The Adoption and Impact of HIT in U.S. Nursing Homes

Friday, March 4, 2016

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Conflict of Interest

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Have no real or apparent conflicts of interest to report.
Agenda

• Health IT Maturation Models
  – Benefits
  – Components

• Impact of Health IT in U.S. Nursing Homes
  – Resident Care
  – Clinical Support
  – Administrative Activities
Learning Objectives

Objective 1:
• Describe the three components of Health IT maturation an LTPAC-EMR Adoption Model should consider

Objective 2:
• Summarize the challenges and opportunities facing nursing home operators in advancing to higher-levels of IT sophistication

Objective 3:
• Assess the association between IT sophistication and quality measures in U.S. nursing homes
STEPS: Electronic Secure Data
## EMR Adoption Model℠

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cumulative Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 7</td>
<td>Complete EMR, CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Physician documentation (structured templates), full CDSS (variance &amp; compliance), Closed loop medication admin.</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Full R-PACS</td>
</tr>
<tr>
<td>Stage 4</td>
<td>CPOE, Clinical Decision Support (clinical protocols)</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology</td>
</tr>
<tr>
<td>Stage 2</td>
<td>CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Ancillaries - Lab, Rad, Pharmacy - All Installed</td>
</tr>
<tr>
<td>Stage 0</td>
<td>All Three Ancillaries Not Installed</td>
</tr>
</tbody>
</table>
EMRAM Distribution: All US Hospitals

Q4 2007

EMRAM Stage

Percent of Hospitals

HIMSS 2016
EMRAM Distribution: All US Hospitals
Q3 2015

Percent of Hospitals

EMRAM Stage

EMRAM Stage

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**eMAR and CPOE: Incremental Benefits**

**Medication Administration Quality and Health Information Technology: A National Study of US Hospitals**

Journal of the American Medical Informatics Association

May-Jun 2012, Volume 19

**Objective**

To determine whether the use of computerized physician order entry (CPOE) and electronic medication administration records (eMAR) are associated with better quality of medication administration at medium-to-large acute-care hospitals.

**Findings**

Compared to hospital not using eMAR and CPOE, the odds of complying with 11 different CMS medication administration quality measures were higher by 14–29% for eMAR-only hospitals and by 11–38% for hospitals with both eMAR and CPOE. These findings suggest the implementation of health information technologies are associated with improved adherence to medication administration best practices in US hospitals.
eMAR and CPOE: Incremental Benefits

**Acute Myocardial Infarction**
- **AMI1**: Aspirin given at admission
- **AMI2**: Aspirin prescribed at discharge
- **AMI3**: Given ACE inhibitor or ARB for left ventricular systolic dysfunction
- **AMI5**: prescribed Beta blocker at discharge

**Heart Failure and Pneumonia**
- **HF3**: Given ACE inhibitor or ARB for left ventricular systolic dysfunction
- **PN5**: Given initial antibiotic(s) within 6 hrs. of arrival
- **PN6**: Given most appropriate initial antibiotic(s)

**Surgical Care Infection Prevention**
- **SCIP-INF1**: Received preventive antibiotics within 1 hr. before incision
- **SCIP-INF2**: Received most appropriate antibiotics for surgery
- **SCIP-INF3**: Stopped preventive antibiotic(s) within 24 hrs. after surgery
- **SCIP-VTE2**: Treatment to prevent blood clots within 24 hrs. before or after select surgery
eMAR Only: Incremental Benefits

Compliance Improvement Compared to Hospitals without eMAR and CPOE

- AM2: 24%
- AM5: 18%
- SCIP-VTE2: 18%
- AM1: 29%
- SCIP-INF2: 19%
- PN6: 21%
- HF3: 16%
- SCIP-INF3: 21%
- PN5: 26%
- SCIP-INF1: 14%
- AM3: 26%

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eMAR and CPOE: Incremental Benefits

Compliance Improvement Compared to Hospitals without eMAR and CPOE

- AMI2: 38%
- AMI5: 36%
- SCIP-VTE2: 29%
- AMI1: 29%
- SCIP-INF2: 26%
- PN6: 25%
- HF3: 22%
- SCIP-INF3: 22%
- PN5: 19%
- SCIP-INF1: 13%
- AMI3: 11%

eMAR only vs. eMAR & CPOE
Components of Health IT Maturation

I. Functions

II. Processes

III. Integration
Components of Health IT Maturation: Functions (Capabilities)

**CLINICAL NOTES**
- Advance directives
- Minimum data set (MDS)
- Medication reconciliation

**THERAPY/TREATMENT PLAN**
- Medical history and physical
- Diagnosis or condition list
- Vital signs

**Physician Orders**
- Resident/Patient demographics (ADT)
- Laboratory Tests
- Secure Messaging

**Nursing Orders**
- Nursing care plans and flow sheets
- Allergy list
- Nursing Orders

**Activities of Daily Living (ADLs) Management**
- Therapy/treatment plan
- Medication administration record (eMAR)
- Vital signs
Components of Health IT Maturation: Processes (Extent of Use)
Components of Health IT Maturation: Integration
Agenda

