Predicting and Preventing Readmissions:

Opportunities & Challenges

Geraint Lewis  MD MPH FRCP FFPH
Senior Director
Clinical Outcomes and Analytics
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Overview

Introduction • Why is Walgreens interested in readmissions?

Challenge 1 • Who is at risk?

Challenge 2 • Who is amenable to preventive care?

Challenge 3 • Which interventions can prevent readmissions?

Challenge 4 • What about Roemer’s law?
Why is Walgreens Interested in Readmissions?
Perception

America’s #1 pharmacy retailer, Trusted for over 100 years.
Walgreens is

- Nearly 8,000 community pharmacies
- More than 8,500 total points of care
- Within 5 miles of 70% of the U.S. population
- #1 in worksite health centers
- #1 in health system pharmacies
- #1 in flu immunizations
- #1 in health testing services

- 6 million consumer visits daily
Why the Interest in This Topic?

**Problem**
- Ageing population
- Rising prevalence of chronic disease
- Cost pressures

**Opportunity**
- ~5% of patients account for 50% of emergency bed days
- Unplanned admissions are:
  - Expensive
  - Undesirable
  - Potentially avoidable

**Four Major Challenges**
- Where Walgreens may be able to add value
The annual cost of poor medication adherence in the US \(^1\):

Readmissions costs of poor adherence: $100 billion \(^2\)

\(^1\)Thinking Outside the Pillbox: A System-wide Approach to Improving Patient Medication Adherence for Chronic Disease. NEHI Research Brief, Aug. 2009

Far Beyond the Corner Drugstore

We have close relationships and interactions with every major stakeholder in healthcare

Health Plans  
Health Systems  
PBM  
Primary Care  
Government  
Consumers  
Employers
Challenge 1: Who is at Risk?
**Medicare Readmission Rates**

<table>
<thead>
<tr>
<th></th>
<th>% Population</th>
<th>Mean Age</th>
<th>% Male</th>
<th>% MH</th>
<th>PMPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 admissions</td>
<td>83.4</td>
<td>70</td>
<td>46</td>
<td>21</td>
<td>$315</td>
</tr>
<tr>
<td>0 readmissions</td>
<td>14.1</td>
<td>72</td>
<td>43</td>
<td>54</td>
<td>$2,636</td>
</tr>
<tr>
<td>1 readmission</td>
<td>1.8</td>
<td>72</td>
<td>45</td>
<td>65</td>
<td>$4,948</td>
</tr>
<tr>
<td>2+ readmissions</td>
<td>0.7</td>
<td>68</td>
<td>47</td>
<td>75</td>
<td>$8,078</td>
</tr>
</tbody>
</table>

Note. Data from 5% Medicare sample in 2010. %MH = proportion with mental health diagnosis

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Readmission Rates: Regional Distribution

% of Medicare beneficiaries with at least one 30-day readmission in 2010, by region

Note: Data from 5% Medicare sample in 2010. Inlayed state map from 2009 Dartmouth Atlas data.
Readmission Decay Curve

Cumulative survival probability for time to readmission

Note: Data from 5% Medicare sample in 2010.
Case study: UK Evercare Pilots

- A 2002 BMJ study* showed that Kaiser Permanente in California seemed to provide higher quality healthcare than the NHS at a lower cost

- Kaiser identifies high risk people in their population and offer them preventive care in the community aimed at avoiding hospital admissions

UK Evercare Pilots

- Comprehensive geriatric assessment, structured assessment tools, and a physical examination

- Individualized care plan agreed with the patient, PCP and other staff

- Patients were then monitored and supported in the community by a specialist nurse

*Feachem RG, Sekhri NK, White KL. Getting more for their dollar: a comparison of the NHS with California's Kaiser Permanente BMJ 2002;324:135-143
No reduction seen in:
- emergency admissions
- emergency bed days
- mortality

Importance of Accurate Case Finding

Halliday R. Department of Health analysis of Hospital Episode Statistics for England

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Importance of Accurate Case Finding

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importance of accurate case finding
Preventive Care Can Only Work if Offered to Individuals Who are Truly at Risk

Inaccurate Approaches:

- Threshold models (e.g. all patients aged >65 with 2+ admissions)
- Clinician referrals

Curry N, Billings J, Darin B, Dixon J, Williams M, Wennberg D. Predictive risk project literature review. London: King’s Fund, 2005
Referrals by Clinicians

Assessed the predictions made by
- Physicians
- Case managers
- Nurses

“...none of the AUC values were statistically different from chance”

LACE Model

Length of stay
Acuity
Comorbidity
ER visits in the last six months

C statistic = 0.684

1-point increase in the LACE score increases the odds of unplanned readmission by 18% (odds ratio 1.18, 95% CI 1.14–1.21)

van Walraven C, Dhalla IA, Bell C, Etchells E, Stiell IG, Zarnke K, Austin PC, Forster AJ. Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community. CMAJ. 2010 Apr 6;182(6):551-7
### Trade-off Between Sensitivity and PPV

<table>
<thead>
<tr>
<th>Cut-off score</th>
<th>Positive predictive value</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0.65</td>
<td>0.54</td>
</tr>
<tr>
<td>70</td>
<td>0.77</td>
<td>0.18</td>
</tr>
<tr>
<td>80</td>
<td>0.84</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Area under the ROC curve ("c-statistic") = 0.685

Billings et al. Case finding for patients at risk of readmission to hospital: development of algorithm to identify high risk patients. BMJ 2006;333:327

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"Most current readmission risk prediction models perform poorly…Efforts to improve their performance are needed.”

