Testing the Re-Engineered Discharge

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Associate Professor and Vice Chair

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Boston Medical Center / Boston University School of Medicine
Plan for Today

I. The Problem
II. How We Got Started
III. NQF ‘Safe Practice’
IV. RCT: Is ‘Safe Practice’ Safer?
V. Can Health IT Deliver?
“Perfect Storm” of Patient Safety

**Loose Ends** - workups NOT completed

**Communication** - DC summary not available

**Poor Quality Info** - DC summary lack results

**Poor Preparation** - few pts know meds/dx

**Fragmentation** - who is in charge?
There are Many Discharges and they are Costly

• In 2003 there were over 38 million discharges
  – That’s over $753 BILLION

• 13% of patients are recurrently hospitalized – and use 60% of resources
Patients Are Not Prepared?

At Discharge:

- 37.2% able to state purpose of all their medications
- 14% knew their medication’s common side effects
- 41.9% able to state their diagnosis

Mayo Clinic Proceedings
August 2005; 80(8):991-994
Little Time Spent on DC

- Audiotaped 97 Discharge Encounters
- 8 Elements - Roter Interactional Analysis
  - Nurse, Pharmacist, Physician, Nurse Case Manager
- Averaged 8 minutes (range of 2 to 28.5 min)
- No teachback 84% of the time
- Patient is a passive participant
  - Two initiated questions
- Not comprehensive
  - 4 or fewer elements covered 50%
1095 of 2644 (41%) inpatients discharged with a test result pending

- 9.4% potentially required action
- 2/3 of MDs unaware of results
- 37% actionable and 13% urgent
Work-ups Not Completed

Tying Up Loose Ends
Discharging Patients With Unresolved Medical Issues
Carlton Moore, MD; Thomas McGinn, MD, MPH; Ethan Halm, MD, MPH

• ¼ of discharged patients require additional outpatient work-ups;
• > 1/3 not completed
Communication

Impact of patient communication problems on the risk of preventable adverse events in acute care settings

Gillian Bartlett, PhD, Régis Blais, PhD, Robyn Tamblyn, PhD, Richard J. Clermont, MD and Brenda MacGibbon, PhD

Patients with communication problems:

• 3X more likely to have adverse event
• 46% had multiple adverse events
Communication Deficits at Hospital Discharge are common

- **Discharge summary availability**
  - 1st post-discharge appt 12-34%;
  - 51-77% at 4 weeks

- **Discharge summaries often lack**
  - Test results (33-63%)
  - Hospital course (7-22%)
  - Discharge meds (2-40%)
  - Pending test results (65%)
  - Follow-up plans (2-43%)

- **Direct communication 3-20%**

Discharges are Variable by Day of the Week

Days to Rehospitalization

Discharges are Variable by Day of the Week

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday
An Etiologic Classification of Adverse Events at Hospital Discharge

Discharge

Health Care System
- Lapse of communication
  - Discharge summary to PCP
  - Inpatient team to PCP
  - Community services with PCP
  - Indadequate Patient Education
  - Medication Error
  - Lack of timely follow-up
  - Lapse in community services

Patient
- New Medical Problem
  - Deteriorization of known medical problem
  - Distant from discharge
  - Early Post-discharge
  - Drug/Alcohol use
  - Language/Cultural barrier
  - Medication non-adherence
  - Doesn't keep follow-up appointment

Clinician
- Lab/Test error
  - Not ordered
  - Not performed
  - Not seen
  - Not acted upon
  - Inappropriate discharge
  - Inappropriate medication
  - Inadequate use of community services

Rehospitalization
Errors lead to Adverse Events

**Annals of Internal Medicine**

The Incidence and Severity of Adverse Events Affecting Patients after Discharge from the Hospital

Alan J. Forster, MD, FRCPC, MSc; Harvey J. Murff, MD; Josh F. Peterson, MD; Tejal K. Gandhi, MD, MPH; and David W. Bates, MD, MSc

- 19% of patients had a post discharge AE
  - 1/3 preventable and 1/3 ameliorable

**Arch Intern Med 2003;138**

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**CMAJ 2004;170(3)**

Adverse events among medical patients after discharge from hospital

Alan J. Forster, Heather D. Clark, Alex Menard, Natalie Dupuis, Robert Chernish, Natasha Chandok, Asmat Khan, Carl van Walraven

- 23% of patients had a post discharge AE
  - 28% preventable and 22% ameliorable
Two Questions

We asked:
• Can improving the discharge process reduce adverse events and unplanned hospital utilization?

