Effects of community-based primary care visits and medication reconciliation after discharge on risk of 30-day hospital readmissions in Ontario

LUKE MONDOR, MSc

2015 CAHSPR CONFERENCE
MAY 28, 2015
MONTREAL, QC
Research Team & Acknowledgements

Walter P. Wodchis PhD\textsuperscript{1,2,3,4}; Luke Mondor, MSc\textsuperscript{1,2}; Ashley Corallo, MPH\textsuperscript{1}; Qi Li, MASc\textsuperscript{1}; Jun Guan, MSc\textsuperscript{1}; Astrid Guttmann, MDCM MSc\textsuperscript{1,2,3,5,6}

1. Institute for Clinical Evaluative Sciences (ICES), Toronto, ON
2. Health System Performance Research Network (HSPRN), Toronto, ON
3. Institute of Health Policy, Management and Evaluation (IHPME), University of Toronto, Toronto, ON
4. Toronto Rehabilitation Institute, Toronto, ON
5. Division of Paediatric and Emergency Medicine, The Hospital for Sick Children, Toronto, ON
6. Department of Paediatrics, University of Toronto, Toronto ON

Funding provided by the Ontario Ministry of Health and Long-Term Care

No conflicts of interest to disclose
Background & Motivation

• 30-day readmissions are common, costly and potentially preventable

• Those occurring within 30 days after discharge may be attributable, in part, to gaps in coordination of care or communication between healthcare providers as a patient transitions away from acute care

• Early physician follow-up (within 7 days) can improve care transitions and reduce potentially preventable hospital readmissions
  • Heart failure (HF)

• Research has been narrowly-focused (i.e., condition-specific, generally older patients) and less is known about post-discharge strategies that can be implemented more broadly
Research Objective

To examine the effectiveness of early community-based follow-up care on 30-day hospital readmissions, including

- Primary care physician visits,
- Usual provider of care (UPC) visits, and
- Receipt of medication reconciliation from a community pharmacist

...among patients discharged from acute care in Ontario to home after hospitalization for a broad set of clinical conditions
Methods

• Data sources: population-based health administrative data in Ontario
• Study design: cohort study
• Population: patients discharged from acute care to home from 2008 to 2012 with cardiac conditions other than heart attack, CHF, COPD, pneumonia, diabetes, stroke, or GI disease (25 Case Mix Groups)
• Outcome: 30-day all-cause (unplanned) hospital readmission
• Exposure: (exogenous) annual hospital-specific rate of community-based follow-up care
  1. Primary care physician – incl. GP/FP, Geriatrician, or Pediatrician visits (OHIP)
  2. Usual provider of care (UPC) - based on (A) patient rostering, or (B) volume of physician services prior to acute care
  3. Medication reconciliation – incl. claims for the MedsCheck program (ODB)

Hospitals assigned a quartile ranking – used for analysis
Statistical Analysis

- Cox proportional hazards models
  - Adjusting for patient-level factors:
    - Age
    - Sex
    - Residence (Urban/Rural)
    - Income quintile
    - Discharge year & day
    - Charlson score
    - Prior hospitalizations
    - Length of stay
  - Robust standard errors to account for clustering
- Sensitivity analysis (selected)
  - Among patients at high risk of readmission (LACE Index>10)
### Results: Patient characteristics at discharge

