

The Re-Engineered Hospital Discharge Program to Decrease Rehospitalization

By **Brian Jack, MD, and Timothy Bickmore, PhD**

The hospital discharge is a complex, multistep process requiring integrated communications among the inpatient care team, primary care team, community services, and the patient and patient's family. The process is a transition in care that provides an opportunity for both human and system errors. Such errors can be a contributing factor in the rehospitalization of patients.

Development of RED

The Re-Engineered Discharge (RED) program is the product of 5 years of work supported with over \$7.5 million from the Agency for Health Research and Quality (AHRQ) and the National Heart, Lung and Blood Institute (NIH-NHLBI). Preliminary work included intensive study of the discharge process, borrowing methodologies from engineering such as process mapping, failure mode effect analysis, probabilistic risk assessment, root cause analysis, and qualitative analysis to define what we now call the RED, a set of mutually reinforcing components that we believe define a high-quality hospital discharge (see Components of the RED). The components of the RED were endorsed by the National Quality Forum (NQF) and form the basis for the NQF "Safe Practice" on the hospital discharge.

Components of the RED

- Educate the patient about diagnosis throughout the hospital stay.
- Make appointments for follow-up and post-discharge testing, with input from the patient about time and date.
- Discuss with the patient any tests not completed in the hospital.
- Organize post-discharge services.
- Confirm the medication plan.
- **Reconcile the discharge plan with national guidelines and critical pathways.**
- Review with the patient appropriate steps of what to do if a problem arises.
- Expedite transmission of the discharge summary to clinicians accepting care of the patient.
- Assess the patient's understanding of this plan.
- Give the patient a written discharge plan.
- Call the patient 2-3 days after discharge to reinforce the discharge plan and help with problem-solving.

Working with design and health literacy consultants, the RED was operationalized using a tool we call the "After Hospital Care Plan" (AHCP), a spiral-bound, color booklet that clearly presents the components of the RED.

Proof of Concept

In 2008 we completed a randomized controlled trial of 749 subjects randomized at the time of hospital admission comparing the impact of the RED process delivered by a nurse using the AHCP tool compared with usual care. The results show a 30% lower rate of hospital utilization in the intervention group compared to usual care (IRR, 0.695; 95% CI [0.515, 0.937]) in 30 days of discharge. One readmission or emergency department visit was prevented for every 7.3 subjects receiving the intervention. Further, the difference between study groups in total cost was \$149,995—an average of \$412 per person who received the intervention. This represents a 33.9% lower observed cost for the intervention group. These results have important implications for quality of care and costs for the more than 38 million hospital discharges each year in the US.

Measures of the impact of this work are:

- The RED tools and the nurse training

The RED process delivered by a nurse using the AHCP tool compared with usual care showed a 30% lower rate of hospital utilization in the intervention group in 30 days of discharge. One readmission or emergency department visit was prevented for every 7.3 subjects receiving the intervention, at an average savings of \$412 per patient.

manual have been downloaded by over 500 hospitals from 49 states and 9 countries.

- Carolyn Clancy, the Director of AHRQ, has published a piece in AARP journal highlighting the importance of this work (even before the release of the RCT).
- The US Center for Medicaid and Medicare Services (CMS) recently awarded 14 grants to quality improvement organizations (QOIs) to improve hospital transitions; of note, 8 of the 14 are using the RED methodology as part of their intervention.
- Finally, the RED program received the 2007 “Patient Care Award for Excellence in Patient Education Innovation”, and Dr. Jack was named the “Patient Safety Investigator of the Month” by AHRQ and was given the “Partner in Public Health Improvement” award from the Centers for Disease Control and Prevention in 2008.

Health Information Technology Can Improve Delivery of RED

Although the RED was shown to be cost-saving, we sought to determine if we could cut down on the time needed by hospital nurses to deliver the RED components by utilizing a health infor-

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mation technology system. Working with Tim Bickmore PhD, Professor of computer science at Northeastern University, we created the “Virtual Discharge Advocate, or Louise™,” a hospital bedside patient education system that engages with patients about their post-discharge self-care plans.

“Louise” is an animated conversational character that simulates face-to-face interaction between a patient and a nurse, and its design is based on detailed analyses of how human nurses explain written medical instructions to patients. The virtual nurse runs on a touch screen display mounted on an articulated arm connected to a mobile cart, so that patients can interact with the nurse from a variety of positions in their hospital bed. The virtual nurse talks using synthetic speech and synchronized animation, and patients “talk” by touching what they want to say on the touch screen. The language used by the virtual nurse is dynamically composed based on each patient’s medical data and questions asked. “Louise” and the patient review the AHCP together. Louise has a copy that is displayed on-screen while patients hold their own paper-based copy. “Louise” answers questions, and tests patients’ understanding of key facts. Following the interaction, a report is produced of their issues and questions that the agent could not address for a human nurse to follow up on.

Both the AHCP booklet and Louise are specifically designed for patients with low health literacy. Ninety million Americans (36% of adults) have inadequate health literacy, resulting in a reduced ability to read and follow direc-

tions in the health care environment. They have higher health care costs and higher rates of hospitalization and rehospitalization.

The “Louise” system includes:

- A networked server with relational database
- A GUI-based data entry and management program (the “workstation”)
- A report generator that produces the AHCP booklet for patients to take home
- The bedside patient education system (“Louise”).

The system works either in a completely stand-alone fashion, in which all patient data are entered via the workstation, or with any portion of the data populated from the hospital information technology systems.

