Enterprise-Wide Medical Device Integration

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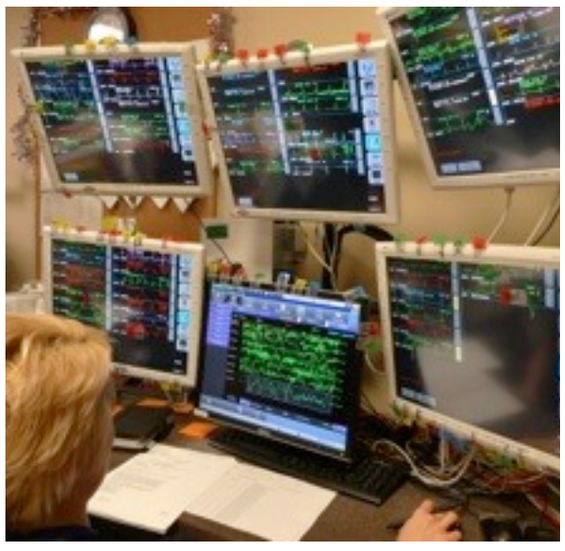
The majority of clinical data originates from biomedical devices. For maximum efficiency, data quality and timeliness of data, the acquisition of biomedical device data must be automated.



Connectivity

Workflow automation through the integration of medical devices and information systems

Interoperability

The ability of two or more systems or components to exchange information *and to use the information that has been exchanged*

Manual Data Acquisition

- Data collected or entered late or period missed: 15 min - 8 hours
- Typographical or transposition data entry errors
- Right data entered into wrong patient
- For nurse, entering data read off medical devices into EMRs is extra work for no value

Functionality

- Automatically acquires medical device data at specified periods
- Acquisition period definable by patient
- Provides clinician validation of data when required

Benefits

Acquired data reduces transcription and documentation errors - to zero if barcodes are used

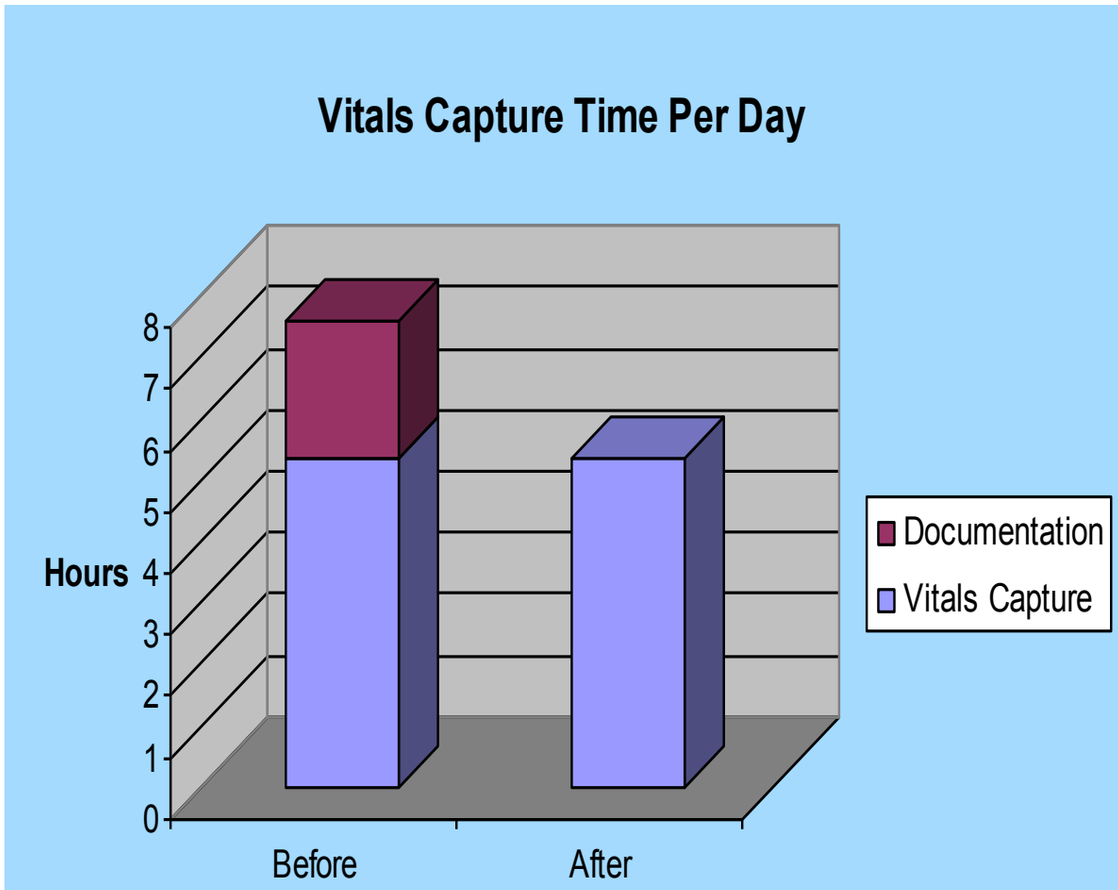
Data immediately available once acquired