Grant reviewer asked:
• What is the “discharge process?”
Principles of the RED: Creating the Toolkit
Process Mapping-1
Ready for Discharge?

NO

READY FOR DISCHARGE?

YES

HOSPITALIZATION

Medical:

Physician Team*

Other Consultants

Physician Team includes:
Sub-I, Medical Student,
Intern, Junior Resident,
Senior Resident and
Attending Physician

Social/Behavioral:

Case Manager/Social Worker

Psychiatry

Physical:

Physical Therapy

Occupational Therapy

Nutrition:

Nutritionist

Substance Abuse Counselor

Preparedness:

Patient

Family

Supports

Facilities

B1, B2, B3 (Homefund)
7:30-8:30 - Morning Report
8:30-10:15 - Rounds
10:15-11am - (sit down) Rounds, 15 minutes per Team

B4 Team
7:30-8:30 - Morning Report
8:30-11am - Rounds
9:15-9:30 - Case Manager Joins Rounds

Nursing/Case Management
11-11:15am - Morning Meeting to Discuss Patients' Discharge Status
Re-engineering the Discharge

- Iterative Group Process
- Identification of Potential Failures
- Prioritization
Re-engineering the Discharge-2

• Brainstorming of Alternatives

• Re-design of Process Map
Principles of the Newly Re-Engineered Hospital Discharge

- Explicit delineation of roles and responsibilities
- Patient education throughout hospitalization
- Easy Information flow
  - from PCP
  - among hospital team
  - back to PCP
- Written Discharge Plan
- All information organized and delivered to PCP
- Waiting until discharge order is written before beginning discharge process is error-prone
- Efficient and safe hospital discharge is significantly more challenging if discharge personnel work only 7AM to 3 PM shift
- All patients have access to their discharge information in their language and at their literacy level
- Those at-risk have discharge plan re-enforced after discharge
- Discharge processes benchmarked, measured and subject to continuous quality improvement programs
RED Checklist

Eleven mutually reinforcing components:

1. Medication Reconciliation
2. Reconcile Plan with National Guidelines
3. Follow-up Appointments
4. Outstanding Tests and Studies
5. Post-discharge Services
6. Written discharge plan
7. What to do if a problem arises
8. Patient Education
9. Assess patient understanding
10. Dc summary to PCP
> Telephone Reinforcement

Adopted by National Quality Forum as one of 30 "Safe Practices" (SP-11)
Should the **NQF/RED** be Done at Discharge at Every Hospital?

**Hypotheses**

The RED will:

- Improve readiness for discharge
- Lower adverse events
- Lower hospital utilization
- The intervention will be especially effective for those with limited health literacy
Testing the RED Schematic

Enrollment N=750

Randomization

RED Intervention

Usual Care

30 day Outcome Data
Phone Call
Chart Review
Intervention to Administer RED

- In Hospital - Discharge Advocate (DA)
  - Nurse
  - Interact with care team - med rec and guidelines
  - Prepare the After Hospital Discharge Plan (AHCP)
  - Teach the AHCP

- After Discharge - Clinical Pharmacist
  - Follow-up call @ 2-3 days

- The DA and Pharm manual
  - Scripts for each task
** Bring this Plan to ALL Appointments **

After Hospital Care Plan for:

John Doe

Discharge Date: October 20, 2006

Question or Problem about this Packet? Call your Discharge Advocate: (617) 414-6822

Serious health problem? Call Dr. Brian Jack: (617) 414-2080

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**EACH DAY** follow this schedule:

**MEDICINES**

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Why am I taking this medicine?</th>
<th>Medication name</th>
<th>Amount</th>
<th>How much do I take?</th>
<th>How do I take this medicine?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td>blood pressure</td>
<td>PROCARDIA XL NIFEDIPINE</td>
<td>90 mg</td>
<td>1 pill</td>
<td>By mouth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HYDROCHLOROTHIAZIDE</td>
<td>25 mg</td>
<td>1 pill</td>
<td>By mouth</td>
</tr>
<tr>
<td></td>
<td>blood pressure</td>
<td>CLONIDINE HCl</td>
<td>0.1 mg</td>
<td>3 pills</td>
<td>By mouth</td>
</tr>
<tr>
<td></td>
<td>cholesterol</td>
<td>LIPITOR</td>
<td>ATORVASTATIN CALCIUM</td>
<td>20 mg</td>
<td>1 pill</td>
</tr>
<tr>
<td></td>
<td>stomach</td>
<td>PROTONIX</td>
<td>PANTOPRAZOLE SODIUM</td>
<td>40 mg</td>
<td>1 pill</td>
</tr>
<tr>
<td>Time</td>
<td>Condition</td>
<td>Medicine Details</td>
<td>Dose</td>
<td>Administration</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------------------</td>
<td>-------------------------------------------------------</td>
<td>--------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>Heart to stop smoking</td>
<td>ASPIRIN EC 325 mg, NICOTINE 14 mg/24 hr, NICOTINE 7 mg/24 hr</td>
<td>1 pill</td>
<td>By mouth, On skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood pressure</td>
<td>COZAAR LOSARTAN POTASSIUM 50 mg</td>
<td>1 pill</td>
<td>By mouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection in eye</td>
<td>VIGAMOX MOXIFLOXACIN HCI 0.5 % soln</td>
<td>1 drop</td>
<td>In your left eye</td>
<td></td>
</tr>
<tr>
<td>Noon</td>
<td>Blood pressure</td>
<td>ATENOLOL 75 mg</td>
<td>1 pill</td>
<td>By mouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood pressure</td>
<td>LISINOPRIL 40 mg</td>
<td>1 pill</td>
<td>By mouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection in eye</td>
<td>VIGAMOX MOXIFLOXACIN HCI 0.5 % soln</td>
<td>1 drop</td>
<td>In your left eye</td>
<td></td>
</tr>
</tbody>
</table>
** Bring this Plan to ALL Appointments **

John Doe

What is my main medical problem?
Chest Pain

When are my appointments?

<table>
<thead>
<tr>
<th>Tuesday, October 24th at 11:30 am</th>
<th>Thursday, October 26th at 3:20 pm</th>
<th>Wednesday November 1st at 9:00 am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Brian Jack</td>
<td>Dr. Jones</td>
<td>Dr. Smith</td>
</tr>
<tr>
<td>Primary Care Physician</td>
<td>Rheumatologist</td>
<td>Cardiologist</td>
</tr>
<tr>
<td>(Doctor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at Boston Medical Center</td>
<td>at Boston Medical Center</td>
<td>at Boston Medical Center</td>
</tr>
<tr>
<td>ACC – 2nd floor</td>
<td>Doctor’s Office Building</td>
<td>Doctor’s Office Building</td>
</tr>
<tr>
<td></td>
<td>4th floor</td>
<td>4th floor</td>
</tr>
<tr>
<td>For a Follow-up</td>
<td>For your arthritis</td>
<td>to check your heart</td>
</tr>
<tr>
<td>appointment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Phone #:</td>
<td>Office Phone #:</td>
<td>Office Phone #:</td>
</tr>
<tr>
<td>(617) 414-2080</td>
<td>(617) 638-7460</td>
<td>(617) 555-1234</td>
</tr>
<tr>
<td>Sunday</td>
<td>Monday</td>
<td>Tuesday</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pharmacist will call today or tomorrow</td>
</tr>
<tr>
<td>29</td>
<td>30</td>
<td>31</td>
</tr>
</tbody>
</table>

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Noncardiac Chest Pain

Noncardiac chest pain is chest pain that is not caused by a heart problem.

