and medical appointments.

Pharmacy: There were two mechanisms through which a pharmacist was consulted on a patient. The majority of consults were be generated through the use of automatic triggers generated from pharmacy information system if the patient was 1) scheduled to have more than five daily medication administration times; 2) on 10 or more medications total, or 3) on five or more new medications started during the hospitalization. Additionally, pharmacist were consulted directly by nursing staff if 1) the patient's nurse felt that nursing-directed educational efforts were insufficient to meet the particular patient's educational needs or 2) the patient was admitted for drug-related problem (e.g., wrong medication, wrong dose, drug interaction, adverse drug reaction). The pharmacist met daily with the nurse in charge to determine the patients who were eligible for pharmacy education. A decentralized pharmacist or clinical pharmacy specialist covering a nursing unit provided pharmacy education using the health behavior change model and assessed patient understanding of the information provided. If appropriate, the pharmacist reviewed the patient's medication regimen, conducted a complete medical history, provided oral and written medication education using the health behavior change model, assessed the patient's understanding of the information provided, and provided the patient with a pill box to prepare for hospital discharge. The pharmacist providing medication education initialed any written information provided to the patient and documented the education intervention in the medication administration application system. Also, if deemed appropriate by the pharmacist, the pharmacist recommended a medication change to the physician caring for the patient that was designed to appropriately simplify the patient's medication regimen.

Respiratory Therapy: A list of patients admitted to a medical or surgical unit and identified by a daily computer query of the UPMC's clinical data repository was reviewed by respiratory care. Patients meeting inclusion for respiratory care consults were those on an inhaled medication. Respiratory therapists provided education, using the health behavior change model, and assessed patient understanding of information provided. A respiratory therapist initialed any information provided to the patient in the patient's medication education folder. Other steps paralleled those described for the pharmacists.

Patient: In order to empower the patient and reinforce the importance of understanding and adhering to the medication regimen, he or she was encouraged to independently read the medication information leaflets in his or her personalized bedside folder. The

patient was be encouraged to ask questions regarding medications throughout the hospital stay. Due to the nature of ongoing education through the course of the day, and as a consequence of confidentiality concerns, patients' families were not a formal component of this intervention. However, should a patient have requested a family member to remain present during an educational encounter, this was acceptable and encouraged.

RESULTS/PRODUCTS:

The primary results can be summarized as follows:

- Senior administrative support is essential for programmatic success.
- Training staff around health behavior change concepts in large volume is possible using face-to-face lectures and web-based and computer-based tools.
- Implementation of the intervention by pharmacy and respiratory therapy staff is relatively easy, given the limited number of staff in both clinical areas.
- Nursing implementation is challenging even in the face of senior management support. This is a result of large number of nurses (we had well over 1000) requiring training, patient workflow demands, and professional cultural barriers to changing practice.
- Significant future work must be done to streamline the implementation with nursing.
- Technological (health information technology) impediments regarding the linkages between ordered medications and the production of educational materials must be improved in the future.
- Educational materials must be developed that can be tailored to individual patient needs, including but not limited to pre-existing knowledge and health literacy.
- Patients were able to:
    - Verbalize that they were more aware of their medications (effects, side effects, adverse reactions);
    - Identify that significant education had taken place during the course of hospital admission; and
    - Articulate that the overall hospital experience was positively impacted by the educational interactions.
- The lasting impact on medication adherence behaviors is difficult to quantify.
- The 30-day readmission was not affected by the intervention. This is likely a result of the inconsistent ability across nursing units to fully deploy the intervention.
- Medication regimen simplification did occur when pharmacists were included as part of the consultative role designed for patients on complex medication regimens.
- Physician acceptance of these interventions, particularly the added education provided by pharmacists and respiratory therapists, was high and appreciated as providing valuable adjuncts to patient care.
- The role of respiratory therapy in the design and implementation of patient education programs should not be underestimated as to its importance and positive impact.
- Unexpected and significant medication errors were identified in approximately 20% of a subset of patients analyzed, suggesting a subsidiary benefit to improving inpatient care.
- The result of the work are generalizable to acute healthcare settings.

- A CD was developed and is available for training in the Health Behavior Model.
- A web-based tool is available at http://www.ccm.upmc.edu/epitome for those interested in developing a similar program.
- References are available on request.