Automating Quality Measurement: HealthIT for Scalable, Comprehensive, and Routine Quality Assessment

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Quality of care in the US healthcare system is unacceptably low (IOM, JAMA 1998)

“…Serious and widespread quality problems exist throughout American medicine. These problems….occur in small and large communities alike, in all parts of the country, and with approximately equal frequency in managed care and fee-for-service systems of care. Very large numbers of Americans are harmed as a result…."

Background

- Developed and applied 439 quality measures to comprehensively “score” care quality from paper records.
  - Condition (30 conditions)
  - Type of care (Acute, Chronic, Prev)
  - Function of care (Dx, Tx, Screen, F/U)

- Manually reviewed medical records for ~7,000 participants recruited in 12 metropolitan regions of the US.
McGlynn et al: Findings

Quality of care across conditions

- Cataract
- Breast cancer
- Prenatal Care
- CHF
- Asthma
- Pneumonia
- STD
- Alc. Depend

% of recommended care delivered
McGlynn et al: Conclusions

- On average, Americans receive about 55% of recommended medical care processes.
- A key component of any solution is the routine availability of information on care delivery performance at all levels.
  - Electronic healthcare data could make possible automated assessment of care quality, eliminating sampling, surveying, manual review of charts.
Clinical Guidelines

Knowledge Base

Complex language-based propositions

Automated Assessment of Care Quality

Data on health and care delivery

Large % of the relevant data is non-standard or in text notes

Development of EMR-sensitive measures

Extraction of Guideline-relevant clinical events
Where will these data come from?

- Jennifer Hicks (McGlynn student) dissertation
  Analysis of the electronic data needed to construct the RAND QA measures
- Using **electronic claims data** alone, only 34% of the measures can be obtained
  Codes for billable services (includes diagnosis codes; procedure/lab performed, basic demographic information).
What’s missing?

- Clinically detailed information
  - Severity of a condition
  - Timing or results of procedure or lab
  - History
  - Counseling/education
  - Signs/symptoms
  - Physical examination
What does additional standard coded clinical data provide?

- Four additional types of standardized coded information were considered by Hicks as possible “add-on” to claims data.
  - Lab results
  - Procedure results
  - Vital signs
  - Signs/symptoms

- Estimated additional coverage of the 439 RAND quality measures
Coverage goes from about 34% to about 47% of measures
The remainder is found in either the templated- or free-text clinical notes of the EMR!
A system for automated, comprehensive, quality measurement

Clinical Guideline

Clinical Data Warehouse

EMR Adapter

CDA (XML)

MediClass

CDA w/ Clinical Events

Post processor

Events Dataset (Flatfile)

Measure Implementation

Measurements

Data Extraction

Clinical Event Identification

Quality Measurement
MediClass – A MEDIcal record CLASSifier

1. Takes in encounter record (CDA) and marks up each data section with identified clinical concepts.
2. Identifies concepts within text notes (using NLP algorithms) and coded elements of each encounter record.
3. Uses rules defining logical combinations of concepts to infer additional clinical events (classifications) of interest.

MediClass History

- We have been working on MediClass since 2003 and have applied it on numerous studies to:
  - Assess the 5A’s of smoking cessation in primary care
  - Detect vaccine adverse events
  - Characterize asthma prevalence and severity
  - Identify family and personal history of breast and ovarian cancer
  - Classify severity of diabetic retinopathy and macular edema
  - Measure outpatient asthma care quality
  - Measure obesity care quality in primary care
## Example: Assessing delivery of the 5 A’s

<table>
<thead>
<tr>
<th>5A Step</th>
<th>Operational definition</th>
<th>Example in free-text notes of EMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask</td>
<td>Identify tobacco status at every visit</td>
<td>“patient smokes 1ppd”</td>
</tr>
<tr>
<td>Advise</td>
<td>Advise all tobacco users to quit</td>
<td>“it is important for you to quit smoking now”</td>
</tr>
<tr>
<td>Assess</td>
<td>Determine patient’s willingness to make a quit attempt</td>
<td>“pt not interested in quitting smoking”</td>
</tr>
<tr>
<td>Assist</td>
<td>Aid the patient in quitting</td>
<td>“started pt on zyban”</td>
</tr>
<tr>
<td>Arrange</td>
<td>Schedule follow-up contact, in person or via telephone</td>
<td>“follow-up in 2 wks for quit progress”</td>
</tr>
</tbody>
</table>
How well does MC do classifying the 5 A’s in the EMR's of 4 different health plans?

Created a gold standard using 4x125 records and 5 trained coders

MC agreed with the gold standard 91% of the time

<table>
<thead>
<tr>
<th>5A step</th>
<th>Frequency in gold standard (n=500)</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask</td>
<td>417 (83%)</td>
<td>0.97 (0.95-0.99)</td>
<td>0.95 (0.88-0.98)</td>
</tr>
<tr>
<td>Advise</td>
<td>161 (32%)</td>
<td>0.68 (0.60-0.75)</td>
<td>1.0 (0.99-1.0)</td>
</tr>
<tr>
<td>Assess</td>
<td>55 (11%)</td>
<td>0.64 (0.50-0.76)</td>
<td>0.96 (0.94-0.98)</td>
</tr>
<tr>
<td>Assist</td>
<td>71 (14%)</td>
<td>1.0 (0.94-1.0)</td>
<td>0.82 (0.78-0.85)</td>
</tr>
<tr>
<td>Arrange</td>
<td>1 (0.2%)</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
A system for automated, comprehensive, quality measurement

