Got Med Wreck?
Targeted Repairs from the Multi-Center Medication Reconciliation Quality Improvement Study (MARQUIS)

Dr. Jeffrey Schnipper, MD, MPH, FHM
January 2014
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Hélène Riverin
Conseillère en sécurité et en amélioration
Safety Improvement Advisor
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Got Med Wreck?
Targeted Repairs from the Multi-Center Medication Reconciliation Quality Improvement Study (MARQUIS)

Jeffrey L. Schnipper, MD, MPH, FHM
Director of Clinical Research, BWH Hospitalist Service
Associate Physician, Division of General Medicine,
Brigham and Women’s Hospital
Associate Professor, Harvard Medical School
Goals

- To provide an overview of the MARQUIS study and toolkit
- To preview the preliminary results of the MARQUIS study
- To discuss lessons learned from sites that have implemented the MARQUIS program and how they might be applied to Canadian hospitals
- To make the case for provinces, health systems, and hospitals to invest in medication reconciliation quality improvement efforts, and why physicians need to play a major role in these efforts
“A process of identifying the most accurate list of all medications a patient is taking… and using this list to provide correct medications for patients anywhere within the health system.”
MARQUIS Study Aims

1. Develop a toolkit of best practices for med reconciliation
2. Conduct a multi-site mentored quality improvement (QI) study
3. Assess effects of QI interventions on unintentional medication discrepancies with potential for patient harm.
4. Conduct rigorous program evaluation to determine
   a. Most important components of a med rec program
   b. How best to implement them
Design

- Mentored quality improvement
- 5 sites around U.S.
  - 2 academic medical centers
  - 2 community hospitals
  - 1 Veterans Affairs hospital
- Vary in size, academic affiliation, location, and use of health information technology
Patients

- Medical and surgical non-critical care units
- Hospitalized long enough for a “gold-standard” medication history to be obtained by a study pharmacist
Mentored Implementation

• Each site
  – Local champion / mentee
  – QI team

• Mentor
  – Physician with QI and medication safety experience

• Monthly calls together
• 2 mentor site visits
• Support from SHM headquarters
• Controlled studies
• English language
• Med rec was primary focus of intervention
• Defined comparison group

• Hospital setting, during the period of hospitalization and/or transition into or out of the hospital
• Quantitative results provided

→ YIELDED 26 Studies
Review of 26 Studies

**STUDY DESIGN**

- 10 RCT
- 3 Non-RCT
- 13 Pre-Post

**INTERVENTIONS**

- 15 Pharmacist
- 6 IT-related
- 5 “Other” = staff education, use of standardized med reconciliation tool

**QUALITY SCORE**

(Based on USPSTF Criteria)

- 6 “Good” Quality
- 5 “Fair” Quality
- 15 “Poor” Quality
## Results

<table>
<thead>
<tr>
<th></th>
<th>PHARMACIST</th>
<th>IT-RELATED</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Good” Quality Rating</td>
<td>4/15</td>
<td>2/6</td>
<td>0/6</td>
</tr>
<tr>
<td>↓ Medication Discrepancies</td>
<td>10/10</td>
<td>3/3</td>
<td>4/4</td>
</tr>
<tr>
<td>↓ Potential Adverse Drug</td>
<td>2/3</td>
<td>1/1</td>
<td>2/2</td>
</tr>
<tr>
<td>Events (PADE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓ Preventable Adverse Drug</td>
<td>1/2</td>
<td>1/1</td>
<td>---</td>
</tr>
<tr>
<td>Drug Events (ADE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓ Healthcare Utilization</td>
<td>2/7</td>
<td>0/1</td>
<td>---</td>
</tr>
</tbody>
</table>
Conclusions

• Most robust literature is for pharmacy-related interventions:
  – 15/26 studies included
  – 4/6 good quality studies
  – Examined clinical outcomes (ADE, utilization)

• Successful interventions included:
  – Intensive pharmacy staff involvement
  – Focus on high risk subset of patients
Intervention Components

• Medication Reconciliation Bundle
  – “Best Possible Medication History”
  – Reconciliation at Discharge
  – Patient Counseling
  – Forwarding information to next provider

• Risk Assessment

• Intense vs. Standard Bundle depending on patient risk

• Training providers in taking a BPMH and in performing discharge counseling

• Improving access to preadmission medication sources
  – Encouraging patient-owned medication lists
  – Facilitating access to other medication sources (e.g., pharmacies)