• Health IT Maturation Models
  – Benefits
  – Components

• Impact of Health IT in U.S. Nursing Homes
  – Resident Care
  – Clinical Support
  – Administrative Activities
## Defining Health IT Sophistication

<table>
<thead>
<tr>
<th>Attributes of IT Sophistication</th>
<th>Domains of Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resident care</td>
</tr>
<tr>
<td>Capability</td>
<td>Resident care activities supported by technology</td>
</tr>
<tr>
<td>Extent of Use</td>
<td>Technology used in resident care activities</td>
</tr>
<tr>
<td>Integration</td>
<td>Degree of integration of resident care technology</td>
</tr>
<tr>
<td></td>
<td>Clinical support</td>
</tr>
<tr>
<td></td>
<td>Clinical processes supported by technology</td>
</tr>
<tr>
<td></td>
<td>Technology used in clinical support</td>
</tr>
<tr>
<td></td>
<td>Degree of integration of clinical support technology</td>
</tr>
<tr>
<td></td>
<td>Administrative activities</td>
</tr>
<tr>
<td></td>
<td>Administrative activities supported by technology</td>
</tr>
<tr>
<td></td>
<td>Technology used in administrative activities</td>
</tr>
<tr>
<td></td>
<td>Degree of integration of technology supporting administrative activities</td>
</tr>
</tbody>
</table>
Recruitment: Total Surveys 815

ZIP Code locations on a US Map
moving Alaska, Hawaii and Puerto Rico
Health IT Sophistication: Resident Care

I. Resident Management

II. Resident Care Activities
   A. Physician
   B. Nursing
   C. Physical/Occupational Therapy
   D. Patients/Families
# Quality Measures: Comparison

<table>
<thead>
<tr>
<th>CMS Quality Measure</th>
<th>National</th>
<th>AHRQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Stay Residents Whose Need for Help with ADLs has Increased</td>
<td>15.7</td>
<td>15.8</td>
</tr>
<tr>
<td>Long Stay Residents Who Self Report Moderate to Severe Pain</td>
<td>7.7</td>
<td>8.6</td>
</tr>
<tr>
<td>High Risk Long Stay Residents With Pressure Ulcers</td>
<td>6.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Long Stay Residents Who Lose Too Much Weight</td>
<td>7.2</td>
<td>7.0</td>
</tr>
<tr>
<td>Low Risk Long Stay Residents Who Lose Control of Their Bowel or Bladder</td>
<td>44.4</td>
<td>42.2</td>
</tr>
<tr>
<td>Long Stay Residents with a Catheter Inserted and Left in Their Bladder</td>
<td>3.1</td>
<td>3.2</td>
</tr>
<tr>
<td>Long Stay Residents With a Urinary Tract Infection</td>
<td>5.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Long Stay Residents Who Have Depressive Symptoms</td>
<td>6.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Long Stay Residents Who Were Physically Restrained</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Long Stay Residents Experiencing One or More Falls with Major Injury</td>
<td>3.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Long Stay Residents Assessed and Appropriately Given the Seasonal Influenza Vaccine</td>
<td>94.0</td>
<td>94.0</td>
</tr>
<tr>
<td>Long Stay Residents Assessed and Appropriately Given the Pneumococcal Vaccine</td>
<td>94.2</td>
<td>93.1</td>
</tr>
<tr>
<td>Long Stay Residents Who Received an Antipsychotic Medication</td>
<td>19.8</td>
<td>19.3</td>
</tr>
<tr>
<td>Short Stay Residents Who Self Report Moderate to Severe Pain</td>
<td>18.8</td>
<td>19.5</td>
</tr>
<tr>
<td>Short Stay Residents With Pressure Ulcers That Are New or Worsened</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Short Stay Residents Who Were Assessed and Appropriately Given the Seasonal Influenza Vaccine</td>
<td>84.5</td>
<td>83.0</td>
</tr>
<tr>
<td>Short Stay Residents Assessed and Appropriately Given the Pneumococcal Vaccine</td>
<td>83.0</td>
<td>81.4</td>
</tr>
<tr>
<td>Short Stay Residents Who Newly Received an Antipsychotic Medication</td>
<td>2.4</td>
<td>2.5</td>
</tr>
</tbody>
</table>
**Health IT Capability: Resident Care**

