Update on the AHRQ Quality Indicators program for FY 2011

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AHRQ Validation Pilot: Goals

- Gather evidence on the scientific acceptability of the PSIs (to support National Quality Forum review)
  - Medical record review
  - Analyses of linked data
- Improve guidance about how to interpret and use the data
- Evaluate potential refinements to the specifications
## Patient Safety Indicators

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental puncture and laceration</td>
<td>Foreign body left in during procedure</td>
</tr>
<tr>
<td>Iatrogenic pneumothorax</td>
<td>Postoperative Hemorrhage or Hematoma</td>
</tr>
<tr>
<td>Postoperative Pulmonary Embolism or Deep Vein Thrombosis</td>
<td>Postoperative Physiologic and Metabolic Derangement</td>
</tr>
<tr>
<td>Postoperative Sepsis</td>
<td>Postoperative Respiratory Failure</td>
</tr>
<tr>
<td>Selected Infection due to Medical Care</td>
<td>Postoperative Wound Dehiscence</td>
</tr>
</tbody>
</table>
Focused on estimating sensitivity using complex stratified probability sampling scheme, overweighting cases “at high risk” for unreported complications due to other (related) diagnosis or procedure codes.

Updated Phase 1 estimates for Postoperative Deep Vein Thrombosis or Pulmonary Embolism.

Continued collaboration with National Association of Children’s Hospitals and Related Institutions, Department of Veterans Affairs, and University HealthSystem Consortium.
Pilot participants

Total: 47
Facilitating organizations (e.g., Arizona)
Hospital systems
Individual hospitals
Summary of Phase 1 PPV estimates

- APL, n=249
- PTX, n=205
- DVT/PE, n=121
- Selected inf, n=191
- Postop sepsis, n=164
- Postop resp failure, n=609

% cases

% Other
% Exclusions
% Miscoding
% POA
% PPV
### Comparison with UHC and VA findings

<table>
<thead>
<tr>
<th>Name</th>
<th>VA</th>
<th>AHRQ</th>
<th>UHC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPV (%) (95% CI)</td>
<td>Sample (n)*</td>
<td>PPV (%) (95% CI)</td>
</tr>
<tr>
<td>Decubitus Ulcer</td>
<td>30 (22-40)</td>
<td>112</td>
<td>--</td>
</tr>
<tr>
<td>Foreign Body Left in During Procedure</td>
<td>46 (36-55)</td>
<td>93</td>
<td>--</td>
</tr>
<tr>
<td>Iatrogenic Pneumothorax</td>
<td>73 (64-81)</td>
<td>112</td>
<td>78 (73-82)</td>
</tr>
<tr>
<td>Central Venous Catheter-related Bloodstream Infections</td>
<td>38 (29-47)</td>
<td>112</td>
<td>61 (51-71)</td>
</tr>
<tr>
<td>Postoperative Hip Fracture</td>
<td>28 (15-43)</td>
<td>46</td>
<td>--</td>
</tr>
<tr>
<td>Postoperative Hemorrhage or Hematoma</td>
<td>75 (66-83)</td>
<td>112</td>
<td>--</td>
</tr>
<tr>
<td>Postoperative Physiologic and Metabolic Derangements</td>
<td>63 (54-72)</td>
<td>119*</td>
<td>--</td>
</tr>
<tr>
<td>Postoperative Respiratory Failure</td>
<td>67 (57-76)</td>
<td>112</td>
<td>--</td>
</tr>
<tr>
<td>Postoperative PE or DVT</td>
<td>43 (34-53)</td>
<td>112</td>
<td>47 (42-52)</td>
</tr>
<tr>
<td>Postoperative Sepsis</td>
<td>53 (42-64)</td>
<td>112</td>
<td>41 (28-54)</td>
</tr>
<tr>
<td>Postoperative Wound Dehiscence</td>
<td>87 (79-92)</td>
<td>112</td>
<td>--</td>
</tr>
<tr>
<td>Accidental Puncture or Laceration</td>
<td>85 (77-91)</td>
<td>112</td>
<td>91 (86-94)</td>
</tr>
</tbody>
</table>
Obstetric trauma

- California Obstetric Valiation Study (Romano et al.):
  - Stratified random cluster sample of 1,662 records from 52 hospitals (51% vaginal)
  - Sensitivity=90% (95% CI, 82-96%) and PPV=90-95%
  - Adjusted sensitivity=93% (95% CI, 82-97%) and PPV=73%