• Other high-risk, high-reward interventions
  – Implementing and improving HIT
  – Utilizing social marketing
  – Engaging community resources
**High Level Flow Diagram: MARQUIS**

**Pre-Admission**
- **PATIENT**
  - Pre-Admission Medication List
  - Risk Stratification: Average Risk → Intensive Interview
  - Risk Stratification: High Risk

**Admission / Transfer**
- **1** → Best Possible Medication List
- **2** → Admission / Transfer Medication List
- **3** → Discharge Medication List
- **Interview**
  - Intensive Interview

**Discharge**
- **4** → Reconciliation
- **5** → Education
- **Intensive Reconciliation**
- **Intensive Education**

**MARQUIS Standard Bundle:**
1. **Risk stratification**: standard approach for placing patients in high or low risk pathway
2. **Interview**: standard approach at admission to take Best Possible Medication History (BPMH)
3. **Reconciliation**: standard approach at discharge to highlight changed, discontinued, or new medications
4. **Education**: standard approach at discharge to educate patient on changed, discontinued, or new medications
5. **Forwarding**: standard approach at discharge to forward discharge medication list to next provider

**MARQUIS Intensive Bundle:**
- **Output**: Risk status documented
- **Output**: Best Possible Medication List
- **Output**: Accurate discharge medication list depicting changes
- **Output**: Patient educated
- **Output**: Discharge medication list forwarded to next provider
MARQUIS Toolkit*

- A compilation of the “best practices” around medication reconciliation, with resources to support deployment of the intervention components

  - MARQUIS Implementation Manual
  - Taking a Good Medication History Video
  - Good Discharge Counseling Video
  - Best Possible Medication History (BPMH) Pocket Cards

*All available for download at www.hospitalmedicine.org/marquis
• The goal of the manual is to compile the best practices around medication reconciliation efforts

• Provides detail for adaptation to each organization

• Explains the fundamentals of quality improvement and how they can be applied to medication reconciliation efforts
Taking a Good Medication History Video

• Produced at Vanderbilt University with content developed by the MARQUIS study team

• Reviews the fundamentals of taking a BPMH while modeling correct interviewing technique
Good Discharge Counseling Video

• Produced at Vanderbilt with content developed by the MARQUIS study team

• Illustrates the “usual” patient discharge medication counseling with contrasting optimal patient discharge counseling
“BPMH” Pocket Cards

- **Best Possible Medication History pocket cards**

  - Provides a step by step guide for eliciting the best possible medication history from your patient

  - Provides prompts for clinicians to use while efficiently conducting patient interviews

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### MARQUIS Best Possible Medication History (BPMH) Quick Tips

**Goal**: Obtain complete information on the patient’s medication regimen, including:
- Name of each medication
- Formulation (e.g., extended release)
- Dosage, Route, Frequency
- Non-prescription medications (e.g., herbs, OTCs, vitamins)

**Try to use at least two sources of info between the different sources**
- If your starting point is a medication:
  - Review and verify each med
  - Best to start by having the patient don’t read the list aloud as
- Questions to elicit a complete medical history:
  - For each medication, elicit:
    - When appropriate, ask about:
      - Start with an open-ended question:
    - Use Probing Questions:

**Time-saving tips**
- Start with easily accessible recent hospital discharge
- If patients use a list or pill box, data are not that dissimilar differences can be explained
- If patients are not sure, ask “clean up” the other source, additional sources such as:
  - If the medication history is, between what the patient actually take) then contact the family bring in the pill box