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>TOTAL</th>
<th>Not Readmitted</th>
<th>Readmitted</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=488,442</td>
<td>N=436,587 (89.4%)</td>
<td>N=51,855 (10.6%)</td>
<td></td>
</tr>
<tr>
<td>Age (years), Mean ± SD</td>
<td>62.69 ± 22.87</td>
<td>62.05 ± 23.14</td>
<td>68.02 ± 19.63</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>240,041 (49.1%)</td>
<td>213,997 (49.0%)</td>
<td>26,044 (50.2%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Clinical Condition, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac Conditions</td>
<td>83,949 (17.2%)</td>
<td>77,301 (17.7%)</td>
<td>6,648 (12.8%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>40,432 (8.3%)</td>
<td>33,467 (7.7%)</td>
<td>6,965 (13.4%)</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>48,517 (9.9%)</td>
<td>42,272 (9.7%)</td>
<td>6,245 (12.0%)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>21,671 (4.4%)</td>
<td>19,891 (4.6%)</td>
<td>1,780 (3.4%)</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal Disease</td>
<td>189,795 (38.9%)</td>
<td>168,717 (38.6%)</td>
<td>21,078 (40.6%)</td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>70,183 (14.4%)</td>
<td>63,397 (14.5%)</td>
<td>6,786 (13.1%)</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>33,895 (6.9%)</td>
<td>31,542 (7.2%)</td>
<td>2,353 (4.5%)</td>
<td></td>
</tr>
<tr>
<td>Prior Hospitalization, n(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No hospitalization</td>
<td>400,440 (82.0%)</td>
<td>365,737 (83.8%)</td>
<td>34,703 (66.9%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>0-30 days</td>
<td>50,553 (10.3%)</td>
<td>39,954 (9.2%)</td>
<td>10,599 (20.4%)</td>
<td></td>
</tr>
<tr>
<td>31-60 days</td>
<td>22,025 (4.5%)</td>
<td>17,988 (4.1%)</td>
<td>4,037 (7.8%)</td>
<td></td>
</tr>
<tr>
<td>61-90 days</td>
<td>15,424 (3.2%)</td>
<td>12,908 (3.0%)</td>
<td>2,516 (4.9%)</td>
<td></td>
</tr>
<tr>
<td>Charlson Score, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 score</td>
<td>288,872 (59.1%)</td>
<td>265,782 (60.9%)</td>
<td>23,090 (44.5%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>1-2 score</td>
<td>147,305 (30.2%)</td>
<td>128,949 (29.5%)</td>
<td>18,356 (35.4%)</td>
<td></td>
</tr>
<tr>
<td>3+ score</td>
<td>52,265 (10.7%)</td>
<td>41,856 (9.6%)</td>
<td>10,409 (20.1%)</td>
<td></td>
</tr>
<tr>
<td>LOS (days), Mean ± SD</td>
<td>5.54 ± 7.64</td>
<td>5.37 ± 7.49</td>
<td>6.99 ± 8.64</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>High Risk, n (%)</td>
<td>122,945 (25.2%)</td>
<td>101,274 (23.2%)</td>
<td>21,671 (41.8%)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Abbreviations:** LOS = length of stay; High Risk = LACE score ≥10
Figure

Hospital-Level Rate of Early (7-day) Follow-up to any Primary Care Physician, a Usual Provider of Care (UPC), or Receipt of Medication Reconciliation (by year)

29.9% (24.5-34.5%)  
23.8% (20.0-27.9%)  
1.7% (1.1-2.3%)  

A. Primary Care Physician  
B. Usual Provider of Care*  
C. MedsCheck  

*Among patients enrolled in a primary care model, or assigned to physician based on volume of services 2 years prior to index admission (n=472,375)  
Median and Interquartile Range (IQR) over all years shown
Findings: Effect of follow-up care on readmission

<table>
<thead>
<tr>
<th>Quartile</th>
<th>7-Day Early Follow-Up, All Patients (n=488,442)</th>
<th>p</th>
<th>7-Day Early Follow-Up, High Risk Patients (n=122,945)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adj. Hazard Ratio*</td>
<td></td>
<td>Adj. Hazard Ratio*</td>
<td></td>
</tr>
<tr>
<td>Any Primary Care Physician Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (lowest)</td>
<td>1 (Reference)</td>
<td></td>
<td>1 (Reference)</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>0.997 (0.950-1.046)</td>
<td>0.896</td>
<td>0.985 (0.944-1.028)</td>
<td>0.488</td>
</tr>
<tr>
<td>Q3</td>
<td>1.006 (0.960-1.055)</td>
<td>0.794</td>
<td>0.965 (0.921-1.012)</td>
<td>0.139</td>
</tr>
<tr>
<td>Q4 (highest)</td>
<td>0.951 (0.904-1.000)</td>
<td>0.052</td>
<td>0.961 (0.910-1.014)</td>
<td>0.148</td>
</tr>
<tr>
<td>Any Usual Provider of Care Visit¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (lowest)</td>
<td>1 (Reference)</td>
<td></td>
<td>1 (Reference)</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>1.004 (0.965-1.044)</td>
<td>0.855</td>
<td>0.962 (0.911-1.015)</td>
<td>0.156</td>
</tr>
<tr>
<td>Q3</td>
<td>0.981 (0.935-1.028)</td>
<td>0.416</td>
<td>0.945 (0.892-1.002)</td>
<td>0.057</td>
</tr>
<tr>
<td>Q4 (highest)</td>
<td><strong>0.930 (0.884-0.980)</strong></td>
<td><strong>0.006</strong></td>
<td><strong>0.929 (0.873-0.989)</strong></td>
<td><strong>0.021</strong></td>
</tr>
<tr>
<td>Medication Reconciliation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (lowest)</td>
<td>1 (Reference)</td>
<td></td>
<td>1 (Reference)</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>0.957 (0.903-1.015)</td>
<td>0.142</td>
<td>1.024 (0.959-1.093)</td>
<td>0.483</td>
</tr>
<tr>
<td>Q3</td>
<td><strong>0.937 (0.879-0.997)</strong></td>
<td><strong>0.041</strong></td>
<td>0.991 (0.931-1.055)</td>
<td>0.779</td>
</tr>
<tr>
<td>Q4 (highest)</td>
<td><strong>0.908 (0.851-0.968)</strong></td>
<td><strong>0.003</strong></td>
<td>0.993 (0.929-1.062)</td>
<td>0.842</td>
</tr>
</tbody>
</table>