Larger volume of consistent data

Increases adoption of EMRs and CPOE

Productivity Impact

- Average vitals capture time = 3.79 minutes
- Approx. 33% of taking vitals is admin
- Automating vitals saves 1.12 minute per vital event
- Time saved = 28 to 38 hours per day



Source: Automating the Vitals Capture Process, Michael Phelps, 2005, VA Medical Center, Minneapolis, MN

MARCH2013

THE VALUE OF MEDICAL DEVICE INTEROPERABILITY:

Improving patient care with more than $30 billion in annual health care savings

Impact on Patient Outcomes

Policy white paper evaluating impact on U.S. health care costs

westhealth™ institute

Source: http://www.westhealth.org/institute/interoperability

Connectivity Impacts

Costs resulting from redundant testing: $3 Billion

Clinician time spent manually entering data: $12.4 Billion

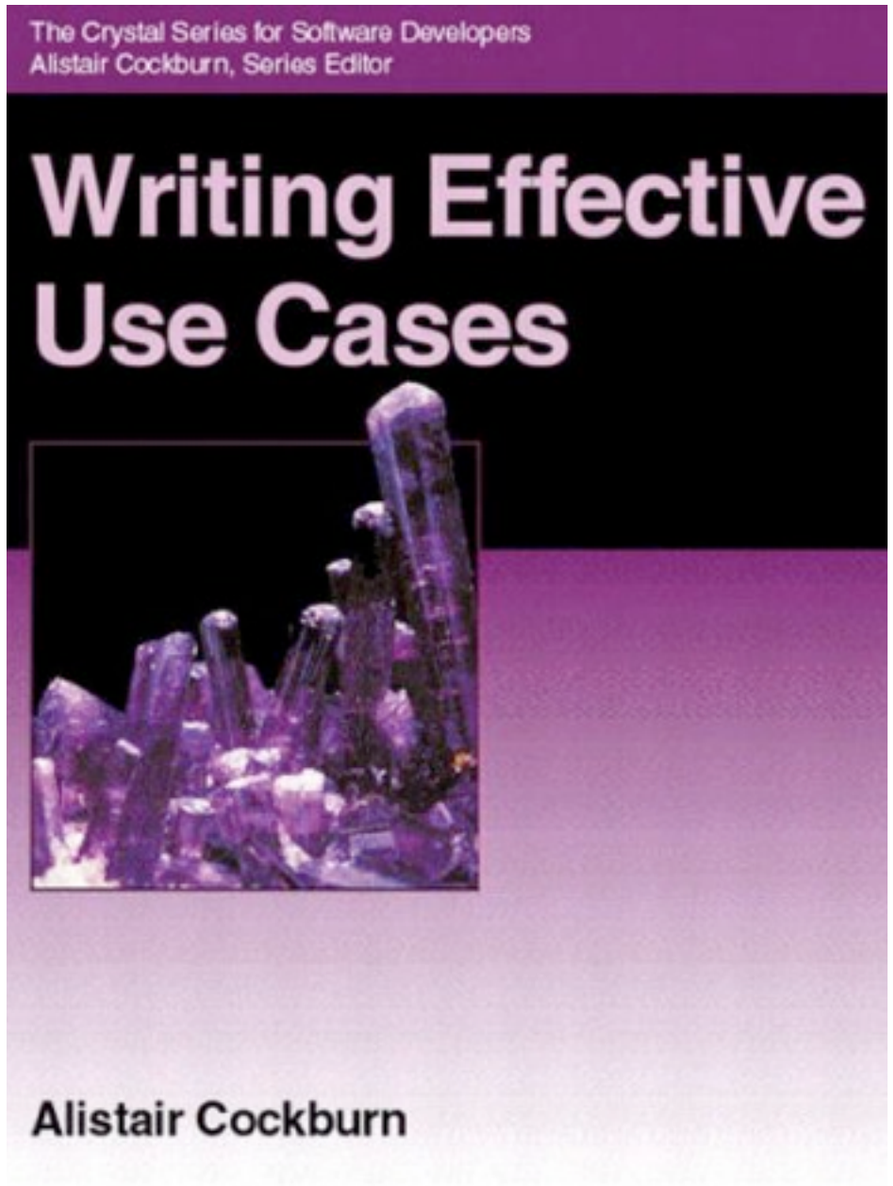
Increased length of stay: $17.8 Billion

Typical Workflows

- Patient Management
- Patient Context
- Scheduling
- Order Workflow
- Data acquisition
- Data analysis
- Clinical documentation
- Surveillance
- Messaging
- Data management
- Report generation
- Device specific workflows

Use Cases

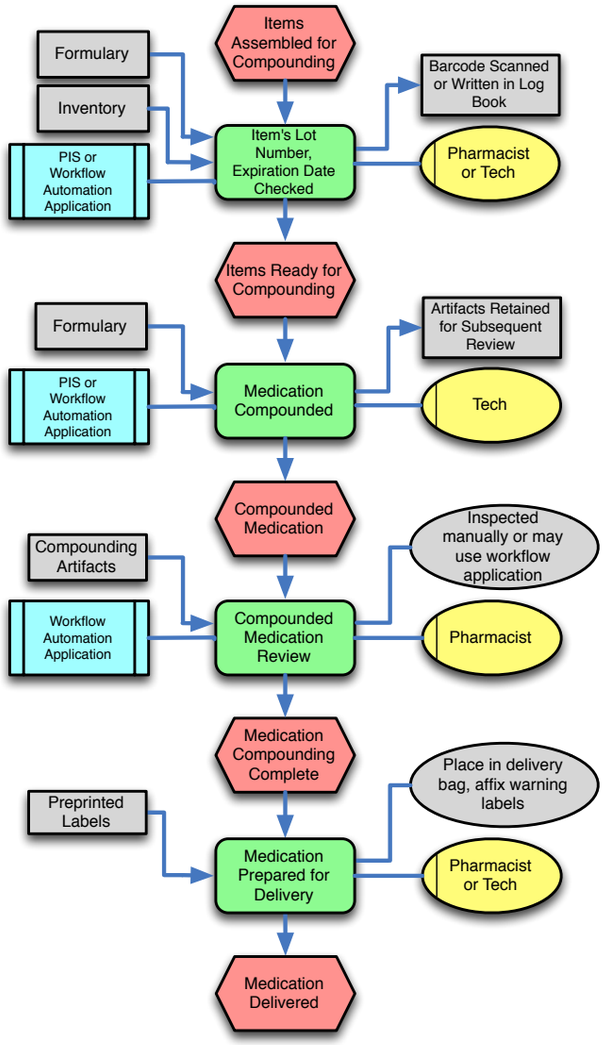
- A methodology used in systems analysis to identify, clarify workflow and organize system requirements
- Day-in-the-life story, formal very structured text, flow charts, sequence charts, etc.
- An agreement between users and product developers regarding how a system will operate