### Probing Questions:

- **✓** Ask about scheduled medications.
- **✓** Ask about PRN medications.
  - Which medicines do you take only sometimes?
  - What symptoms prompt you to take them?
  - How many doses per week do you take?
  - What’s the most often you are allowed to take it?
  - Do you often take something for headaches? Allergies? To help you feel asleep? When you get a cold? For heartburn? For constipation?
- **✓** Assessing the purpose of each medication may lead to additional prompts.
  - What is each medicine for?
  - Do you take any other medications for that?
  - Ask about medications for specific conditions that the patient has.
    - What medicines do you take for your diabetes, high blood pressure, etc.?
  - Ask about medications prescribed by subspecialists who follow the patient.
    - Does your [arthritis doctor] prescribe any medications for you?
  - Ask about medications that are easy to forget.
    - Do you take any inhalers, nebulizers, nasal sprays, ointments, creams, eye drops, ear drops, patches, injections or suppositories?
    - Do you take any medications in the evening or at night?
    - Do you take any medicines once a week or once a month?
  - Ask about non-prescription products.
    - Which medicines do you take that don’t require a prescription? (Over-the-counter medicines, vitamins, herbal, and minerals)
  - Assess recent medication use and adherence.
    - When did you take the last dose of each of your medicines?
    - Tell me about any problems that you’ve had taking these medicines as prescribed (non-compliance).
    - Many patients have difficulty taking their medications exactly as they should every day. In the last week, how many days have you missed a dose of your [medication]?
Primary Outcome

• # of potentially harmful unintentional medication discrepancies per patient

• Physician adjudicators categorize discrepancies by
  – timing (admission vs. discharge)
  – type (omission, additional medication, change in dose, route, frequency, or formulation, or other)
  – reason (history vs. reconciliation error)
  – potential for harm
  – potential severity
# Program Evaluation

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Focus Groups</th>
<th>Interviews</th>
<th>Fidelity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro- &amp; Micro-organizational Structure</td>
<td>Groups of stakeholders during first site visit</td>
<td>1 on 1 with champions, key leaders at first site visit and by phone later</td>
<td>By direct observation of mentor at both site visits</td>
</tr>
<tr>
<td>Safety culture, work climate, teamwork</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction with process &amp; software, perceptions of errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job satisfaction and burnout</td>
<td></td>
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</tbody>
</table>
## Baseline Results

<table>
<thead>
<tr>
<th>Discrepancy type</th>
<th>All sites (n=488)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total discrepancies per patient (all types)</td>
<td>3.3</td>
<td>2.0-4.5</td>
</tr>
<tr>
<td>Admission</td>
<td>1.6</td>
<td>0.9-2.4</td>
</tr>
<tr>
<td>Discharge</td>
<td>1.7</td>
<td>1.1-2.1</td>
</tr>
<tr>
<td>History discrepancies</td>
<td>1.6</td>
<td>0.4-3.1</td>
</tr>
<tr>
<td>Admission</td>
<td>0.7</td>
<td>0.3-1.3</td>
</tr>
<tr>
<td>Discharge</td>
<td>0.9</td>
<td>0.4-1.8</td>
</tr>
<tr>
<td>Reconciliation discrepancies</td>
<td>1.7</td>
<td>0.3-2.6</td>
</tr>
<tr>
<td>Admission</td>
<td>0.9</td>
<td>0.1-1.5</td>
</tr>
<tr>
<td>Discharge</td>
<td>0.8</td>
<td>0.3-1.9</td>
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</tbody>
</table>
Adjudicated Results

<table>
<thead>
<tr>
<th>All medications</th>
<th>All sites (N=488)</th>
<th>Range</th>
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<tr>
<td>Potentially harmful discrepancies</td>
<td>0.34</td>
<td>0.20-0.60</td>
</tr>
<tr>
<td>Admission</td>
<td>0.10</td>
<td>0.03-0.14</td>
</tr>
<tr>
<td>Discharge</td>
<td>0.24</td>
<td>0.11-0.47</td>
</tr>
<tr>
<td>History Discrepancies</td>
<td>0.10</td>
<td>0.01-0.14</td>
</tr>
<tr>
<td>Reconciliation Discrepancies</td>
<td>0.24</td>
<td>0.07-0.58</td>
</tr>
<tr>
<td>Potential severity: admission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant</td>
<td>0.08</td>
<td>0.03-0.11</td>
</tr>
<tr>
<td>Serious</td>
<td>0.02</td>
<td>0.00-0.08</td>
</tr>
<tr>
<td>Potential severity: discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant</td>
<td>0.18</td>
<td>0.05-0.28</td>
</tr>
<tr>
<td>Serious</td>
<td>0.07</td>
<td>0.01-0.09</td>
</tr>
</tbody>
</table>
50% could benefit from refresher classes on medication reconciliation
50-70% never received training in how to take a BPMH
80% never received feedback on the quality of pre-admission medication histories
60% not given sufficient time to take a BPMH
60-75% not given sufficient time to do med rec well in high-risk patients
70% feel hospital doesn’t have enough staff allocated for med rec in high-risk patients
50% never been trained in ‘teach-back’ or use it as part of DC education
50% never received training in communicating with low health literacy patients
Intervention Components

