Patient Monitor Gateway Implementation with EMR Case Review

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Partners HealthCare System

PHS consists of:

- 55,000 EMPLOYEES
- 7,000 PHYSICIANS
- 3,400 BEDS
- 16.6 MM SQUARE FEET
- TWO ACADEMIC MEDICAL CENTERS AND TWO SPECIALTY HOSPITALS CONSISTENTLY RATED AMONG THE TOP U.S. HOSPITALS BY U.S. NEWS AND WORLD REPORTS

McLean Hospital, Belmont
North Shore Medical Center, Salem
Spaulding Rehabilitation Hospital
Massachusetts General Hospital
Brigham & Women’s Hospital
Newton Wellesley Hospital
Faulkner Hospital
Rehab Hospital of Cape & Islands
Martha’s Vineyard Hospital
Nantucket Cottage Hospital
Two Academic Medical Centers

Brigham and Women’s Hospital

Two Medical Centers consist of:
• 77,302 Active Medical Devices
• 2,381 Manufacturers
• 9,237 Device Models
• 1,143 Device Models with Software
• BWH: 777 licensed beds, 146 ICU beds, 489 telemetry beds, 43 operating rooms
• MGH: 1000 licensed beds, 180 ICU beds, 350 telemetry beds, 70 operating rooms

Massachusetts General Hospital
EMR Implementation

• Acute Care Documentation (ACD) project
  – Purchased electronic medical record (EMR) system and integration with PHS applications
• Documentation required for most all patient care processes
  – Vital communication tool
• Documentation includes:
  – Order Entry
  – Medication Administration
  – Assessments
  – Progress Notes
  – History and Physical
  – Flowsheets (Vital Signs & I/Os)
  – Consult Notes
  – Plans of Care
  – Task Lists
  – Problem List…
EMR Implementation

• Acute Care Documentation (ACD)
  – e-Chart within PHS Clinical Application Suite and WebShell

• Intended for 3 documentation needs
  – Assessments, Flowsheets & Notes
High Level Drivers

• External
  – ARRA
  – Meaningful use

• Internal
  – Integrated documentation system
  – Coded data to facilitate decision support
  – Reduce time spent documenting and gathering information
Partners ACD Objectives

- Increase patient safety and quality through standardization
- Provide real-time clinical decision support at the time of documentation
- Provide authorized users with concurrent on-line access to real time information i.e. orders and results from Flowsheets, Notes, Patient Assessments and Plan of Care
- Ensure documentation completeness and facilitate documentation of Flowsheets, Notes, Patient Assessments and Plan of Care
- Ensure documentation legibility
- Facilitate communication between caregivers
- Increase availability of the patient chart
- Facilitate data gathering for quality improvement, research and operational initiatives
- Allow documentation to be viewed from anywhere in the hospital and remotely from home
- Time neutral

** - Medical device connectivity required to enable objective

Nowhere is medical device connectivity explicitly stated. It’s simply supposed to be there like electrical power – readily available.
System Involves Numerous Components

- Desktop Integration
- Servers/Backup
- Content (Enterprise, Site and Department)
- User Interface
- Allergies
- Notifications/Alerts
- e-MAR and Medication Dictionary
- Labs
- Results (PHS Document Repository)
- Health Information System (administrative support)
- Patient Identification (EMPI) and Location (ADT)
- Medical Devices
Our Component

• Medical Device Integration and Informatics
• MDII Team
  – Leadership role in medical device integration and developing PHS connectivity roadmap
  – Responsible for medical device data from source to database and how they’re used
• Strategic implementation plan
  – Realign initial decisions after market survey
    • Crawl, walk, run…
    • Starting with patient monitors and connected ventilators
  – Rapidly evolving state of the art
  – Retraining 30-40,000 users is very difficult
Standards & Regulatory

• FDA Medical Device Data Systems and IEC 80001
  – Determining what systems and/or components are affected
  – Addressing requirements in implementation

• Implementing emerging standards and regulations isn’t always straightforward

• Integrating established product line (networked monitors) with an established standard (HL7)
  – How hard can it be…?
Systems Development Life Cycle

