Device Integration: RNs and IT Collaborate to Achieve Meaningful Use

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Disclaimer: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of HIMSS.
Conflict of Interest Disclosure

Ann Farrell, BSN – Principal, Farrell Associates
Ruth Suchomski, RN – Aspirus Wausau Hospital, Wausau WI

Have no real or apparent conflicts of interest to report.
Learning Objectives

• State rationale and business case for accelerating time-line for medical device integration initiatives to align with Phase 1 Meaningful use vital sign capture and Computerized Provider Order Management

• Define the role of Medical Device integration in CPOE /Clinical Decision Support, nursing productivity and clinician satisfaction with EHRs

• Define the impact of medical device integration on nursing time, productivity, quality of care and hospital return on investment

• Define critical success factors for a successful medical device integration effort

• State the predicted future direction of medical device integration
Role of Vital Signs in Med Management Process, CDS and Meaningful Use

Core RN process
(#1 Reason for hospitalization)

Monitor data vs patient values
(CC vs Med Surg vs home)

Assess Patient
RN – Interview, Observe S/S, Review EHR /chart
- Collect patient values (CDS data)
  ▪ Allergies (MU – 2011)
  ▪ Height / Weight (BMI) - (MU - 2011) - MDI
  ▪ T P R BP (“Vital Sign”) - (MU - BP 2011) – MDI
  ▪ Bedside lab values, e.g. SpO2 sat – MDI
  ▪ I & O - MDI
  ▪ Other device / monitor data - MDI

Document Findings

Administer Meds
RN/RT – Validate Order(s)
Reassess Patient
  ▪ CDS Data (may retake VS) - MDI
  (“~30% meds require VS check)

Document Med(s)
  - eMar – MU 2013 (Draft)
  PPID (BCMA) - MU 2013 (Draft)

& Patient Response

Evaluate Pt - Clinical Decisions
MD / Providers - Review CDS data
  ▪ Results – Lab , Imaging
  ▪ CDS Data - MDI data
    [eMar if prior meds ordered]

Enters Order(s) MU 2011 (meds)
(Drug interactions & formulary check - MU 2011)

Validate Order
Pharmacist – Validate Med Order(s)
Review Drug Interactions
Review (subset of orders)
  ▪ Results
  ▪ CDS Data - MDI
    [eMar if prior meds ordered]

Dispense Med(s)
Chaotic Nature of Med Admin

Medication Administration Workflow (in seconds)

Transforming Nursing Workflow, Part 1 - The Chaotic Nature of Nurse Activities, Paul Cornell, PhD et. al JONA Vol. 40, No. 9 September 2010
Vital Signs – “Current State” (not pretty)

1. Manual data collection inefficient
   MDI saves ~ 1 to 1.5 hrs per shift per RN or CNA ¹, ²
   - Periodic monitoring (spot check)
   - Continuous monitoring

2. Vital Sign documentation error prone - transcription mistakes & “workarounds” lead to errors
   ~23% vital signs inaccurate (paper and EHR manual entry) ³
   Paper: Jot notes @ POC, transcribe later - or much later- on paper chart & form(s)
   Electronic: VS collected @ bedside – memorized, entered in WOW in hallway →

3. Long “lag time” in VS availability in EHR
   6 to 12 hour data “latency” ¹, ²
   - Contributes to “failure to rescue syndrome”
   - Need near real time clinical decision support data (local & remote MDs & Care Managers)

¹ CareTrends (Sensitron): El Camino Hospital, CA: Medical Surgical Benefits Study; 2006
² iSirona Case Study: Weiss Regional Health System, TX (Benefits Study); 2009
³ Wager, K. A. et al, Comparison of Quality and Timeliness of Vital Signs Data...Intel Motion 2009, CIN Sept. 2010
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Aspirus Fact Sheet

• Aspirus
  • 6 Hospitals
  • 47 Clinic locations in 20+ communities

• Aspirus Wausau Hospital
  • Not for profit, community based, tertiary care referral center
  • Level II Trauma Center
  • 321 licensed beds
  • Average daily census of ~160
  • Emergency Department: 18 beds
  • Cardiac ICU: 8 beds
  • Medical-Surgical ICU: 18 beds
Aspirus EHR Background

Phased approach…
• Combination of electronic and paper since 2004
• Written physician orders entered into EMR by the unit clerk or nurse
• IP Nursing electronic documentation except in ICU

Next Steps…

**Enable** meaningful use stage I criteria via
• MDI—Best practice for ICU vital sign collection (5/1/2011)
• CPOM (Computerized Provider Order Management (11/6/11)
Aspirus EMR Adoption