• Medication Reconciliation Bundle
  – “Best Possible Medication History”
  – Reconciliation at Discharge
  – Patient Counseling
  – Forwarding information to next provider

• Risk Assessment

• Intense vs. Standard Bundle depending on patient risk

• Training providers in taking a BPMH and in performing discharge counseling

• Improving access to preadmission medication sources
  – Encouraging patient-owned medication lists
  – Facilitating access to other medication sources (e.g., pharmacies)

• Other high-risk, high-reward interventions
  – Implementing and improving HIT
  – Utilizing social marketing
  – Engaging community resources
Case Study #1

• **Medication Reconciliation Bundle**
  – “Best Possible Medication History”
  – Reconciliation at Discharge
  – Patient Counseling
  – Forwarding information to next provider

• **Risk Assessment**

• **Intense vs. Standard Bundle depending on patient risk**

• **Training providers in taking a BPMH and in performing discharge counseling**

• **Improving access to preadmission medication sources**
  – Encouraging patient-owned medication lists
  – Facilitating access to other medication sources (e.g., pharmacies)

• **Other high-risk, high-reward interventions**
  – Implementing and improving HIT
  – Utilizing social marketing
  – Engaging community resources
• Success Factors

1. Medication safety a priority at organizational level
   a. Medication Reconciliation Assistant (MRA) Program
      * 70-85% patients admitted to intervention unit receive a high-intensity BPMH
   b. Medication Counseling (SafeMed) Program
      * 10% of patients discharged from intervention unit receive post-discharge medication review & counseling
Case Study #1

MRA Work at Workstation (15–20 min)
A. ID next patient, create initial med list (2 min)
B. Request info from collateral sources (5 min)
C. Collect Info via phone or email-fax
D. Build pre-admission med list in EMR (5–10 min)
E. Print hardcopy, place in chart for provider, and document activities (5 min)

Output: BPMH-grade medication list ready for admitting provider

Provider Work (5 min)
A. Perform medical decision making
B. Order admission medications (5 min)

Output: reconciled admission medication list with appropriate meds continued, held, or changed

MRA Work w/Patient (Interview)
A. Take medication history
B. Identify collateral sources of info

Output: modified med list and identified collateral sources

- MRAs – 4 FTEs, pharmacy techs w/retail pharmacy experience
- Stationed in ED
- Aim to see every ED patient admitted to hospital
- Do BPMH for 60-90 patients / day (535-bed community hospital)
- Each MRA sees 20-30 patients / 8-hour shift
- 3 shifts / day Mon-Thur and 2 shifts / day Fri - Sun
Safe Med Program*

- Recently hospitalized high risk patients
- Pharmacist outreach for meds education and management
  1. Duplicate meds
  2. Unnecessary meds
  3. Cost effective alternatives
  4. Identify potential oversights
  5. Assess & improve adherence
  6. Plug-in to patient assistance programs as needed
  7. Communicate with PCPs

*Available to patients of PCPs in Novant Medical Group
Case Study #1

• Success Factors

2. MARQUIS QI Team Leadership

a. Co-chair is VP of Clinical Improvement
   *Able to push BPMH training video and pocket cards to nurses, pharmacy staff, hospitalists

b. Co-chair clinical pharmacist from intervention unit
   *Able to create a daily list of patients on intervention unit who did not get BPMH from MRA
   *Able to create a daily list of patients on intervention unit who are high-risk and need high intensity DC medication counseling
• Barriers

  – Available, competent BPMH-takers
    
    o Who will perform BPMH for the 2-8 patients/day on
      intervention unit who bypassed the ED’s MRA program?
    
    o How do you ensure BPMH competence for these people?
  
  – Scrap & re-work (gold vs. garbage conundrum)
    
    o How does discharging provider discern if admission
      medication list is the product of a BPMH, i.e. gold?
    
    o Or the opposite, i.e. garbage?
    
    o Not knowing means a diligent provider must do a BPMH at
      the time of discharge (scrap & re-work = waste)
Case Study #1

• Barriers

  - Role clarity: who does what and when?
  - Competency training: how do we train the right people for their roles, i.e. BPMH and Discharge Medication Counseling?
  - Ongoing competency training: how do you reach new hires, i.e. BPMH and Discharge Medication Counseling?

