The Re-Engineered Hospital Discharge Program to Decrease Rehospitalization

The Problem: The hospital discharge is a complex, multi-step 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 federal dollars 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 Table). 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. 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 present 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 percent 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 for 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.

> ### 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.

Measures of the impact of this work are (1) the RED tools and the nurse training manual have been downloaded by over 500 hospitals from 49 states and 9 countries; (2) 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); and (3) the U.S. 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 information technology system. Working with Tim Bickmore PhD, professor
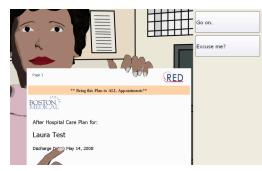
of computer science at Northeastern University, we created the "Virtual Discharge Advocate, or Louise™" a hospital bedside patient education system that engages with patients about their post-discharge self-care plans.
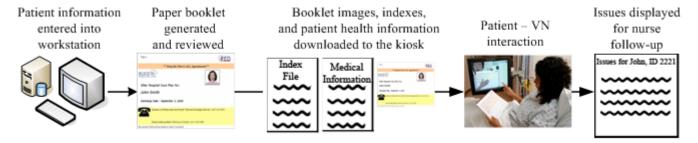
"Louise" is an animated conversational character that simulates face-to-face interaction between a patient and a nurse, and its design is based on detailed analyses of how human nurses explain written medical instructions to patients. The virtual nurse runs on a touch screen display mounted on an articulated 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 the patient holds 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.

Louise - the "Virtual Discharge Advocate

The "Louise" system is comprised of: (1) a networked server with relational database; (2) a GUI-based data entry and management program (the "workstation"); (3) a report generator that produces the AHCP booklet for patients to take home; and (4) the bedside patient education system ("Louise"). The system works either in a completely stand-alone fashion, in which all patient data is entered via the workstation, or with any portion of the data populated from the hospital information technology systems.

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 include:

"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 ideas to write things down because when I get to the doctor I always forget what I'm going to ask."

Why Should Hospitals Use RED?

1. Improves community image
   a. Brands the hospital with a high quality
   b. Improves satisfaction of patients and their families.
2. Meet 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. Improve clinical outcomes
   a. Decreases 30 day re-hospital utilization from 20% to 15% and ED use from 24% to 16%
   b. Improves patient "readiness for discharge" and PCP follow-up
4. Avoid litigation
   a. Documents the discharge preparation
   b. Documents patient understanding of the plan.
5. Saves money:
   a. Saves $412 per subject enrolled
   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

The Evidence Base for the RED Discharge Process

1. Jack BW, et al. The Re-Engineered Discharge: A RCT of a Comprehensive Hospital Discharge Program. *Annals of Internal Medicine* 2009;150: In Press - Feb 2009.
2. Greenwald, JL, Denham C, Jack BW. The Hospital Discharge: A Care Transition with a High Potential for Errors. *The Journal of Patient Safety* 2007;3:97-106.
3. Jack B, et al. Developing the Tools to Administer a Comprehensive Hospital Discharge Program: The ReEngineered Discharge (RED) Program. In, Henriksen K, Battles JB, Keyes MA, Grady ML, editors. *Advances in patient safety: New directions and alternative approaches.* Vol. 3. Performance and Tools. AHRQ Publication No. 08-0034-3. Rockville, MD: Agency for Healthcare Research and Quality; August 2008.
4. Bickmore T, Pfeifer L, Jack B. Taking the Time to Care: Empowering Low Health Literacy Hospital Patients with Virtual Nurse Agents. 2009 *ACM* 978-1-60558-246.
5. NQF Safe Practices: http://www.qualityforum.org/docs/safe-practicees/txSafePracticesforWeb05-10-06.pdf).

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Website

http://www.bu.edu/fammed/projectred/ describes our program in more detail, other related publications, and the RED tools and nurse training manual which are available for download at no cost.