• Initiation, Concept Development, Planning, Requirements, Design, Development
• Testing, testing, testing…
  – Unit, Functional, Integrated (1 & 2), Performance, Fault, Regression, Parallel, User Acceptance…
  – Medical device software version compatibility
• Implementation
  – March 2012
• Operations
  – Calls will go the PHS IS HelpDesk
  – Synchronizing BME and IS operations
• Disposition
  – What does the future hold?
Medical Device Data Association

• Critical to bind patient identification (PID) with medical device data

• The state of the art pivots on: location or patient identification
  – Each has pros and cons

• But… how are data loaded to EMR database?
  – PHS’ system, by location or PID – not both
    • PID only does not work if field is blank or wrong
  – Other EMR vendors load data by location as well
Implementation Needs and Configuration Decisions

• Single Source of Truth
  – Identify what system holds the “truth” and avoid duplication (use pointers)

• Ubiquitous availability
  – Patients move throughout their stay
  – Most all hospital staff interact with a computer
  – Not a monitor or device connectivity solution

• Enterprise and system integration
  – EMR and ADT designated as patient location source of truth
The Path for Just One Device’s Patient Context-MD Data

1. Provider Order Entry (POE)
2. Patient arrives hospital
3. Enterprise Information System
4. Medical Device Connectivity
5.Vendor
6. Location ID only
7. Location
8. Electronic Medication Administration Reconciliation (eMAR)
9. Patient
10. Patient ID
11. Proprietary Medical Device Manufacturer Server
12. MD data arrives

Note: Assuming all systems are working correctly and no last minute changes.
Data Association

• Works well when things work as expected
  – Unit testing verified correct: measure, value, unit, time and patient
  – Functional testing evaluated: interactions with other components (i.e. ADT, GUI)
  – Integrated testing looked at: expected and alternative workflows

• Challenges encountered
  – Early on with transport monitors
  – Later with fault conditions (e.g. device and server disconnects, ADT down… )
Data Association Challenge

• Uploading buffered data into EMR by location is problematic if patient A moves, and patient B is admitted to that bed
  – Buffered data from patient A are incorrectly loaded into patient B’s record
Data Association

• Partners implementation: even one occurrence of wrong data in a patient’s record is too much
  – No data is better than wrong data
  – Disabling and purging buffered data capabilities until issue gets resolved
  – Without an HL7 arbitrator, or certification body, only the system integrator identifies potentially latent problems
    • It’s difficult for manufacturers to make site specific changes

• Again - our EMR vendor is not the only one associating device data solely by location
  – Other EMR manufactures disregard HL7 PID
So What…?

- Other hospitals have the same problem
- Rely on policies and archive only validated data
- User must keep track of when patient arrives and departs the location
- Users demand more data, not less
  - Validated versus un-validated data use may change
- Future decision support tools
Go-Live and Operations

• Culmination of collaborative effort between BME and IS
  – First time BME will respond to a call placed to the IS HelpDesk at PHS
  – Pairing first call response
  – Developing support center for Go-Live
• Users excited, but a little anxious
• Developing support plan and service level agreements
Challenges Persist

- Complicated work requires collaboration from everyone involved
  - Most everyone is outside of their comfort zone
- Standards not enough to prevent problems
  - Need arbitrators
- Ventilator terminology
  - 4 models tested
  - Nomenclature inconsistency prevents automatically loading much of the available data to EMR
    - 10 out of 39 data elements are common to all 4 models
  - Inaccurately transmitted zeros and resolution introduce additional challenges
    - “0” sent when Inspiratory Time is not set
    - Tidal/Minute Volume rounded values sent for pediatric patients
Looking Ahead…

• Users want access to more data and post-processing capabilities

• Decision support using medical device data is not far away
  – People creating rules must understand medical device data and constraints
  – Time synchronization
  – Real time, near real time, and buffered data

• Requirements for waveforms and other high fidelity signals likely coming
  – Infrastructure requirements and changes
Thank you. Questions?