1. Please check which of the following documents or activities are computerized.

- Discharge summary
- Physician order entry
- Physician Order Sheet (POS)
- Progress notes
- Results reporting
- Face sheet (abstracts)
- None are computerized
- Other(s) (please specify):

<table>
<thead>
<tr>
<th>Discharge summary</th>
<th>Physician order entry</th>
<th>Physician Order Sheet</th>
<th>Progress notes</th>
<th>Results reporting</th>
<th>Face sheet</th>
<th>None</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>47.4%</td>
<td>51.0%</td>
<td>52.3%</td>
<td>51.2%</td>
<td>31.7%</td>
<td>88.0%</td>
<td>8.0%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>
## Health IT Capability: Resident Care

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Level of Capability</th>
<th>Extent used</th>
<th>Degree of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>26.9</td>
<td>17.5</td>
<td>20.8</td>
</tr>
<tr>
<td>50</td>
<td>41.5</td>
<td>36.9</td>
<td>42.1</td>
</tr>
<tr>
<td>75</td>
<td>58.5</td>
<td>52.3</td>
<td>67.0</td>
</tr>
</tbody>
</table>
**Correlations:** Quality Measures and Health IT in Resident Care

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Residential Care</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>401.00 Precent of Long Stay Residents Whose Need for Help with ADLs has Increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402 Percent of Long Stay Residents Who Self Report Moderate to Severe Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>403 Percent of High Risk Long Stay Residents With Pressure Ulcers</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>405 Percent of Low Risk Long Stay Residents Who Lose Control of Their Bowel or Bladder</td>
<td>0.17</td>
<td>0.20</td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>419 Percent of Long Stay Residents Who Received an Antipsychotic Medication</td>
<td>-0.16</td>
<td>-0.13</td>
<td>-0.13</td>
<td></td>
</tr>
</tbody>
</table>
Health IT Sophistication: Clinical Support

I. Laboratories

II. Radiology

III. Pharmacy
# Health IT Capability: Clinical Support

3. Please circle the answer that best indicates the extent of pharmacy systems integration.

<table>
<thead>
<tr>
<th>Pharmacy systems are integrated to computerized systems in other units (nursing, OT/PT, etc.) in your nursing home</th>
<th>Not at all (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>Very much (7)</th>
<th>Unsure (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Your pharmacy systems have an interface with external entities’ systems (e.g., pharmacies, other hospitals, nursing homes, etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pharmacy systems are integrated to computerized systems</th>
<th>Not at all (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>Very Much (7)</th>
<th>Unsure (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>456 (59.8%)</td>
<td>25</td>
<td>18</td>
<td>28</td>
<td>32</td>
<td>27</td>
<td>146 (19.1%)</td>
<td>31 (4.1%)</td>
</tr>
<tr>
<td>Your pharmacy systems have an external interface</td>
<td>490 (63.9%)</td>
<td>19</td>
<td>12</td>
<td>19</td>
<td>28</td>
<td>24</td>
<td>83  (10.8%)</td>
<td>92 (12.0%)</td>
</tr>
</tbody>
</table>

Weighted Average

- Pharmacy systems are integrated to computerized systems: 3.0 / 8
- Your pharmacy systems have an external interface: 2.9 / 8
## Health IT Capability: Clinical Support

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Level of Capability</th>
<th>Extent used</th>
<th>Degree of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.37</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>50</td>
<td>17.8</td>
<td>13.4</td>
<td>0.00</td>
</tr>
<tr>
<td>75</td>
<td>33.3</td>
<td>32.4</td>
<td>22.4</td>
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</tbody>
</table>
**Correlations:** Quality Measures and Health IT in Clinical Support

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Clinical Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>401.00 Precent of Long Stay Residents Whose Need for Help with ADLs has Increased</td>
<td>-0.10</td>
</tr>
<tr>
<td>405 Percent of Low Risk Long Stay Residents Who Lose Control of Their Bowel or Bladder</td>
<td>-0.10</td>
</tr>
<tr>
<td>407 Percent of Long Stay Residents With a Urinary Tract Infection</td>
<td>-0.11</td>
</tr>
<tr>
<td>419 Percent of Long Stay Residents Who Received an Antipsychotic Medication</td>
<td>-0.13</td>
</tr>
</tbody>
</table>
Health IT Sophistication: Administrative Activities

I. Administrative Activities
   A. IT Staffing and Systems
   B. Connectivity
   C. General

II. General Information
   A. About the Respondent
   B. About the Nursing Home
Health IT Capability: Admin. Activities

- IT Staffing & Systems, Connectivity, Enterprise Resource Planning System
- Ex:
  
  1. Please check which of the following statements best describes the reality of the present IT architecture in your nursing home. Please check only one.

