Developing a Strategy for Integrating Medical Device Data with Clinical Information Systems
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WHY NOW?
The Current Reality of Bedside Care
External Market Drivers for PCDI

- HITECH/ARRA incentives
- National healthcare reform & cost containment
- Patient safety focus
- Reimbursement pressures
- Patient acuity management in multiple settings
- Focus on mobile computing and all things wireless
External Market Drivers for PCDI

- IEC 80001 - voluntary standard focused on risk management of networked medical devices in hospitals
  
  Compliance requirements for hospitals, device manufacturers & IT infrastructure vendors

- IHE Patient Care Device Domain
  
  Use cases associated with patient care devices that communicate with another “actor

  IHE & Continua announcement
Internal Hospital Drivers

- Adoption of sophisticated diagnostic and clinical care applications
- Deployment of technologically advanced medical diagnostic and treatment devices
- Drive to improve clinician productivity, quality and patient service
- Focus on next generation analytic and decision support systems
- Need to contain costs & improve ROI related to technology acquisitions
Benefits of PCDI

Enhance quality of care & patient safety

- Documentation errors are significantly reduced or eliminated
- Nurses can review data collected when they are not present by the bedside
- Data is captured at increased frequency for a more accurate depiction of patient condition
- Rapid access to all data elements in EMR/CIS for clinicians across the enterprise
- Integrated systems can flag suspicious data (smart pumps & allergy alerts/DERS)
Benefits of PCDI

Improve productivity

- Reduces nursing time to manually enter high volumes of discreet data, particularly in high acuity intensive care units
- Nurses can validate rather than enter data

Enhance staff satisfaction

- Automated data capture allows care givers to provide better patient care & support of family needs
- “Nurse the patients, not the technology”
Benefits of PCDI

Integrated and interoperable devices will provide contextual awareness (www.MDPnP.org)

- Clinical decision support systems
- Smart clinical alarms
- Medical device safety interlocks
- Closed-loop control of medication delivery
- Remote healthcare delivery (home, battlefield, e-ICU, etc.)
- Complete, accurate electronic medical records
- Hospital emergency preparedness
- Increased quality and completeness of national research databases
ROI & Field Studies

MindGent Study: “Addressing the Issues of Nursing Shortages and Patient Safety through Biomedical Device Integration”

- Cost study extrapolated from a 150 bed hospital
- PCDI can save up to 2408 hours of nursing time annually (20 FTEs)
- Cost savings of up to $970,338 per year

Rausch and Judd study: “The Development of an Interoperable Roadmap for Medical Devices”

- Projected savings of 50% of support staff charting time and 20% of practitioner charting time
- Associated with device-to-EMR automatic charting and analysis of vital signs in the ED
ROI & Field Studies

WellSpan Health (Pennsylvania)
- PCDI in ICU, ED & PACU
- Respiratory Therapy minutes saved per shift = 60
- Registered Nurse minutes saved per shift = 30 (lower acuity ICU patients)

UAB Health System
- RN minutes saved per shift = 175 – 225 (high acuity ICUs and PACUs)
- 20 seconds to verify data vs. 4 minutes to enter data (savings of 86,000 nursing hours per year)

St. Johns MC (Wyoming)
- 60% time savings from importing rather than entering vital sign data
- More thorough documentation – vital signs automatically charted every 5 minutes
Challenges

- Connectivity must be seen as in the service of tangible clinical benefits & productivity gains (e.g., connectivity is not “plumbing”)
- Create a compelling vision for workflow automation to enable better patient care and safety, then translate that into implementation roadmaps for the organization
- This requires a lot of collaborative thinking and work across traditional departmental silos & with external partners
- From strategic vision to first implementation takes time – about 2 years
Developing a Strategy for Integrating Medical Device Data with Clinical Information Systems

One Provider’s Experience
Overview

- Introduce Virtua Health
- Explain Motivation for Device Integration
- Review our Planning Process
  - Create a Vision
  - Assess Inventory and Database
  - Define Data Needs and Clinical Workflow
  - Prioritize Devices
  - Evaluate Vendors
  - Assess Network
  - Assess Facility
  - Create a Support Model
Located in Southern New Jersey

Four Hospitals – 975 licensed beds

Specialized Programs of Excellence

Long-Term Care
- Berlin 128 beds
- Mt. Holly 180 beds

Ambulatory
- Ambulatory Centers (2)
- Satellite Emergency Room
- Surgical Centers (4)
- Health Fitness Centers (2)
- Home Health

Physician Services
- 150 employed physicians

Foundation

Insurance Captive

Nearly 8,000 employees

Net revenue ~$1 billion
Coming Soon

Ambulatory Services Center - Opens December 2009

Replacement Hospital
350 Beds - Opens Q1 2011
Virtua’s STAR underpins everything we do.
Motivation for Device Integration

- Implementing an Enterprise Acute Care and Periop Clinical Information System
- Find ways to automate nursing workflow and get buy-in from nursing
- Device integration can save nursing time on documentation and ensure accurate, real-time patient data
- Received senior management and stakeholder support
- Considered a critical feature when evaluating CIS
Planning Process