When the discharge protocol is carried out solely by human nurses and not the virtual discharge nurse, it cuts costs by about \$123 per patient (based on a 30% decrease in hospital and emergency department utilization). Although this process saves money, it costs nurses about 81 minutes of their time. With the new virtual discharge system, 30 minutes is now automated—a total savings of \$145 per patient. There were over 38 million hospital discharges in the US in 2003 alone—the virtual discharge system could save our health care system over \$5 billion per year. The possible reach of the virtual discharge system’s power is evident in the inquiries from hospitals in 49 states wanting to implement some part of the discharge protocol. There are currently no other national standards that address hospital discharge, ►

What Do Patients' Say About "Louise"?

In a pilot study of the automated "virtual nurse" system, 74% of hospital patients said they preferred receiving their discharge instructions from the virtual nurse, rather than their human doctors or nurses. Comments included:

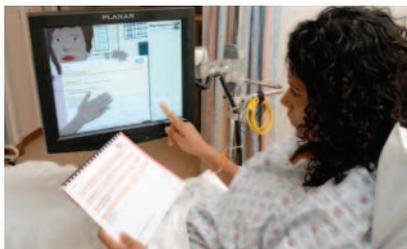


Photo: Glenn Kulbako

- “ She kept asking if I was tired, if I wanted to take a break. She cared about me, you know.”
- “ It's more helpful than talking to a person; it's just like the nurse, but she explained everything to the 'T.'”
- “ Sometimes doctors just talk and assume you understand what they're saying. With a computer you can go slow, go over things again, and she checks that you understand.”
- “ It was just like a nurse, actually better, because sometimes a nurse just gives you the paper and says 'Here you go.' Elizabeth explains everything.”
- “ I think that's great. Because when I was hospitalized and they discharged me, they gave me a lot of medicines, but they didn't really go over them. They were just like 'here are your prescriptions.' If someone came in like that [pointing to the computer] and talked to me I would have felt like 'Yes, I'm ready to go home.'”
- “ I've had problems with, not this hospital, but other hospitals. I wasn't given the quality time that this lady gave me.”



- “ I would like that. When you're waiting to get discharged you need something to do anyway. I like the idea to write things down because when I get to the doctor I always forget what I'm going to ask.”

nor any other automated systems available that assist with this process.

Project RED Toolkit

The project also includes a toolkit to help hospitals adopt this program, available for download at www.bu.edu/fammed/projectred/toolkit.html. The kit includes:

After Hospital Care Plan (AHCP)

One of the principles of RED and of the NQF Safe Practice is that all patients should leave the hospital with a discharge plan. We call our discharge plan the "After Hospital Care Plan" because in the course of our work we realized that some patients are confused by the word "discharge." The AHCP is a spiral-bound, color booklet that is designed to clearly present the information needed by patients to prepare them for the days between discharge and the first visit with their ambulatory care physician. We worked with consultants from the Rhode Island School of Design to help us with the graphic design. The personalized AHCP lists medications and upcoming appointments and tests; provides a color-coded calendar of upcoming appointments; and is designed to help the patient prepare for his/her upcoming appointment (patient activation).

Training Manual

We have prepared a 25-page training manual and workbook for health professionals that describes in detail how to deliver a safe and effective hospital discharge. For each of the components of the RED, the manual contains a detailed script describing how to collect the necessary information. For example, the manual describes how to determine the best time for the appointment, provides a photograph of the primary care physician, and prompts providers to ascertain that the patient has transportation, to give the patient a map describing the location of the appointment, and to tell

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the patient what to do if the appointment needs to be changed. Detailed dialogue is provided for each step.

Computerized Workstation to Print the AHCP

Creation of the AHCP is now automated by means of a Discharge Planning Workstation, a dedicated computer workstation. The workstation is the nexus of all information regarding patient discharge and discharge follow-up. It is a stand-alone tool where the nurse responsible for the discharge (the “discharge advocate”) enters the key data into a database. Once this information is entered, a draft AHCP is created automatically by the workstation. The discharge nurse then reviews and refines this plan, if necessary. Following this, the discharge nurse prints out the draft discharge plan and takes it to the House Officer for review and sign-off, making any revisions suggested by the House Officer. Once the discharge plan has been finalized, it is “published” and a spiral binding is added at the workstation. The discharge advocate then teaches and reviews the contained material to the patient at the bedside. One of the objectives of the current proposal is to integrate the workstation into the hospital’s electronic health record (EHR) system (Centricity-Logician™ at Boston Medical Center), exporting the information to the patient’s ambulatory EHR and e-mailing it to the patient’s primary care physician.

Why Should Hospitals Use RED?

1. Improves community image
 - a. Brands the hospital with a high-quality image

- b. Improves satisfaction of patients and their families
2. Meets safety standards
 - a. Endorsed by the National Quality Forum Safe Practice Committee
 - b. Safe practice endorsed by IHI, Leapfrog, CMS, TJC, and others
 - c. Meets and documents Joint Commission standards
3. Improves clinical outcomes
 - a. Decreases 30-day rehospitalization from 20% to 15% and emergency department use from 24% to 16%
 - b. Improves patient “readiness for discharge” and follow-up with the primary care physician
4. Helps to avoid litigation
 - a. Documents the discharge preparation
 - b. Documents patient understanding of the plan
5. Saves money
 - a. Saves \$412 per subject enrolled (RED Project without virtual nurse)
 - b. “Louise” will further increase cost savings
 - c. Allows for all discharges to be billed at a higher level—adding over \$50 of revenue per discharge
 - d. Reduces diversion and creates greater capacity for higher revenue patients
 - e. Improves market share as “preferred provider”
 - f. Improves relationships with ambulatory providers
 - g. Prepares for near certain change in CMS rules regarding readmission reimbursement 

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For more information about Project RED, research:
www.bu.edu/fammed/projectred/index.html

For additional information about dissemination:
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