  - Discreet Manual Systems
  - Discreet Automated Systems
  - LAN-Based Automated Systems
  - Integrated Systems with Independent Modules
  - Totally Integrated Systems

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5%</td>
<td>7.9%</td>
<td>27.7%</td>
<td>30.4%</td>
<td>24.6%</td>
<td></td>
</tr>
</tbody>
</table>
## Health IT Capability: Admin. Activities

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Level of Capability</th>
<th>Extent used</th>
<th>Degree of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>21.1</td>
<td>23.8</td>
<td>36.3</td>
</tr>
<tr>
<td>50</td>
<td>36.9</td>
<td>35.3</td>
<td>47.7</td>
</tr>
<tr>
<td>75</td>
<td>55.8</td>
<td>45.7</td>
<td>59.5</td>
</tr>
</tbody>
</table>
**Correlations:** Quality Measures and Health IT in Administrative Activities

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Administrative Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>402 Percent of Long Stay Residents Who Self Report Moderate to Severe Pain</td>
<td>Capability: -0.10</td>
</tr>
<tr>
<td>405 Percent of Low Risk Long Stay Residents Who Lose Control of Their Bowel or Bladder</td>
<td>Extent of Use: 0.24</td>
</tr>
<tr>
<td>419 Percent of Long Stay Residents Who Received an Antipsychotic Medication</td>
<td>Integration: 0.17</td>
</tr>
<tr>
<td></td>
<td>Total IT: 0.19</td>
</tr>
</tbody>
</table>
Year 1 Study: Conclusions

- National assessments are critically needed to follow progress between:
  - ITS (types of IT used, extent of use, and degree of integration)
  - health care dimensions (resident care, clinical support, and administrative activities)
  - LTPAC resident outcomes (Quality Measures)

- Despite its promise for improving care, IT is not linked to key quality measurement systems used in LTPAC.

- Little has been written about the use and effectiveness of IT in LTPAC regarding disciplines that use them.
Year 1 Study: Conclusions (cont’d)

• We need to grow knowledge about the types of IT that NH staff are using and how increasing IT use is associated with quality outcomes.

• We can enable LTPAC consumers by creating educational interventions about specific types of IT capabilities to inform those committed to quality improvement through IT implementation.
Year 1 Key Questions about the Future

1. What are the pattern of changes in overall ITS over time and what links exist between the changes in ITS and NH attributes.

2. Are patterns of overall ITS changes over time associated with changes in Quality Measures over time.

3. Which relationships between specific types of ITS (dimensions and domains), facility attributes (Staffing, Facility, and Market Characteristics), and Quality Measures create the best opportunities for quality improvement.
Increasing Focus on Quality Measures

• IMPACT Act Quality Measure Domains:
  – Functional Status
  – Cognitive Status
  – Skin Integrity
  – Medication reconciliation
  – Incidence of Major Falls
  – Communication of health information and care preferences

• Recommendations on future payment reform
Increasing Focus on Quality Measures

• Process to Outcome Measures
  – Is there strong evidence linking the process to outcomes?
  – Is the execution of process affected by other events outside the control of the provider?
  – Is the collection of the required level of data feasible?

• Emerging Need: Measures for Interoperability
NQF: Prioritizing Measures

- **NQF: Getting to Measures That Matter**
  - **Adult Immunization**
    Focused on identifying critical areas for performance measurement to optimize vaccination rates and outcomes across adult populations
  - **Alzheimer's Disease and Related Dementias**
    Targeting a high-impact condition with complex medical and social implications that impact patients, their family members, and their caregivers
  - **Care Coordination**
    Focused on the dynamics of coordination and team-based care between providers of primary care and community-based services in the context of the "health neighborhood"
  - **Health Workforce**
    Emphasizing the role of the workforce in prevention and care coordination, linkages between healthcare and community-based services, and workforce deployment
  - **Person-Centered Care and Outcomes**
    Considering measures that are most important to patients—particularly patient-reported outcomes—and opportunities to advance them through the use of health information technology
Filling the Gap in National Adoption Intelligence

• Lack of national adoption of health IT/EHRs Data to compare LTPAC/Nursing Homes
  – Adoption
  – Type of health IT
  – How it is used

• Study provides national researched-data
  – Compare and contract health IT in LTPAC to improve understanding of differences with hospitals and physicians
  – Provides better understanding for future development and standards
  – Understand current and evolving health IT staffing and infrastructure
Importance of Supporting Evidence-based Knowledge

• Need for evidence-based research on clinical impact and value of types of health IT

• Success of study is dependent on Nursing Home engagement through full course of study
  – Interested in participating?
  – Recruitment for 2\textsuperscript{nd} and 3\textsuperscript{rd} year
STEPS: Treatment/Clinical

Improvements yet to be determined
Questions

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University of Missouri

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