Clinic Data Warehouse

EMR Adapter → CDA (XML) → CDA w/ Clinical Events → Post processor → Events Dataset (Flatfile) → Measure Implementation

Data Extraction

Clinical Event Identification

Quality Measurement
Quality Measurement Definitions

- Observation period = data window (3 yrs)
  - Qualification period is first portion (2 yrs)
- Each measurement represents the proportion of recommended care delivered to those eligible.
  - Denominator counts patients who qualify (within qualification period) to receive the care prescribed by the measure
  - Numerator counts patients in the denominator who actually receive the care (during some “measure interval” defined by the measure and relative to patients qualification for the measure).
## Asthma Care Quality Measure Set (partial)

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Denominator criteria [Index Date]</th>
<th>Numerator criteria [Measure Interval]</th>
<th>Operationalization Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with the diagnosis of persistent asthma should have a historical evaluation of asthma precipitants</td>
<td>Patients with persistent asthma [PA Qualification Date]</td>
<td>Patients with a subjective evaluation of precipitants or triggers [observation period]</td>
<td>Probably only found in the text progress notes</td>
</tr>
<tr>
<td>Patients with the diagnosis of persistent asthma should have spirometry performed annually</td>
<td>Patients with persistent asthma [PA Qualification Date]</td>
<td>Patients with orders for PFTs or documentation of office spirometry or PFT results [subsequent 12 mnths]</td>
<td>Numerator satisfied with documentation of referral to pulmonary specialist if no PFT known available</td>
</tr>
<tr>
<td>Patients with the diagnosis of persistent asthma should have available short acting beta2-agonist inhaler for symptomatic relief of exacerbations</td>
<td>Patients with persistent asthma [PA Qualification Date]</td>
<td>Prescription for a short acting beta-2 agonist to use PRN [subsequent 12 mnths]</td>
<td>Numerator satisfied if prior / existing active Rx; also combination Rx (i.e. Combivent) Exclusion if adverse reaction to b-agonists</td>
</tr>
<tr>
<td>All patients seen for an acute asthma exacerbation should have current medications reviewed</td>
<td>Patients with persistent asthma meeting criteria for outpatient exacerbation [Exac. Encounter]</td>
<td>Documentation that medications reviewed by provider [same visit]</td>
<td>Numerator satisfied if provider documents asthma specific medication history in notes or active mgmnt of current med list</td>
</tr>
</tbody>
</table>
A definition of “persistent asthma”

- Patient meets any of the following within any 12 month window during qualification period
  - 4 “fills” ordered of asthma-specific meds
  - 2 “fills” ordered of asthma-specific meds and 4 outpatient visits coded with asthma Dx
  - Asthma-related ED visit or hospitalization
  - Provider notation that patient has persistent asthma
  - Provider use of “home grown” persistent asthma Dx code
Quality Profile for Patient “X”

- Chest Exam Performed
- Spirometry Ordered or Discussed
- Medications Reviewed
- Asthma Med Ordered
- Subjective eval of precipitants
- Asthma visit
- Asthma exacerbation
- Persistent asthma notation

1/1/01 1/1/02 1/1/03 12/31/03

Persistent Asthma Exacerbation
Asthma Care Quality (ACQ) findings

- 22 Outpatient asthma measures identified
  - 18 (80%) have prototype implementations
    - 2 rely on complex assessment of “control”
    - 2 rely on knowing patients baseline PFT values

- 6 of the 18 (33%) require processing clinician’s text notes, another 6 are enhanced by it
  - In addition, roughly 6% of persistent asthma qualifications were found to rely on text processing
More ACQ findings

- **KPNW**
  - Multiple observation windows in 2001 – 2008 period
  - Roughly 45,000 study patients per window; 13,000 with persistent asthma

- **OCHIN**
  - 8 orgs with the EMR installed in 2006-2008 period
  - Single observation window (all data available)
  - Roughly 5,000 study patients; 1,000 with persistent asthma
Currently underway (ACQ)

➢ Preliminary measurements
  • Patients with the diagnosis of persistent asthma should have available Rx for beta2-agonist inhaler for symptomatic relief of exacerbations  --  86%
  • All patients seen for acute asthma exacerbation should have history taken or reviewed for prior episodes of respiratory failure requiring intubation  --  1.2%

➢ Validation of measures
  • Comparisons to manual chart review (~450 patients at each site)

➢ Outcomes studies
  • Death, Hospitalizations for asthma, Asthma exacerbations, Asthma-related utilization (visits, meds)
NHLBI has developed a 10 step clinical guideline for obesity care in adults

- Includes steps such as:
  - assess cardiovascular risk factors,
  - measure BMI,
  - counsel overweight and obese patient on weight loss and exercise.

- From this guideline we have:
  - produced a draft measure set,
  - conducted a consensus process involving clinicians from the represented organizations to refine the draft,
  - begun to operationalize the measure set
Next Steps

- Complete our ACQ study (scheduled for this fall).
- We need to streamline application development, and enable broader dissemination of the system.
  - New grant applications to produce tools that would accelerate this.
- We need to demonstrate that we can assess/measure quality intervention efforts
  - Identifying new funding and partners to conduct quality improvement trials using this infrastructure.
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