Use Cases Vary by Medical Device

- Vital signs monitors - *spot check*
- Continuous patient monitors - *sampling of data stream*
- Infusion pumps - *limited EMR support*
- Ventilators - *limited EMR support*
- Workflows for the same device can vary across clinical areas - *e.g., ED, surgery, ICU or Med/Surg units*

Clinical practice use cases



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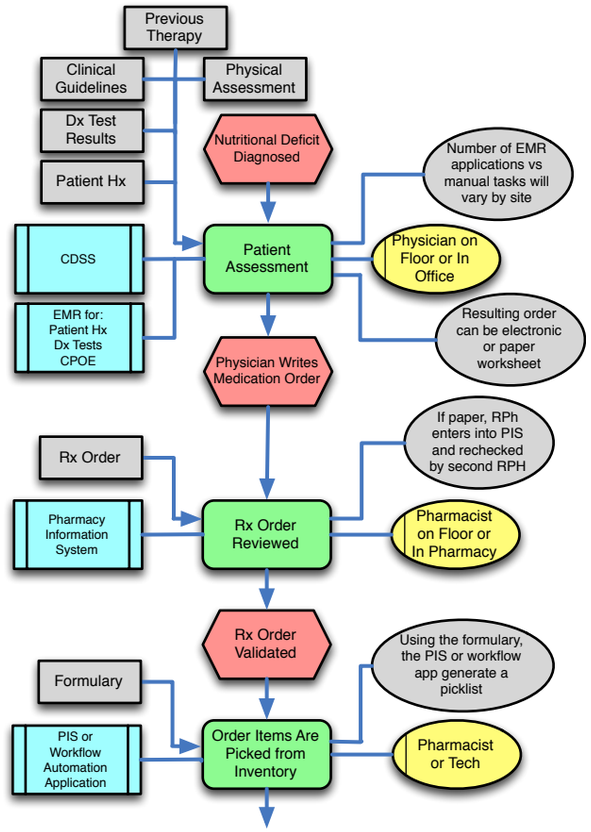
Product Use Cases



Workflow matches
Workflow gaps
Flexibility - configurability
Evaluate trade-offs

Activity Diagrams: http://en.wikipedia.org/wiki/Activity_diagram

Recommendations

- Document your workflow with use cases
- Require vendors to disclose their uses cases
- Include use case requirements in purchase agreements to ensure vendor compliance