Example: one new role (new unit-based Admit/Discharge RN) was unfamiliar with Teach Back despite the organization having rolled out a Teach Back educational offering 2 years ago
Case Study #1

• Lessons

  – **We can determine oversights in real-time**
    o MARQUIS pharmacist can generate list of:
      1. High risk patients
      2. Patients who still need BPMH (i.e. not seen by MRA in ED)
      3. Patients who need medication counseling at discharge

  – **We can determine needs so we can recommend rational resource allocation to leadership**
    o 4-8 patients / day on intervention unit still need a BPMH
    o 1-2 patients / day on intervention unit qualify for medication counseling at discharge
    o We know who these patients are, so could address in real-time
Case Study #1

Objective 1: determine if possible to eradicate unintentional medication discrepancies
Objective 2: determine resource requirements necessary to do so

Intervention 1

Intervention 2

Intervention 1 = MRA performs BPMH every day on 6A patients who arrived to the unit without a BPMH (~4-6 patients/day, 20-30 min/patient, 8-12 wks)

Intervention 2 = 6A clinical pharmacist performs medication counseling on high risk 6A patients not referred to SafeMed (~1-2 patients/day, 20-30 min/patient, 4-6 wks)
Case Study #1

• Lessons (continued)

  – **Addressing issues of training and competency assessment:** Created simulation-based training
    - Role-play by instructor with script
      - Only remember certain medications when prompted
    - Access to sources of medication information when asked
    - Checklist of desired behaviors
    - Gold-standard medication list when completed
    - Pilot-tested at Vanderbilt, not yet in use at Site #1

  – **Need for documentation of quality of and sources used to create medication history**
Case Study #1: Preliminary Results
## Preliminary Results

<table>
<thead>
<tr>
<th>Unintentional Discrepancies</th>
<th>Pre-Intervention (N=126)</th>
<th>Concurrent Control (N=119)</th>
<th>Intervention (N=127)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total per patient</td>
<td>4.5</td>
<td>5.2</td>
<td>3.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Due to history errors</td>
<td>3.1</td>
<td>4.0</td>
<td>2.6</td>
<td>0.002</td>
</tr>
<tr>
<td>Due to reconciliation errors</td>
<td>1.4</td>
<td>1.2</td>
<td>0.8</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Potentially harmful discrepancies</th>
<th>Total per patient</th>
<th>Due to history errors</th>
<th>Due to reconciliation errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total per patient</td>
<td>0.25</td>
<td>0.13</td>
<td>0.12</td>
</tr>
<tr>
<td>Due to history errors</td>
<td>0.32</td>
<td>0.29</td>
<td>0.03</td>
</tr>
<tr>
<td>Due to reconciliation errors</td>
<td>0.09</td>
<td>0.06</td>
<td>0.02</td>
</tr>
</tbody>
</table>

* Intervention compared with both controls combined
Intervention Components

• Medication Reconciliation Bundle
  – “Best Possible Medication History”
  – Reconciliation at Discharge
  – Patient Counseling
  – Forwarding information to next provider

• Risk Assessment

• Intense vs. Standard Bundle depending on patient risk

• Training providers in taking a BPMH and in performing discharge counseling

• Improving access to preadmission medication sources
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  – Facilitating access to other medication sources (e.g., pharmacies)

• Other high-risk, high-reward interventions
  – Implementing and improving HIT
  – Utilizing social marketing
  – Engaging community resources
Case Study #2

• Medication Reconciliation Bundle
  – “Best Possible Medication History”
  – Reconciliation at Discharge
  – Patient Counseling
  – Forwarding information to next provider

• Risk Assessment

• Intense vs. Standard Bundle depending on patient risk

• Training providers in taking a BPMH and in performing discharge counseling

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• Other high-risk, high-reward interventions
  – Implementing and improving HIT
  – Utilizing social marketing
  – Engaging community resources
Case Study #2

• Success Factors

MARQUIS QI Team Leadership

a. Co-chair is physician Chief Quality Officer
   *Able to push BPMH training video and pocket cards to nurses, pharmacy staff, hospitalists

b. Co-chair is NP HF Discharge Specialist
   *Able to perform project management

c. Engaged, broad-reaching QI team
   *Pharmacy director, passionate pharmacy tech, hospitalist, nurse champion
Case Study #2