- If your chest pain gets different or worse, call your doctor.
- Take your medications as prescribed.
- Carry your medicine with you.
- See your doctor and ask questions.

Picture adapted from The Society of Thoracic Surgeons' Website
Enrollment Criteria

- Admitted to Boston Medical Center
- ≥ 18 years old
- English speaking
- Not on precautions
- Does not live in an institutionalized setting
- Has telephone
- Able to consent
- Not previously enrolled
Enrollment

Admitted to hospital service during study dates (n=5,489)
Assessed for eligibility (n=3,873)
Not assessed for eligibility (n=1,616) - lack of staffing

Excluded (n=3,124)
Did not meet inclusion criteria (n=1,049)
Refused to participate (n=527)
  Reached maximum subjects enrolled/day (n=954)
  Subject unavailable (n=474)
  Subject previously enrolled (n=120)

Randomized (n=749)
Allocation

Randomized (n=749)

Allocated to usual care (n=376)
Allocated to intervention (n=373)

Received in-hospital intervention (n=335)
Received Pharmacist call (n=228)

30-day Outcome Assessment
Not reached (n=68)
Could not be contacted (n=66)
Died after index discharge (n=2)

30-day Outcome Assessment
Not reached (n=66)
Could not be contacted (n=65)
Died after index discharge (n=1)
**Randomization Worked**

- **No significant differences by group (n=749)**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Intervention</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, % F</td>
<td>53</td>
<td>47</td>
<td>0.15</td>
</tr>
<tr>
<td>Age</td>
<td>49.6 (15.3)</td>
<td>50.1 (15.1)</td>
<td>0.61</td>
</tr>
<tr>
<td>Race, % Black</td>
<td>52</td>
<td>51</td>
<td>0.80</td>
</tr>
<tr>
<td>Homeless, % in last 3m</td>
<td>11</td>
<td>9</td>
<td>0.65</td>
</tr>
<tr>
<td>% Medicaid</td>
<td>49</td>
<td>47</td>
<td>0.58</td>
</tr>
</tbody>
</table>

- Income, Education Level, Literacy, Employment
Randomization Worked

- No Significant differences by group (n=749)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Intervention</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charleston</td>
<td>1.2 (2.0)</td>
<td>1.2 (1.8)</td>
<td>0.91</td>
</tr>
<tr>
<td>PCP at enrollment</td>
<td>81</td>
<td>80</td>
<td>0.96</td>
</tr>
<tr>
<td>SF-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCS</td>
<td>40.7 (7.4)</td>
<td>40.1 (7.3)</td>
<td>0.25</td>
</tr>
<tr>
<td>MCS</td>
<td>46.3 (9.8)</td>
<td>46.7 (9.3)</td>
<td>0.53</td>
</tr>
<tr>
<td>Prior Admissions 12m</td>
<td>0.71 (1.4)</td>
<td>0.64 (1.1)</td>
<td>0.44</td>
</tr>
</tbody>
</table>

- Prior ED visits, LOS (2.7), PHQ-9
### How Successfully was the Intervention Applied?

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Intervention Group (#,%) (n=373)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PharmD TC at 2-4 days</td>
<td>61%</td>
</tr>
<tr>
<td>PCP appointment scheduled</td>
<td>349 (94%)</td>
</tr>
<tr>
<td>Discharge plan sent to PCP</td>
<td>338 (91%)</td>
</tr>
<tr>
<td>Medications reconciled with EMR</td>
<td>145 (47%)</td>
</tr>
<tr>
<td>AHCP given to patient</td>
<td>306 (82%)</td>
</tr>
</tbody>
</table>

AHCP included:
- Appointment schedule: 291/300 (97%)
- Appointment calendar: 298/300 (99%)
- Diagnosis information: 276/300 (82%)
How Successfully were Outcomes Collected?