- Clinical research data set (Brubaker et al. 2007):
  - 393 indicator-positive and 383 indicator-negative vaginal deliveries
  - Sensitivity=77% (95% CI, 72-81%)
  - Specificity=99.7% (95% CI, 98.5-99.4%)
  - PPV could not be estimated due to the sampling design, but should be approximately 93% given a typical prevalence of 5%

- English NHS study (Bottle and Aylin, 2008):
  - 955 cases from 18 English NHS trusts sampled
  - PPV=85% (none present at admission, 15% miscoded)
Pending estimates (Phase 2/3)

- **Postoperative hemorrhage or hematoma**
  - PPV = 75%; sensitivity pending
  - Most false positives due to (1) intraop hemorrhage without postop hemorrhage, or (2) event present on admission

- **Postoperative physiologic or metabolic derangement (PPV and sensitivity)**

- **Pressure ulcer (sensitivity)**
  - <50% overall; higher for Stage 3/4 ulcers
Postoperative DVT/PE
Follow-up study of PPV in academic centers

126 VTE flagged by PSI 12 (+4 Readmission)

- Positive Predictive Value
  \[ \text{PPV} = \frac{TP}{TP + FP} \]
  \[ = \frac{125}{125 + 1} \]
  \[ = 0.992 \]

125 cases True Positive postop lower ext DVT or PE
1 case clinical False Positive (superficial) saphenous Vein

Chart Abstraction
Postoperative DVT/PE
Follow-up study of NPV in academic centers

Chart Abstraction

- 463 Not flagged as VTE by PSI 12
  - 5 cases had VTE per UHC abstract
  - 458 cases had no VTE (TN)
    - 3 cases False Negative
    - 2 cases superficial or upper extremity thromboses

- Negative Predictive Value
  \[ \text{NPV} = \frac{\text{TN}}{\text{FN} + \text{TN}} \]
  \[ = \frac{458}{458 + 3} = 0.993 \]

- Previous sensitivity estimate from 33 teaching hospitals:
  96% (95% CI: 86-100%)  
  100% if limited to acute DVT or PE
QI Expansions in testing ED-Prevention Quality Indicators

- Extend Prevention Quality Indicators (PQIs) or concept of “potentially preventable hospital admissions” to Emergency Department data
  - “Potentially preventable emergency department visits”
- Modify and test these proposed indicators using State Emergency Department Databases (and the National Emergency Department Sample)
<table>
<thead>
<tr>
<th>Under Consideration</th>
<th>Recommended for Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes, Short-term Complications</td>
<td>Diabetes, Long-term complications</td>
</tr>
<tr>
<td>Uncontrolled Diabetes</td>
<td>Angina without Procedure</td>
</tr>
<tr>
<td>Asthma</td>
<td>Perforated Appendix</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease (COPD)</td>
<td>Lower-extremity Amputation in Persons with Diabetes</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td></td>
</tr>
<tr>
<td>Dehydration</td>
<td></td>
</tr>
<tr>
<td>Bacterial Pneumonia</td>
<td></td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td></td>
</tr>
</tbody>
</table>
## ED-Prevention Quality Indicators

### Draft Indicator Set

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Ratio treat-and-release ED visits to admissions</th>
<th>Correlation with inpatient rate (areas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM short-term complications</td>
<td>0.17</td>
<td>0.27</td>
</tr>
<tr>
<td>Uncontrolled diabetes</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>9.11</td>
<td>0.25</td>
</tr>
<tr>
<td>COPD</td>
<td>1.28</td>
<td>0.80</td>
</tr>
<tr>
<td>Hypertension</td>
<td>4.87</td>
<td>0.63</td>
</tr>
<tr>
<td>Heart failure</td>
<td>0.24</td>
<td>0.12</td>
</tr>
<tr>
<td>Dehydration/AGE</td>
<td>1.76</td>
<td>0.28</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0.63</td>
<td>0.34</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>6.45</td>
<td>0.35</td>
</tr>
</tbody>
</table>
QI Expansions in testing
ED – Patient Safety Indicators

- Measure development process
  - Literature review of candidate indicators
  - Expert work group (not formal panels)
  - Empirical analyses of reliability and construct validity

- Candidate measures
  - Adverse events (accidental puncture or laceration, iatrogenic pneumothorax, postprocedural hemorrhage or hematoma)
  - Appropriate use of ECG (stroke, nontraumatic chest pain, syncope)
  - Revisits for asthma (1/3 days), chest pain (3/7 days)
  - Missed (underestimated) serious diagnoses (acute coronary syndrome, subarachnoid hemorrhage)
QI Expansions in testing Postprocedural infections (HAIs)

- Measure development process
  - Literature review of candidate indicators
  - Expert work group (not formal panels)
  - Empirical analyses of reliability and construct validity