• Successes

1. Offered education to frontline providers and nurses: BPMH and best-practice discharge counseling (using MARQUIS materials)

2. Created new hospital Medication Reconciliation Policy setting out expectations for who does what and by when

3. Determined resources required to perform BPMH on high-risk patients and built business case to pay for new MRA program (CEO recently approved 1.5 FTE pharmacy techs)

4. Convinced IS to acquire new EMR functionality to print patient discharge med list that clearly depicts medications as continued, changed, new, & stopped (see Lessons)

5. Developing agreement with Walgreen’s to send clinical pharmacists to perform pre-discharge medication counseling
Case Study #2

• Successes
  – New MRA Program
    • **Description**: pharmacy technicians to perform BPMH and assessment of compliance in high risk patients admitted to EJCH
    • **Capacity**: 50 high-risk patients per week
    • **Primary benefit**: reduce hospital ADEs causing preventable harm and cost
    • **Secondary benefit**: workforce efficiency gains
      1. Nurse will save 10-40 minutes / patient at time of admission
      2. Physician will save:
         a. 10-40 minutes / patient at time of admission
         b. 5-20 minutes / patient at time of discharge
Case Study #2

- **Successes**
  - Proposed new MRA Program

**Financial case: based on inpatient ADEs avoided**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of unintentional medication discrepancies in admission orders per patient based on MARQUIS Study</td>
<td>2.0</td>
</tr>
<tr>
<td>Number of inpatient admissions per year</td>
<td>5,000</td>
</tr>
<tr>
<td>Potential medication errors per year that can be avoided with improved pharmacist-conducted medication histories and reconciliation</td>
<td>10,000</td>
</tr>
<tr>
<td>% of avoided medication errors that would be harmful to the patient^A</td>
<td>0.90%</td>
</tr>
<tr>
<td>% of errors that can be prevented by pharmacists</td>
<td>75%</td>
</tr>
<tr>
<td>Total avoided harmful medication errors per year</td>
<td>68</td>
</tr>
<tr>
<td>Cost of harmful medication error to hospital(^B)</td>
<td>$4,655</td>
</tr>
<tr>
<td>Annual savings to hospital as a result of avoided harmful medication errors</td>
<td>$314,213</td>
</tr>
<tr>
<td>Time (in minutes) required per admission for pharmacist to complete a medication admission history and perform medication reconciliation</td>
<td>21</td>
</tr>
<tr>
<td>Pharmacist tech MRA hours required per year to perform medication reconciliation</td>
<td>1,750</td>
</tr>
<tr>
<td>MRA FTE required per year to perform medication reconciliation</td>
<td>0.8</td>
</tr>
<tr>
<td>MRA FTE needed to add to budget to staff FTEs (benefit time, etc)</td>
<td>1.1</td>
</tr>
<tr>
<td>MRA salary(^C)</td>
<td>40,000</td>
</tr>
<tr>
<td>MRA fringe benefit rate</td>
<td>35%</td>
</tr>
<tr>
<td>Total labor cost per MRA FTE</td>
<td>$54,000</td>
</tr>
<tr>
<td>Total labor cost for all additional pharmacist medication reconciliation FTEs</td>
<td>$59,063</td>
</tr>
</tbody>
</table>

**Net Savings to Hospital**

$255,150
Case Study #2

• Barriers
  – Available, competent BPMH-takers
    o Who will perform BPMH for the high risk patients?
    o How do you ensure BPMH competence in each of them?
  – Scrap & re-work (gold vs. garbage conundrum)
    o How does discharging provider discern if admission medication list is the product of a BPMH, i.e. gold?
    o Or the opposite, i.e. garbage?
    o Not knowing means a diligent provider must do a BPMH at the time of discharge (scrap & re-work = waste)
Case Study #2

• Barriers

  – New EMR created problems
    o Paper system had effect of making admitting physician accountable to the initial medication history
      – As admitting physician you signed your name at the bottom of the admission med rec form
      – As a discharging physician you could readily discern which colleague performed the initial medication history
      – With electronic format, accountability for the admission medication list became diffuse; the new EMR made the admission med list feel like a “wiki” (responsibility diffused and accountability suffered)
    o Discharge medication list produced by EMR lost the ability to group medications by continued, change, stopped, or new (helpful to neither the patient nor the professional coming along to do discharge medication counseling)
Case Study #2