Outcome Assessment:
Telephone Contact at 30 days 82%
Chart Review at 30 days 100%

Average Clinical Time Required:
- DA 121 minutes
- PharmD 30 minutes
Medication Errors (MEs)
PharmD Telephone Call
2-4 days after discharge (n=169)

**MEs due to failure to take medication:**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient does not think s/he needs med</td>
<td>19 (15%)</td>
</tr>
<tr>
<td>Patient did not fill because of cost</td>
<td>20 (16%)</td>
</tr>
<tr>
<td>Patient did not pick up from pharmacy</td>
<td>14 (11%)</td>
</tr>
<tr>
<td>Patient did not get prescription on discharge</td>
<td>15 (12%)</td>
</tr>
<tr>
<td>Patient self-discontinued due to side effects</td>
<td>12 (10%)</td>
</tr>
<tr>
<td>Patient did not fill because of insurance</td>
<td>10 (8%)</td>
</tr>
<tr>
<td>Patient states MD instruction to stop</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Patient misunderstood direction on discharge</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Patient did not fill (unknown reason)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Patient forgot to take</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Patient d/c secondary to MD recommendation</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Inaccurate/incomplete med list</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Perscribed PRN only, pt doesn’t know when to take</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Other</td>
<td>19 (15%)</td>
</tr>
</tbody>
</table>

**Number of subjects with ME due to failure to take medication** 71 (36%)
### Medication Errors (MEs) 
PharmD Telephone Call 
2-4 days after discharge (n=169)

#### MEs due to incorrect self-administration:

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication not on discharge sheet or dc summary</td>
<td>83</td>
<td>45%</td>
</tr>
<tr>
<td>Wrong frequency/interval</td>
<td>39</td>
<td>21%</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>33</td>
<td>18%</td>
</tr>
<tr>
<td>Medication not on discharge sheet, but in Logician</td>
<td>15</td>
<td>8%</td>
</tr>
<tr>
<td>Medication not in Logician, but on discharge sheet</td>
<td>3</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Number of subjects with MEs due to incorrect self-administration</strong></td>
<td>87</td>
<td>45%</td>
</tr>
</tbody>
</table>
**Medication Errors (MEs)**
PharmD Telephone Call
2-4 days after discharge (n=169)

**MEs due to system error:**

<table>
<thead>
<tr>
<th>Error Description</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient not given prescription for most current regimen on discharge</td>
<td>5 (29%)</td>
</tr>
<tr>
<td>Duplication on medication list (same drug, same class, same indication)</td>
<td>3 (18%)</td>
</tr>
<tr>
<td>Conflicting information</td>
<td>4 (24%)</td>
</tr>
<tr>
<td>Patient has allergy/intolerance to medication</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Patient does not know how to use device</td>
<td>2 (12%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (12%)</td>
</tr>
</tbody>
</table>

**# of subjects with MEs due to system error**

12 (6%)
## Interventions

### PharmD Telephone Call

2-4 days after discharge (n=169)

<table>
<thead>
<tr>
<th>PharmD Interventions</th>
<th>Frequency (%) of Intervention*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sent flag to PCP via Logician</td>
<td>55 (38%)</td>
</tr>
<tr>
<td>RPh calls PCP, pharmacy, etc in order to solve problem</td>
<td>24 (16%)</td>
</tr>
<tr>
<td>Instruct to take med after picking up from pharmacy</td>
<td>15 (10%)</td>
</tr>
<tr>
<td>Instruct to take medication; patient has supply</td>
<td>10 (6%)</td>
</tr>
<tr>
<td>Instruct on proper dose/frequency</td>
<td>9 (6%)</td>
</tr>
<tr>
<td>Instruct not to take medication</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>RPh confirmed patient-stated change with Logician</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Take med until PCP gives alternative, then d/c med</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Other</td>
<td>26 (18%)</td>
</tr>
</tbody>
</table>

### # requiring at least 1 intervention

103 (53%)
AHCP Evaluation: 30 days post-discharge

How useful was the booklet to you?

- Extremely: 19%
- Very: 39%
- Moderately: 21%
- A little bit: 17%
- Not at all: 4%
AHCP Evaluation: 30 days post-discharge

What was the most helpful part of the booklet?