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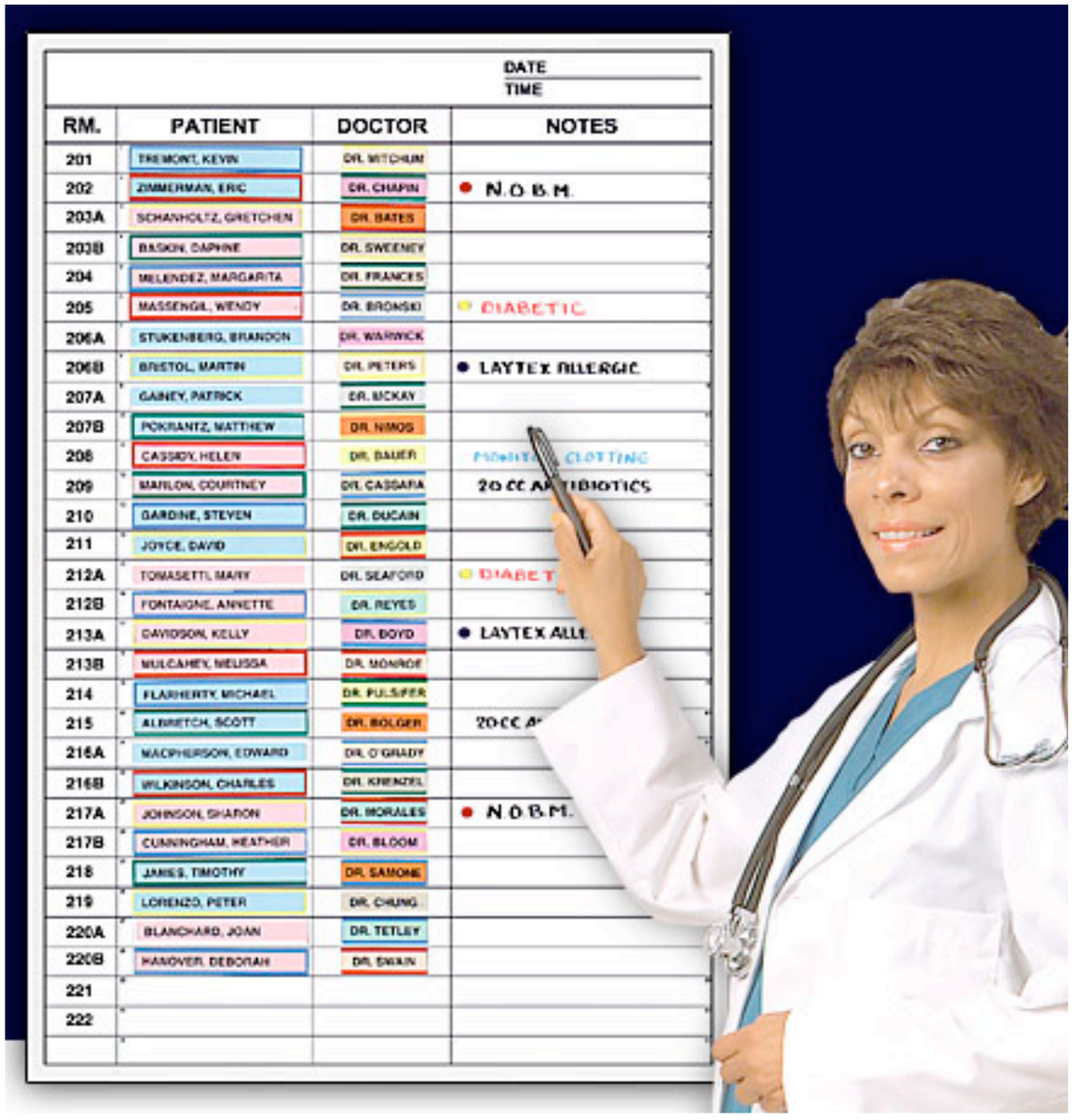
Blog at:

medicalconnectivity.com

Patient Management



Database of relevant patient demographics

Add, edit and delete patients and associated data

Supports flow of patients' contact with medical device system

Data captured prior to, or at the time medical device is applied to patient

Analogs: department marker boards, dashboards

Patient Context

Associates medical device data with the patient attached to the device

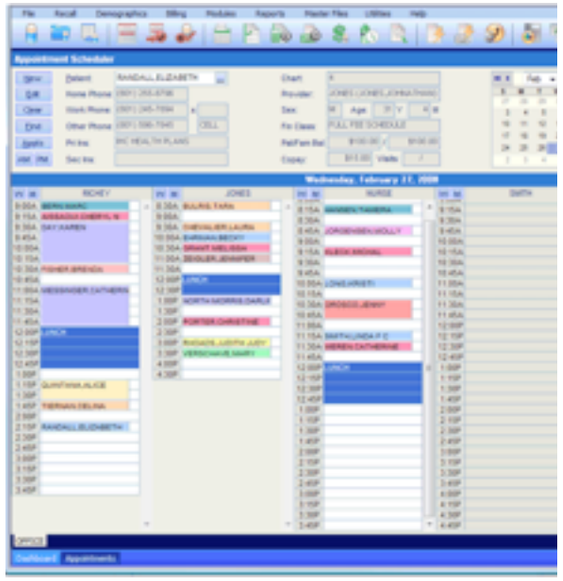
Creates and breaks down association with application and removal of device