- Create a Vision
- Assess Inventory and Database
- Define Data Needs and Clinical Workflow
- Prioritize Devices
- Evaluate Vendors
- Assess Network
- Assess Facility
- Create a Support Model
Create a Vision

- Determine the goals for device integration
  - Enhance patient safety and quality of care - ensure accuracy of data, provide real-time patient data for clinical decisions, provide closed loop medication administration
  - Increase nursing productivity
  - Increase nursing satisfaction
  - Facilitate alarm management

- Align strategic plan for device integration in Biomed, IT, Purchasing and Clinical
Assess Inventory and Database

- Start with a comprehensive biomedical database
  - Make/model, serial #, biomed #, description
  - End of life projection
  - Firmware version
  - IP address scheme
  - Network diagrams
  - Server information
  - Communication/interface port
  - Wireless capabilities
  - Communication Protocol
  - Data Output (type, frequency, elements, format)
  - Technical Manuals

- Create a knowledge library
- Look for standardization opportunities
Define Data Needs and Clinical Workflow

- Assess current and future workflow with clinicians, HIM, biomed, IT and informaticists
- Define device data needs, storage, flow and validation approach
- Design CIS flowsheet and data display
- Map the patient identification and patient-device association/disassociation process and perform risk assessment
Prioritize Devices

- A single hospital has thousands of medical devices
- Prioritize devices based on benefits you want to achieve
  - Potential to improve productivity (amount and frequency of data gathering)
  - Potential to improve quality of care (importance of real-time data for clinical decisions)
  - Value of alarm notification (notification of medical device alarms to clinician devices)
**Top Priority Devices**

- Anesthesia machine
- BiPAP*
- BIS monitor
- Defibrillator**
- Fetal monitor
- Infant incubator
- Infusion pump
- Nitric Oxide delivery unit*

- PCA pump*
- Physiological monitor
- Specialty Bed*
- Spot Vital Signs Monitor
- Syringe pump*
- Telemetry**
- Ventilator

*these devices have no connectivity

** these devices have limited connectivity
Nice to Haves

- 5 lead pneumogram
- Airway monitor
- Apnea monitor
- Arthroscopy pump
- Bladder Scanner
- Capnograph
- Cardiac Output monitor
- Continuous passive motion
- EEG monitor
- Electric bed
- Food pump
- Heated humidifier
- Holter monitor

- Hyperbaric chamber
- Hyperthermia Unit
- Hysteroscopy pump
- Insufflator
- Oxygen monitor
- Pulmonary Function Analyzer
- Pulse oximeter
- Scale
- Sequential compression unit
- Spirometer
- Thermometer
- Tourniquet
- Transcutaneous O2 monitor
- Wound vac

* these devices have no connectivity
## Device Integration Roll-out Plan

<table>
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<tr>
<th>Phase</th>
<th>Acute Care</th>
<th>Periop</th>
<th>ED</th>
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| Phase 1 (within 6 months) | - Physiological monitors and ventilators in critical care  
- Fetal monitors | | |
| Phase 2 (within 1 year) | | - Physiological monitors and ventilators in Periop  
- Anesthesia machines | |
| Phase 3 (within 2 years) | | - BIS monitors  
- Pulse ox | |
| Phase 4 (within 3 years) | - Infusion pumps  
- Incubators | | - Physiological monitors, spot VS monitors, and ventilators in ED |
Evaluate Vendors

- Three types of device integration vendors
  - Medical device manufacturer (often involve a gateway)
  - Independent third party vendor
  - Clinical Information System vendor

- Involve end users, biomed and IT to design evaluation criteria and testing
Vendor Selection Criteria

- Workflow requirements
- Barcode/RFID
- Capture 100% data output
- Frequency of data transmit
- Wired/wireless solution
- Wireless roamability
- Driver development
- Device vendor-neutral
- Device manufacturer relationship
- Robustness/reliability
- Backup and redundancy
- Security
- Management tools
- Ease of maintenance (hardware, server, software)
- Remote diagnostic capabilities
- Experience in healthcare IT and medical device industry
- Training
- Cost
Set up a Test Lab
Assess Network

- Work with IT and biomed to assess network infrastructure
- Identify all biomed and IT networks (either segregated or converged)
- Develop system-level network diagrams
- Assess bandwidth, capacity, wireless coverage, EMI, latency, redundancy, and scalability based on future state
Assess Facility

- Conduct a walkthrough with IT, biomed and facility
- Consider
  - Data and power drops
  - Environment for servers, network gear
  - Physical space in patient care areas and closets to put device integration hardware
  - Consolidation opportunities between biomed and IT closets
Create a Support Model

Traditional Support Model

- Biomedical
  - Device-related problems

- IT/Applications-related problems

IT
Device data is not flowing into CIS ... Who do you call?

Fundamental integration point between Biomed and IT
Create a Support Model

New Support Model

- Clearly define roles and responsibilities
- May need to create new processes
- Assess organizational structure
- Plan for cross training
- Form a **partnership** between IT and biomed
Consider **workflow** throughout planning

Create a **strategic, multi-generational integration plan**

Need **substantial planning effort**, start as early as possible and get stakeholders involved

Set up a **test lab** to effectively evaluate device integration solutions

Prepare for **collaboration and role changes** in your **IT and biomed** departments
Questions?

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