- Medical Provider Information: 25%
- RED Medication Schedule: 15%
- Appointment Page: 13%
- Appointment Calendar: 12%
- Diagnosis Information: 20%
- Other: 15%
AHCP Evaluation:
30 days post-discharge

How helpful was the RED medication calendar?

- Extremely: 26%
- Quite a bit: 45%
- Moderately: 15%
- A little bit: 9%
- Not at all: 4%
## Knowledge of Diagnosis and Making PCP visit
30 days post-discharge

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=373)</th>
<th>Control (n=376)</th>
<th>P - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can identify discharge diagnosis</td>
<td>249 (79%)</td>
<td>217 (70%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Saw PCP within 30 days</td>
<td>190 (62%)</td>
<td>135 (44%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Self-Perceived Readiness for Discharge
30 days post-discharge

![Bar chart showing comparison between Usual Care and RED in various aspects such as Prepared, Understand Appts, Understand Meds, Understand Dx, and Questions answered. The RED group shows higher readiness scores across all categories.]
### Primary Outcome

<table>
<thead>
<tr>
<th></th>
<th>Control (n=376)</th>
<th>Intervention (n=373)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital Utilization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of visits</td>
<td>167</td>
<td>116</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Rate</td>
<td>44/100 subjects</td>
<td>31/100 subjects</td>
<td></td>
</tr>
<tr>
<td><strong>ED</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of visits</td>
<td>90</td>
<td>61</td>
<td>0.01</td>
</tr>
<tr>
<td>Rate</td>
<td>24/100 subjects</td>
<td>16/100 subjects</td>
<td></td>
</tr>
<tr>
<td><strong>Rehospitalization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of visits</td>
<td>77</td>
<td>55</td>
<td>0.05</td>
</tr>
<tr>
<td>Rate</td>
<td>21/100 subjects</td>
<td>15/100 subjects</td>
<td></td>
</tr>
</tbody>
</table>
Cumulative Hazard of Patients Experiencing an Hospital Utilization in 30d After Index Discharge
## Cost

<table>
<thead>
<tr>
<th>Cost (dollars)</th>
<th>Control (376)</th>
<th>Intervention (373)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital visit</td>
<td>412,544</td>
<td>268,942</td>
<td>+143,602</td>
</tr>
<tr>
<td>ED visit</td>
<td>21,389</td>
<td>11,285</td>
<td>+10,104</td>
</tr>
<tr>
<td>RED intervention</td>
<td>-</td>
<td>104,188</td>
<td>-104,188</td>
</tr>
<tr>
<td>Total/study group</td>
<td>433,933</td>
<td>384,415</td>
<td>49,518</td>
</tr>
<tr>
<td>Total/1000 patients</td>
<td>1,154,077</td>
<td>1,030,603</td>
<td>+123,474</td>
</tr>
</tbody>
</table>
## Adjusted Rate Ratio of Hospital Utilization within Subgroups

<table>
<thead>
<tr>
<th></th>
<th>Adjusted Incidence Rate Ratio (95% CI)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IRR</td>
<td>95% CI</td>
</tr>
<tr>
<td><strong>Health literacy ‡</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3 and below</td>
<td>1.47</td>
<td>1.07, 2.0</td>
</tr>
<tr>
<td>Grade 4 to 6</td>
<td>1.07</td>
<td>0.71, 1.62</td>
</tr>
<tr>
<td>Grade 7 to 8</td>
<td>0.98</td>
<td>0.72, 1.32</td>
</tr>
<tr>
<td>Grade 9 and above</td>
<td>REF</td>
<td>REF</td>
</tr>
<tr>
<td><strong>Prior hospital utilization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent hospital utilizer</td>
<td>2.83</td>
<td>2.16, 3.72</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.78</td>
<td>1.39, 2.29</td>
</tr>
<tr>
<td><strong>Depression</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any depression diagnosis</td>
<td>1.74</td>
<td>1.37, 2.22</td>
</tr>
<tr>
<td><strong>Prior hospital utilization x Study group</strong> (Interaction term)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent hospital utilizer, intervention</td>
<td>0.65</td>
<td>0.46, 0.92</td>
</tr>
<tr>
<td>Frequent hospital utilizer, control</td>
<td>REF</td>
<td>REF</td>
</tr>
</tbody>
</table>
Conclusions from the RCT