Implications

• A single, nationwide model is unfeasible
• Additional data points may improve predictive accuracy – possibly including pharmacy data
Challenge 2: Who is Amenable to Preventive Care?
Predictive Risk Model

Whole Population

Impactability Model

People at Risk

People at Risk who will benefit
## Approaches to Impactability Modelling

<table>
<thead>
<tr>
<th>Approach to Impactability Modelling</th>
<th>Efficiency</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prioritise patients with ACS conditions</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Prioritize patients with high “gap scores”</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Exclude “difficult” patients</td>
<td>✔</td>
<td>✗</td>
</tr>
</tbody>
</table>

Lewis GH. Impactibility Models: Identifying the Subgroup of High Risk Patients Most Amenable to Hospital Avoidance Programs. Milbank Quarterly 2010;88(2).

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## Impactability: Top 5 Diagnoses

Data from 5% Medicare sample in 2010.

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Top 5 Commonest Diagnoses by Cohort</th>
</tr>
</thead>
</table>
| 0 readmissions | 1. Pneumonia  
                 2. Osteoarthritis  
                 3. Septicemia  
                 4. Obstructive chronic bronchitis  
                 5. Urinary tract infection |
| 1 readmission  | 1. Pneumonia  
                 2. Obstructive chronic bronchitis  
                 3. Septicemia  
                 4. Urinary tract infection  
                 5. Acute kidney failure |
| 2+ readmissions| 1. Obstructive chronic bronchitis  
                 2. Pneumonia  
                 3. Congestive heart failure  
                 4. Septicemia  
                 5. Urinary tract infection |
% of people, by number of admissions/readmissions, who had recommended annual tests performed according to HEDIS guidelines, by disease category, in the previous year

<table>
<thead>
<tr>
<th>Condition:</th>
<th>CAD</th>
<th>HF</th>
<th>DM</th>
<th>DM</th>
<th>DM</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Test:</td>
<td>LDL</td>
<td>LDL</td>
<td>HbA1C</td>
<td>Eye</td>
<td>Albumin</td>
<td>Spirometry</td>
</tr>
<tr>
<td>0 admissions</td>
<td>77%</td>
<td>66%</td>
<td>76%</td>
<td>47%</td>
<td>33%</td>
<td>24%</td>
</tr>
<tr>
<td>0 readmissions</td>
<td>63%</td>
<td>55%</td>
<td>64%</td>
<td>65%</td>
<td>42%</td>
<td>23%</td>
</tr>
<tr>
<td>1 readmission</td>
<td>57%</td>
<td>52%</td>
<td>58%</td>
<td>61%</td>
<td>39%</td>
<td>23%</td>
</tr>
<tr>
<td>2+ readmissions</td>
<td>51%</td>
<td>47%</td>
<td>52%</td>
<td>59%</td>
<td>34%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Data from 5% Medicare sample in 2010. Annual tests relate to HEDIS measures.
### Medication Fill Rate as a Potential Additional Predictor Variable

<table>
<thead>
<tr>
<th>100%</th>
<th>50% - 70%</th>
<th>48% - 60%</th>
<th>25% - 30%</th>
<th>15% - 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptions</td>
<td>Brought to Pharmacy</td>
<td>Picked up</td>
<td>Are Taken Properly</td>
<td>Are Refilled</td>
</tr>
</tbody>
</table>

33 to 69 percent of readmissions attributed to poor medication adherence*

Challenge 3: Interventions to Prevent Readmissions
“No single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalization”

Toronto Virtual Ward

• Offered to patients with a **high LACE score**

• Care at home using the **systems and staffing of a hospital ward** for 30 days post-discharge

• **Bridge** from hospital to home

• Randomized Controlled Trial underway


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Walgreens Interventions to Prevent Readmission

**Hospital Treatment**
1. Patient identified, enrolled in program
2. Generate medication history
3. Fill, alignment and reconciliation of discharge medications
4. Bedside delivery of medication and patient consultation

**Post-discharge Care**
5. Education follow up initiated 48-72 hours after discharge
6. Clinical therapy review approximately 10 days post discharge
7. Community integration at day 25 post discharge

8. Joint outcomes reporting with health system and IT partner
Challenge 4: Roemer’s Law
Roemer’s Law

Positive correlation between
- number of short-term general hospital beds available per 1,000 population; and
- number of hospital bed-days used per 1,000 population

Roemer’s Law: A hospital bed built is a hospital bed filled

Shain M, Roemer MI. Hospital costs relate to the supply of beds. Modern Hospital 1959;92(4):71-3
Dr. Geraint Lewis  
Senior Director,  
Clinical Outcomes & Analytics  
geraint.lewis@walgreens.com  

1415 Lake Cook Rd. / 4S / MS #L444  
Deerfield, IL  60015