EMR Introduces Problems with Discharge Medication List
Case Study #2

EMR Introduces Problems with Discharge Medication List

Unintentional Discrepancies

- Unintentional Admission Discrepancies
- Unintentional Discharge Discrepancies
- Unintentional Admit and Discharge Discrepancies

Month

Unintentional Discrepancies Per Patient

## Case Study #2

<table>
<thead>
<tr>
<th>Unintentional Discrepancies</th>
<th>Pre-Intervention (N=119)</th>
<th>Intervention Pre-EMR (N=93)</th>
<th>Post-EMR (N=166)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total per patient</td>
<td>2.0</td>
<td>2.4</td>
<td>3.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Due to history errors</td>
<td>1.7</td>
<td>2.0</td>
<td>2.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Due to reconciliation errors</td>
<td>0.3</td>
<td>0.3</td>
<td>1.3</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Total Potentially harmful discrepancies**

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention (N=119)</th>
<th>Intervention Pre-EMR (N=93)</th>
<th>Post-EMR (N=166)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total per patient</td>
<td>0.20</td>
<td>0.56</td>
<td>1.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Due to history errors</td>
<td>0.13</td>
<td>0.46</td>
<td>0.60</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Due to reconciliation errors</td>
<td>0.07</td>
<td>0.10</td>
<td>0.51</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Pre-EMR vs. Post-EMR*
Case Study #2

• Barriers
  – Role clarity: who does what and when?
  – Competency training: how do we train the right people for their roles, i.e. BPMH and Discharge Medication Counseling?
  – Ongoing competency training: how do you reach new hires, i.e. BPMH and Discharge Medication Counseling?
Case Study #2

• Lessons

  – Admission: Scrap/Re-Work Lesson
    
    o As a discharging provider you must either repeat the medication history yourself, or trust that it was done to a BPMH standard
    
    o As with site #1, need to document quality of and sources used to create medication history (paper and EMR med rec applications would need to support this)

  – Discharge: Continue/Change/Stop/New Lesson
    
    o Discharge medication lists matter more than we thought
    
    o List given to patients (and relied upon by those who do discharge medication counseling) must clearly depict meds that are continued, changed, stopped, or started (and PAML must be correct prior to discharge)
Conclusions

• The MARQUIS toolkit plus mentored implementation provides a clear guide on how to improve the medication reconciliation process

• Potential for improvement is clearly there

• Improvement requires at least some of the following:
  – Institutional support
  – A site champion
  – An engaged QI team
  – Pharmacy and/or nursing support

• An understanding of baseline practices and local adaptation of intervention components is required
Conclusions (continued)

- Need for clear delineation of roles and responsibilities among providers
- Need for clear communication and documentation
  - What needs to be done next, who is going to do it
- Ongoing need for training and competency assessment
- Need for clinical champions, real patient stories
  - This is about culture change
- “Measure-vention” can be a very powerful tool to improve outcomes
Conclusions (continued)

• HIT can be a mixed blessing

  – Evidence to support benefits usually from dedicated, stand-alone medication reconciliation applications

  – Can be beneficial when make it easier to

    o Access preadmission medication sources
    o Create a preadmission medication list (PAML)
    o Order admission medications from PAML
    o Order discharge medications from PAML and current medications
    o Compare medication lists across time, identify discrepancies
    o Create documentation that clearly explains differences between PAML and discharge medication orders
    o Forward medication information to next providers of care
Conclusions (continued)

• HIT can be a mixed blessing
  – But HIT can be counter-productive when it
    o Leads to diffusion of responsibility
    o Conflates the PAML with the sources used to create it so that editing the PAML by non-ordering providers becomes a problem
    o Does not document the quality of medication history
    o Does not support division of labor
    o Does not clearly document differences between preadmission and discharge medication lists (especially if the PAML cannot be updated prior to discharge)
  – Some limitations are due to the software itself, others to how it is implemented, and others to how it is used in practice
Conclusions (continued)