*Multivariable models adjust for age (5-year categories), sex, urban/rural residence, income quintile, clinical condition at discharge (case mix group), year of discharge, weekday of discharge, prior hospitalizations in last 30, 60 and 90 days, Charlson score (ordinal variable, 0, 1-2, 3 or more diagnoses), and index hospitalization length of stay 7 days or more

¹Among patients enrolled on a physician roster or affiliated with a physician based on volume of outpatient services (n=472,375 in full population, and n= 118,882 in high risk population)
Summary & Interpretation

• Primary care follow-up visits:
  • Large hospital-level variability
  • Highest rates of early follow-up to a patient’s UPC associated with lower risk of 30-day readmission
    • Continuity of care

• Medication reconciliation after discharge:
  • Very low follow-up rates and little variability
  • Highest rates of early follow-up associated with lower risk of readmission

• Among those at high risk of readmission:
  • Only early follow-up to UPC remained statistically significant

• Most significance requires achieving highest levels of early follow-up
Strengths & Limitations

• Large database
• Exogenous exposure

But…

• Findings are subject to residual and unmeasured confounding
• Quartile approach: loss of information and power
Conclusions

• Timely primary care visits with a familiar physician and medication reconciliation with a community pharmacist are key activities and could be encouraged by hospitals and policy-makers to reduce 30-day unplanned readmissions

• But, need to reach high-levels of compliance to achieve desirable effect
Thank You
References

Canadian Institute for Health Information. (2012). All-Cause Readmission to Acute Care and Return to the Emergency Department. Ottawa, ON. From: https://secure.cihi.ca/free_products/Readmission_to_acutecare_en.pdf


### Supplemental Information: Codes for Selected CMGs and MedsCheck

<table>
<thead>
<tr>
<th>DIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>93899979</td>
<td>Annual medication review</td>
</tr>
<tr>
<td>93899981</td>
<td>Hospital discharge medication review</td>
</tr>
<tr>
<td>93899982</td>
<td>Pharmacist decision medication review</td>
</tr>
<tr>
<td>93899983</td>
<td>Physician or registered nurse referral medication review</td>
</tr>
<tr>
<td>93899984</td>
<td>Planned hospital admission medication review</td>
</tr>
<tr>
<td>93899985</td>
<td>Annual Long-Term Care medication review</td>
</tr>
<tr>
<td>93899986</td>
<td>Quarterly Long-Term Care medication review</td>
</tr>
<tr>
<td>93899987</td>
<td>Annual at home medication review</td>
</tr>
<tr>
<td>93899988</td>
<td>Diabetes annual medication review</td>
</tr>
<tr>
<td>93899989</td>
<td>Diabetes follow-up medication review</td>
</tr>
</tbody>
</table>

### CMG Description

#### Stroke (Age ≥ 45)
- 25 Hemorrhagic Event of Central Nervous System
- 26 Ischemic Event of Central Nervous System
- 28 Unspecified Stroke

#### COPD (Age ≥ 45)
- 139 Chronic Obstructive Pulmonary Disease

#### Pneumonia (All ages)
- 136 Bacterial Pneumonia
- 138 Viral/Unspecified Pneumonia
- 143 Disease of Pleura

#### Congestive Heart Failure (Age ≥ 45)
- 196 Heart Failure without Cardiac Catheter

#### Diabetes (All ages)
- 437 Diabetes

#### Cardiac CMGs (Age ≥ 40)
- 202 Arrhythmia without Cardiac Catheter
- 204 Unstable Angina/Atherosclerotic Heart Disease without Cardiac Catheter
- 208 Angina (except Unstable)/Chest Pain without Cardiac Catheter

#### Gastrointestinal CMGs (All ages)
- 288 Disorder of Biliary Tract
- 231 Minor Upper Gastrointestinal Intervention
- 248 Severe Enteritis
- 251 Complicated Ulcer
- 253 Inflammatory Bowel Disease
- 254 Gastrointestinal Hemorrhage
- 255 Gastrointestinal Obstruction
- 256 Esophagitis/Gastritis/Miscellaneous Digestive Disease
- 257 Symptom/Sign of Digestive System
- 258 Other Gastrointestinal Disorder
- 285 Cirrhosis/Alcoholic Hepatitis
- 286 Liver Disease except Cirrhosis/Malignancy
- 287 Disorder of Pancreas except Malignancy
- 288 Disorder of Biliary Tract