Probabilistic Decision Support in Practice

David Buckeridge, MD PhD FRCPC
Associate Professor | McGill University
CIHR Chair | Applied Public Health Research, E-Health Interventions
Medical Consultant | Montreal Public Health, Quebec Public Health Institute
david.buckeridge@mcgill.ca
Prescribing Decision Support

- 50 to 90% of traditional drug alerts are ignored
  - Generic
  - Clinical implications unclear
- Probabilistic alerts can give clear, target message
  - Personalized alert
  - Tied to important outcome


Traditional
“Level 2 Alert: Age-Drug Interaction with Opiates”

Probabilistic
“15% chance this patient will fall on current dose of codeine”
Fall-Related Injuries in Older Adults are Common and Costly

34% fall each year (336,089)

10% result in serious injuries (36,000)

$653 million in health care costs

Quebec residents >64 years old with RAMQ drug insurance (988,497 in 2007)

RAMQ insurance; Rubenstein & Josephson, 2002, Clinics in Geriatric Medicine; www.cdc.gov/npic/factsheets/fallcost.htm
Psychotropic Medications Cause Fall-Related Injuries

Increase in Risk of Fall-Related Injury per 100

- Any Psychotropic
- Antidepressant
- Benzodiazepine

Adverse Drug Events in Community are Preventable at Time of Prescribing

Proportion of Adverse Drug Events that are Preventable

Timing of Error Leading to a Preventable Adverse Drug Event

Gait & balance
Lower extremity weakness
Cognitive impairment
Number of falls related injuries
Age, gender

Training set:
Model development
N=403,339 (70%)

Test set:
Assess predictive validity
N=172,860 (30%)

Adjusted Risk Factors for Fall Related Injury

Percent Increase in Risk of Fall Related Injury

Risk of Injury

Modifiable

Non Modifiable

Previous Fall
Cognition
Age (5 yr)
Gait
Female
Opiods, Low
Codeine
Oxycodone
Benzo, Long
SSRI
Antipsychotics
### Risk factors
- **Age:** 78
- **Gender:** F
- **Cognitive impairment:**
- **Gait Balance:**
- **Past fall-related injuries:**
- **Psychotropic Drugs:**

### Alert: increased risk of fall

**THERÈSE LACHUTE’s risk of fall-related injury within the year**

<table>
<thead>
<tr>
<th>Current risk (4.93)</th>
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**Lowest risk (3.56)**

* Risk for this patient may be under-estimated because of incomplete data

### Prescriptions
- **ACTONEL 35MG**
- **APO CYCLOBENZAPRINE 10MG**
- **APO FLURAZEPAM 30MG**
- **APO OXAZEPAM 15MG, 30MG**
- **CAL D 500MG+400UI**
- **CODEINE 15MG**
- **METFORMIN 500MG**
- **MODURET 50+5MG**

### Graph

- **Patient $ / RAM Q$: 0 / 0 0 / 0 0 / 0 0 / 0 57 / 101 6 / 14 0 / 0 0 / 0

### Prescriber actions
- **Represcribe**
- **Stop**
- **Prescription History**
- **Legend**
- **Print**

**Go to:** 2009-02
Randomized Controlled Trial Quantifies Risk Reduction

Greatest change for patients at highest risk

Change of -0.17 (-0.32 to -0.02) in risk of injury per 1000

N=2,741 N=2,887

3.71 is the point where the effect of the risk of injury alert is the same as the conventional alert

Further Clinical Implementation

- Implementation with EMR vendor in Quebec and Multi-centered NIH-funded trial in the US
- Adaption to inpatient setting and other geographical locations
- Developing standard methods for predictive models via web services
Population Health Applications

• Guiding investigation of reportable diseases
  – Focusing on tuberculosis cases resulting from recent transmission
  – Consider sexual transmission in enteric diseases

• Guiding population health decisions
  – Avoidable hospital readmissions through primary care


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