- Lessons for provincial, health system, and hospital leadership
  - Investments in medication reconciliation can have substantial returns on investment by reducing inpatient ADEs and readmissions
    - Pharmacy technician “medication reconciliation assistants” to take BPMHs in the ED for admitted patients
    - Pharmacists to do intensive discharge reconciliation and patient counseling in high-risk patients
  - Perhaps the best way to solve this problem is to have a universal, accessible, secure, on-line medical record system, at least for medications, allergies, and problems
    - Download to local EMR, modify, then upload back to the cloud
    - Single source of truth
    - Patients/caregivers could access it as well
Conclusions (continued)

• Lessons for hospital leadership
  – Some administrative support will be required at the hospital level
    o Provider training
    o QI project management
    o Ongoing, low-level data collection
    o Management of political issues
  – Some efficiencies can be gained through process redesign, clarification of roles and responsibilities, reducing redundancy, moving work to earlier in the process, etc.
  – However, this alone will not solve the problem
    o There is an amount of work that is required that has never been adequately resourced
    o The only way to solve this is to bring in more resources
### Table 1: ROI ASSUMPTIONS TABLE

The following assumptions are made about the "model" hospital. These assumptions drive all cost figures in the ROI analysis table below. Each hospital must provide its own information into this assumptions table to derive institution-specific estimates for the ROI analysis. Updating the assumptions table will automatically revise figures in the ROI table.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inpatient admissions per year</td>
<td>35,000</td>
</tr>
<tr>
<td>% of patients that are high-risk using MARQUIS criteria</td>
<td>25%</td>
</tr>
<tr>
<td>Number of patients that would need pharmacist discharge counseling</td>
<td>8750</td>
</tr>
<tr>
<td>Proportion of 30-day readmissions due to adverse drug events (A)</td>
<td>7%</td>
</tr>
<tr>
<td>Proportion of 30-day readmissions due to ADEs considered preventable or ameliorable (B)</td>
<td>65%</td>
</tr>
<tr>
<td>Expected proportion of 30-day readmissions due to ADEs that can be prevented by MARQUIS discharge counseling</td>
<td>22%</td>
</tr>
<tr>
<td>Number of 30-day readmissions that can be prevented per year</td>
<td>135</td>
</tr>
<tr>
<td>Cost of a readmission (e.g., under bundled payments and capitated contracts, not including VBP plus reduced risk of Medicare and Mass Health penalties)</td>
<td>$9,600</td>
</tr>
<tr>
<td>Annual savings to hospital as a result of avoided harmful medication errors</td>
<td>$1,293,600</td>
</tr>
<tr>
<td>Time (in minutes) required per admission for pharmacist to complete high-intensity pharmacist counseling (C)</td>
<td>39</td>
</tr>
<tr>
<td>Pharmacist hours required per year to perform medication reconciliation</td>
<td>5.68</td>
</tr>
<tr>
<td>Pharmacist FTE required per year to perform medication reconciliation</td>
<td>2.7</td>
</tr>
<tr>
<td>Pharmacist FTE needed to add to budget to staff FTEs (benefit time, etc)</td>
<td>3.6</td>
</tr>
<tr>
<td>Pharmacist salary</td>
<td>$100,000</td>
</tr>
<tr>
<td>Pharmacist fringe benefit rate</td>
<td>35%</td>
</tr>
<tr>
<td>Total labor cost per pharmacist FTE</td>
<td>$135,000</td>
</tr>
<tr>
<td>Total labor cost for all additional pharmacist medication reconciliation FTEs</td>
<td>$479,883</td>
</tr>
</tbody>
</table>

C. Based on Novant Health Care experience
• Messages for providers
  – Medication reconciliation is not (just) a regulatory requirement: It is about medication safety
  – At the end of the day, you are responsible for making sure medication orders are correct
  – Medication reconciliation errors can undo a lot of otherwise excellent care
  – You do not need to do every step yourself, but you are responsible for the overall quality of the process
  – Help create systems that improve medication reconciliation quality
  – Know when to get help from other providers
Thank You!

JSCHNIPPER@PARTNERS.ORG
Questions

1. Raise your hand and we may be able to open your phone line

2. Send feedback via the “chat” box
   - Select “All participants”
   - Type message
   - Click “Send”
Please complete our poll
Upcoming MedRec Webinars

Feb 11, 2014  Engaging Patients in MedRec

- Alberta Health Services
- North Bay Regional Health Centre
- Sunrise Health Region

March 25, 2014  MedRec in Home Care