US EMR Adoption Model

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cumulative Capabilities</th>
<th>2010 Q3</th>
<th>2010 Final</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>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Physician documentation (structured templates), full CDSS (variance &amp; compliance), full R-PACS</td>
<td>2.8%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Closed loop medication administration</td>
<td>3.7%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Stage 4</td>
<td>CPOE, Clinical Decision Support (clinical protocols)</td>
<td>10.3%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology</td>
<td>49.7%</td>
<td>49.0%</td>
</tr>
<tr>
<td>Stage 2</td>
<td>CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable</td>
<td>15.4%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Ancillaries - Lab, Rad, Pharmacy - All Installed</td>
<td>6.7%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Stage 0</td>
<td>All Three Ancillaries Not Installed</td>
<td>10.5%</td>
<td>10.1%</td>
</tr>
</tbody>
</table>

Data from HIMSS Analytics™ Database © 2011

N = 5,233  N = 5,281
Device Integration/ICU Module….Why now?

- Replacing Nursing tri-fold data record with electronic flow sheet
- Replacing Respiratory Therapy vent clipboard with electronic flow sheet
- All other patient assessment data on-line
- Physicians value access to on-line data – “single source of truth”
- Nursing and Respiratory not willing to manually document data
- To improve accuracy of vital sign documentation
- To recover valuable clinical time - documentation becomes a by-product of care
- Opportunity to perform nursing research related to MDI (Magnet hospital criteria)
Device Integration Project Scope

• **Departments**
  - ED
  - MSICU (study dept)
  - CICU (study dept)

• **Devices**
  - Bedside monitors
  - Ventilators (4)
  - Intra-aortic balloon pump
  - Bispectral Index
  - ICP

• **Timeline**
  - ED live: 4/2010
  - CICU/MSICU: 5/2011

• **Budget**
  - $370,000 ($377,000 actual)
    - EPIC/Capsule/GE Server/Hardware installation

• **Project Team**
  - I.T.
    - Server
    - Network
    - Hardware
    - Project Mgmt/Analyst
  - Biomed
  - Pharmacy
  - Clinical team
  - Ed Services
  - EPIC
  - Capsuletech
Device Integration Study Overview

- To define and describe the impact of MDI on the accuracy and timeliness of vital sign documentation by nursing and respiratory.

- To define and quantify the impact of MDI on nursing time and workflow.

- 3 Phase approach IRB approved observational study:
  - Phase I, pre-install data collection on CICU and MSICU (12/2010)
  - Phase II, 30 day post-install data collection (6/2011)
  - Phase III, 90 day post-install data collection (8/2011)
  - Publish results when available

- Collaborative effort among:
  - Critical care team
  - IT
  - Nursing leadership
  - Capsule provided:
    - CNO research expertise & guidance in study design
    - Study financial assistance
Impact of Device Integration Measurement

- Documentation Accuracy
- Documentation Timeliness
- Time in Nursing Activities
Study: Participants, Metrics & Tools
Device Integration

Device integration analysis to determine the impact on key users

- Participants (CICU and MSICU)
  - Registered nurses (RNs) and respiratory therapists (RTs)

- Measures
  - Accuracy
  - Timeliness
  - Frequency

- Values collected
  - Nursing: Vital signs
    - Heart rate, Systolic BP, Diastolic BP, SP02
  - Respiratory: Ventilator
    - Set tidal volume, Set rate, Fi02, Mode and Peak airway pressure
Study: Participants, Metrics & Tools

How Nurses Spend Their Time

Work sampling analysis to determine the proportion of nurse’s time devoted to specific work activities

- Participants (CICU and MSICU)
  - Registered nurses

- Measures
  - Reporting of value added activities
  - Reporting of direct time and documentation activities
  - Reporting of location of activities

- Tool: PDA vibrates randomly approximately 22 times in 12 hours
  - Tool has been utilized in other initiatives and studies TCAB (Transforming Care at the Bedside), 36-site Time & Motion Study, AONE
Study Definitions & Limitations/ Considerations

- **Accuracy:** The data recorded is accurate and legible
  - RT accuracy is legibility. No device data to compare recorded data to
  - RN accuracy is legibility and that value matched within 15 point window.
  - Vital signs manually recorded in grid format, not numeric

- **Timeliness:** Data collected when expected within a 15 minute time window
  - Data collection for 3 weeks once per day (7:00am-4:00pm) at random times
  - Staff aware of data collection (Halo Effect?)