RED:

- Successfully delivered using
  - RED protocols
  - AHCP

- Improves ‘Readiness for Discharge’

- Decreases hospital use
  - 32% reduction
  - NNT = 7.9

- Helps high hospital utilizers
  - 35% reduction

- Is Cost-Effective
  - $329 / patient
  - 38 million discharges @ $753 billion x 32% eligible = 4 billion
Policy Implications

The components of the RED should be provided to all patients as recommended by the National Quality Forum Safe Practice #11.
Major Problem: RN Time
Can Health IT Help?

• Embodied Conversational Agent to Teach the AHCP
  – Emulate face to face communication
  – Develop therapeutic alliance
    • Empathy
    • Gaze, posture, gesture
• Workstation database to automatically print AHCP and “feed” Louise
• Connect hospital IT to workstation
• Kiosk for patient access
**Identification of Subjects**
- SCM printout

**Discuss Study and Obtain Consent**
- in/exclusion
- consent form

**Baseline Data**
- Demographics
  - SF-12
  - PHQ-9
  - REALM

**Randomization**
- Block
- Randomization by Health Literacy

**Hospital**

**Control Group**

**Intervention Group**
- DA+RA
  - complete workstation
  - Print AHCP
  - Present ECA to Subject

**Process Outcomes: RA 7 day Phone Call**
- AEs (Forester method)
- Satisfaction
  - Therapeutic Alliance Inventory

**ECA Alerts Responded to by DA, RA**

**Post-Hospital**

**Final Outcomes: 30 days Electronic Record Review**
- PCP visits
- ED visits
- ReHospitalizations
- Costs

**TLC**

**PCP visit**

**Alerts Responded to by DA, RA and PharmD**

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**RED-lit Proposed Methods**

**November 29, 2007**
Skills of the Agent

- Teach the AHCP
- Competency Questions
  We know what they know
- Can drill down in med education
- Maps of test sites and CHCs
- Instructions
  Lovenox
  Glucometer
  Incentive spirometer
- Concordancy Studies
  Race/ethnicity
  Gender
  Empathic styles
Social Chat
Medications
Appointments
Diagnosis
Closing
Thank You! AHRQ

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- Anand Kartha, MD
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The narratives below illustrate some of the issues reported through PA-PSRS:

- **Patient discharged to Nursing Home.** Discharge orders for 50 mg fentanyl but were written as 500 mg. The Nursing home did not catch error until patient became very drowsy. Narcan was administered.

- **Patient was discharged with the wrong discharge medication list.** The discharge medication list was for another patient.

- **Patient admitted with diagnosis of DK A.** An x-ray of left elbow was ordered. Patient was discharged to an extended care facility via ambulance before left elbow x-ray done. Orthopedic doctor notified of x-ray not being done.

- **Patient was discharged to another facility with the right femoral triple lumen catheter still in place.** Staff from the other facility called asking how long and how much pressure to hold on the femoral site when removing the catheter.

- **Patient’s daughter called this nursing unit stating the discharge instructions were unclear.** The nurse discovered the medication discharge instructions were not completed. The patient had received a coronary artery stent and the booklet was still with the chart. The daughter was also unclear of the pacemaker Patient had a 5 second pause on the cardiac monitor. The monitor strip was placed on the medical record but the physician was not notified. The patient was discharged the following morning. The patient’s spouse called to report the patient passed out on the way home. As instructed, they returned to the ED and the patient was admitted. The patient had a dual chamber pacemaker inserted the next day.

- **Pt resumed Coumadin post-op tonsillectomy and developed bleeding requiring admission to the hospital and return to the OR for cauterizing of bleeding site.** Dr. signed standard discharge instruction sheet of surgery center stating pt. to resume medication unless otherwise instructed and did write for pt to not resume Coumadin.

- **Discharge instructions for decadron tapering not clearly written.** Patient stopped taking medication abruptly and required readmission.