- Candidate measures of healthcare associated infections
  - Surgical Site Infection (SSI) in Selected Targeted Procedures
  - Surgical Site Infection (SSI) in Orthopedic Implantation Procedures
  - Post-Operative Surgical Site Infection (SSI)
  - Surgical Site Infection (SSI) in Coronary Artery Bypass Graft Surgery
  - Surgical Site Infection (SSI) in Breast Cancer Surgery
  - Ventilator-Associated Pneumonia (VAP)
  - Catheter-Associated Urinary Tract Infection (CAUTI)
  - Central Venous Catheter-Related Infections
  - Methicillin-resistant *Staphylococcus aureus* (MRSA) Infection
  - Clostridium *difficile* (C. *diff*) Infection
  - Post-Procedure Pneumonia
  - Post-Operative Sepsis
QI Expansions in testing
Resource use measures

- Measure development process
  - Literature review of candidate indicators
  - Expert work group (not formal panels)
  - Empirical analyses of reliability and construct validity

- Candidate measures focus on 30-day readmissions to any acute care hospital within the same state (subset nonelective admissions)
  - Heart failure
  - Acute myocardial infarction
  - Elective coronary interventions
  - Pneumonia
  - Diabetes
  - Chronic obstructive pulmonary disease
  - Asthma
### Pediatric Quality Indicators

#### Confirmed hospital-acquired

<table>
<thead>
<tr>
<th>PDI</th>
<th>Confirmed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NACHRI</td>
</tr>
<tr>
<td>PSI 1: Complications of Anesthesia</td>
<td></td>
</tr>
<tr>
<td><strong>PSI 3: Decubitus Ulcer</strong></td>
<td>60</td>
</tr>
<tr>
<td>PSI 5: Foreign Body Left During Proc</td>
<td>80</td>
</tr>
<tr>
<td>PSI 6: Iatrogenic Pneumothorax</td>
<td>89</td>
</tr>
<tr>
<td>PSI 7: Infection Due To Medical Care</td>
<td>57</td>
</tr>
<tr>
<td><strong>PSI 8: Postop Hip Fracture</strong></td>
<td></td>
</tr>
<tr>
<td>PSI 9: Postop Hemorrhage or Hematoma</td>
<td>97</td>
</tr>
<tr>
<td>PSI 10: Postop Physiologic or Metabolic</td>
<td></td>
</tr>
<tr>
<td>PSI 11: Postop Respiratory Failure</td>
<td>83</td>
</tr>
<tr>
<td><strong>PSI 12: Postop DVT or PE</strong></td>
<td></td>
</tr>
<tr>
<td>PSI 13: Postoperative Sepsis</td>
<td>60</td>
</tr>
<tr>
<td>PSI 14: Postop Wound Dehiscence</td>
<td>90</td>
</tr>
<tr>
<td>PSI 15: Accidental Puncture/Laceration</td>
<td>93</td>
</tr>
<tr>
<td>PSI 16: Transfusion Reaction</td>
<td>71</td>
</tr>
</tbody>
</table>
New Request for Proposals

ICD-10-CM conversion (1 October 2013)

Implement new modules based on validation findings and expert panel voting

- Postoperative/postprocedural healthcare associated infections
- Resource use/readmission
- ED-Prevention Quality Indicators
- ED-Patient Safety Indicators
Consider validity evidence from US studies

- Relatively high PPV for accidental puncture or laceration, obstetric lacerations, postoperative venous thromboembolism,
- Intermediate PPV for catheter-related bloodstream infection, retained foreign body
- Low PPV for postoperative sepsis

Consider data enhancements to support better comparative measurement (recognizing resource limits)

- Consistent definition of principal diagnosis as the principal cause of the admission of the patient (determined after study)
- Present on admission flag for secondary diagnoses (CA, AU, US)
- Unique patient identifier to ascertain readmissions
- Emergency department, ambulatory surgery data
Proposed recommendations to OECD HCQI program

- Consider procedure-linked or procedure-stratified indicators for future work
  - More consistent coding across hospitals and areas
  - Different countries use different procedure classification systems, requiring more mapping effort to ensure comparability

- Postoperative wound dehiscence
- Postoperative hemorrhage or hematoma
- Postoperative respiratory failure
- Iatrogenic pneumothorax
- Postoperative metabolic derangement (renal failure)
Acknowledgments and references

- AHRQ Quality Indicators project team: Mamatha Pancholi, John Bott
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- UHC team: Joanne Cuny, Pradeem Sama, Michael Silver and Cynthia Barnard (Northwestern University Medical Center), Martha Radford (NYULMC)