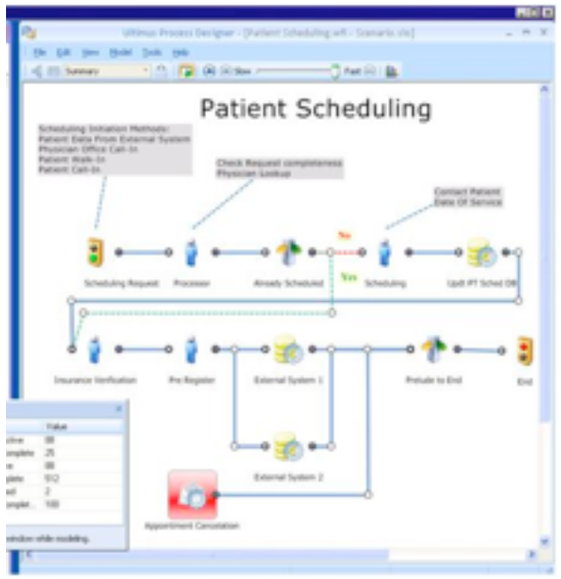
Maintains reliable association during use - wireless makes this challenging

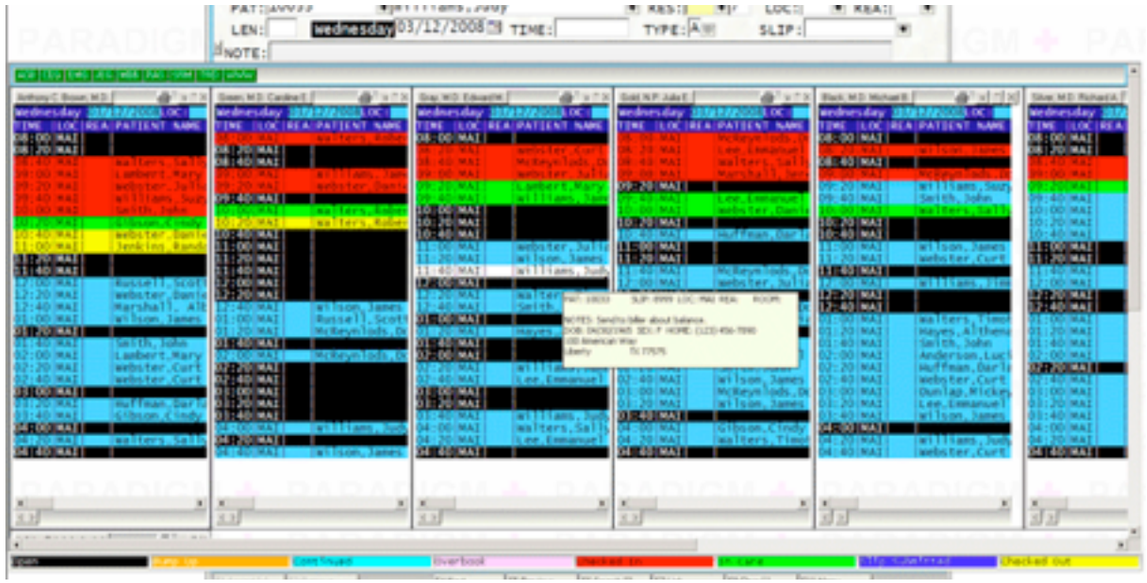
Essential step requires backup methods

Best managed at point of care

Scheduling







- Patient and resource scheduling
- Can be time-specific or a work list
- Patient reminders
- Driven by order set
- Order-specific prerequisites
- Complex rules-driven scheduling algorithms