- **Frequency:** Percentage of time vitals are entered as ordered.
  - Recorded frequency/Ordered frequency
Phase I Study Results
Accuracy and timeliness of vital sign entry

![Bar chart showing accuracy and timeliness of vital sign entry for various parameters: Heart Rate, BP, SPO2, Set Tidal Volume, Set Rate, FIO2, Mode, Peak Airway Pressure.](chart)
How Nurses Spend Their Time: Definitions

- **Direct Care**: Bedside procedures, vital signs, wound/skin care, incontinence, ADL, admit/discharge, assessment, patient services, emergency, bedside report, communication, teaching, meds, care rounds, deliver food tray, ice/beverage, escort patient, monitor patient.

- **Documentation**: Admission paperwork, daily assessment, transcribing orders, writing care plan, meds paperwork, teaching, discharge paperwork, other documentation.

- **Indirect care**: Family services, chart review, report, some communication, care conference.

- **Administrative**: Some communication, some teaching, computer data entry, bed control, copy/fax machine, admin/training.

- **Waste**: Hunting for…, waiting delay.
Phase I Study Results
Time in Nursing Activities

- Direct Care, 53.4%
- Documentation, 14.8%
- In-Direct Care, 9.0%
- Administrative, 9.2%
- Personal, 3.7%
- Waste, 2.8%
- Other, 7.7%
Phase I Study Results
Complete Work Sampling Analysis

<table>
<thead>
<tr>
<th>Aspirus</th>
<th>Value Add</th>
<th>Non-Val Add</th>
<th>Nec</th>
<th>Direct Care</th>
<th>In-Direct Care</th>
<th>Doc</th>
<th>Admin</th>
<th>Personal</th>
<th>Waste</th>
<th>Other</th>
<th>Patient Room</th>
<th>Nurse Station</th>
<th>On the Unit</th>
<th>Off the Unit</th>
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</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>62.4%</td>
<td>13.6%</td>
<td>24.0%</td>
<td>53.4%</td>
<td>9.0%</td>
<td>14.8%</td>
<td>9.2%</td>
<td>3.7%</td>
<td>2.8%</td>
<td>7.1%</td>
<td>48.1%</td>
<td>35.9%</td>
<td>5.8%</td>
<td>4.4%</td>
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<table>
<thead>
<tr>
<th>National Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Quartile (1)</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Quartile (3)</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
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</table>
Lessons Learned

- Start early with a well defined goals, scope & stakeholders:
  - IT, biomed, network administrators, clinicians (MDs, RNs, RT)
- Test, test, test. - use simulated data and live patient data
- Extensive time required of analyst and clinical staff for testing
- Key Challenges:
  - Server software, new monitors in MSICU, EPIC upgrade
- Educate “just in time” and “in the moment”
  - Structured classes 2-3 weeks prior to go-live.
  - Super user support at Go-live.
- Don’t forget the physicians
- IT presence on purchasing committee for new equipment
- Leverage BMDI study results for future BMDI projects
Key Performance Indicators - GOALS (Metrics)

- Revenue / ↓ Cost
- Efficiency (≠ ROI)
- MD Satisfaction
- RN Satisfaction
- Patient Satisfaction
- Patient Safety
- Quality of Care
- Accuracy & timeliness Patient Data
Accurate, timely patient data critical for safe patient care & medication management

Data capture and sharing

Improved outcomes

2011
STAGE 1 FINAL

Hospital Criteria
- Vital Signs (Ht/Wt/BP)
- CPOE (med orders)

2013
Stage 2 DRAFT

CPOE
- eMar / BCMA
- CDS ? Clin doc?

Advanced clinical processes

2015
Stage 3 DRAFT

 PMID & BCMA “joined” processes

No BUT

Medical Device Interoperability

MDI Required?

No BUT

Yes - BUT

Best Practice

Accurate Timely Patient Data critical for CPOE (meds)
Efficient method for VS data collection and validation

5 more years of non-productive manual data entry and aged, inaccurate information used by clinicians in life-critical decisions

???
Future State

• More MDI - “smart” patient monitoring devices
  – Critical Care – more monitors, more wireless, more interoperable devices
  – Med Surg – periodic monitoring, more continuous monitors, vents and IVs
  – More home monitoring (demographics - supports ACOs, Medical Homes)

• Recognition of MDI role in CPOE /CDS, RN productivity, clinician EHR satisfaction, better disease & infection prevention and management

• Improved Work flow efficiency - PPID and Patient to Device Association

• Better MDI - EMR integration – use of Vital Sign Data in surveillance and CDS

• Improved documentation of actual benefits of MDI

*Has Meaningful Use helped or hindered MDI adoption and innovation?*
Device Integration: RNs and IT Collaborate to Achieve Meaningful Use

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