Order Workflow

Order initiates workflow; can initiate patient management

Specifies how medical device is to be used

Monitoring or therapy orders define device configuration

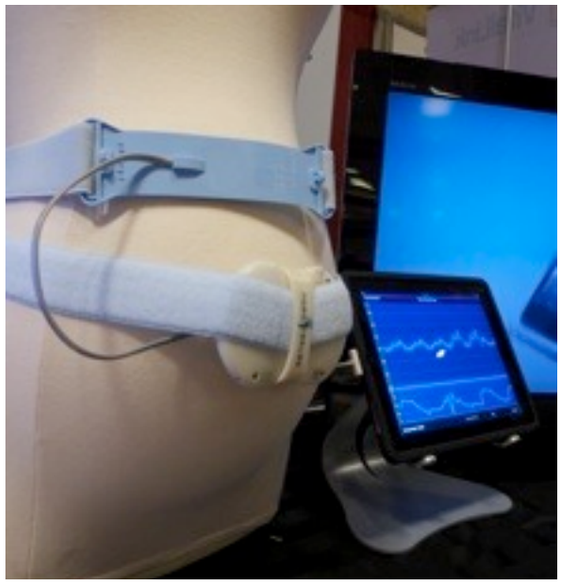
Diagnostic orders define device configuration and procedure

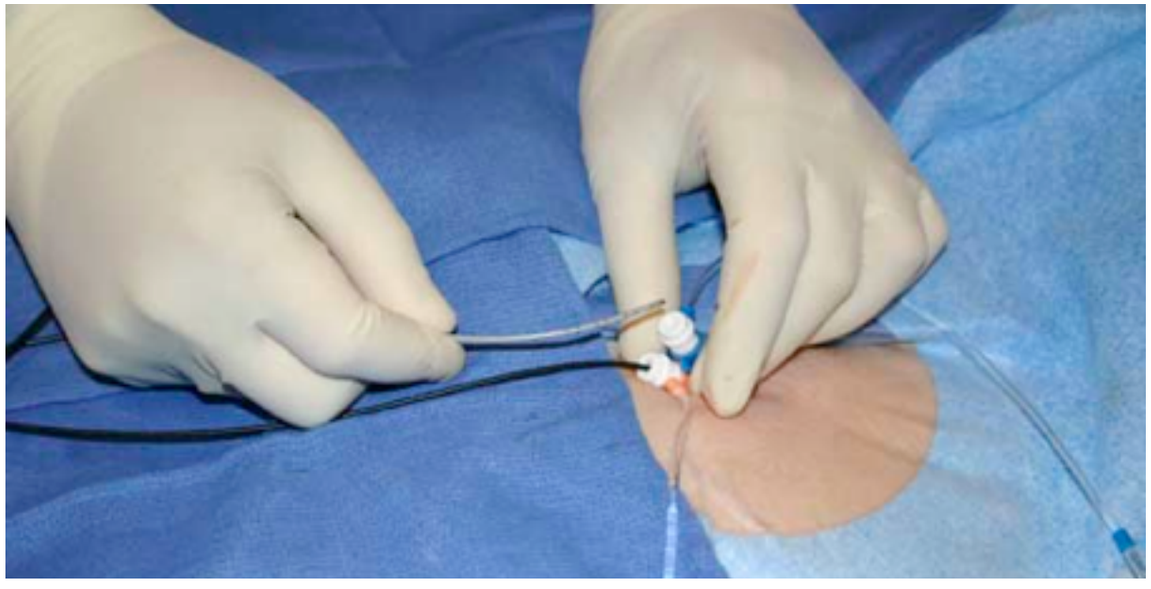
Can include establishing patient context

Dependent on patient management

Includes a formal end step

Data Acquisition





Medical device data is acquired

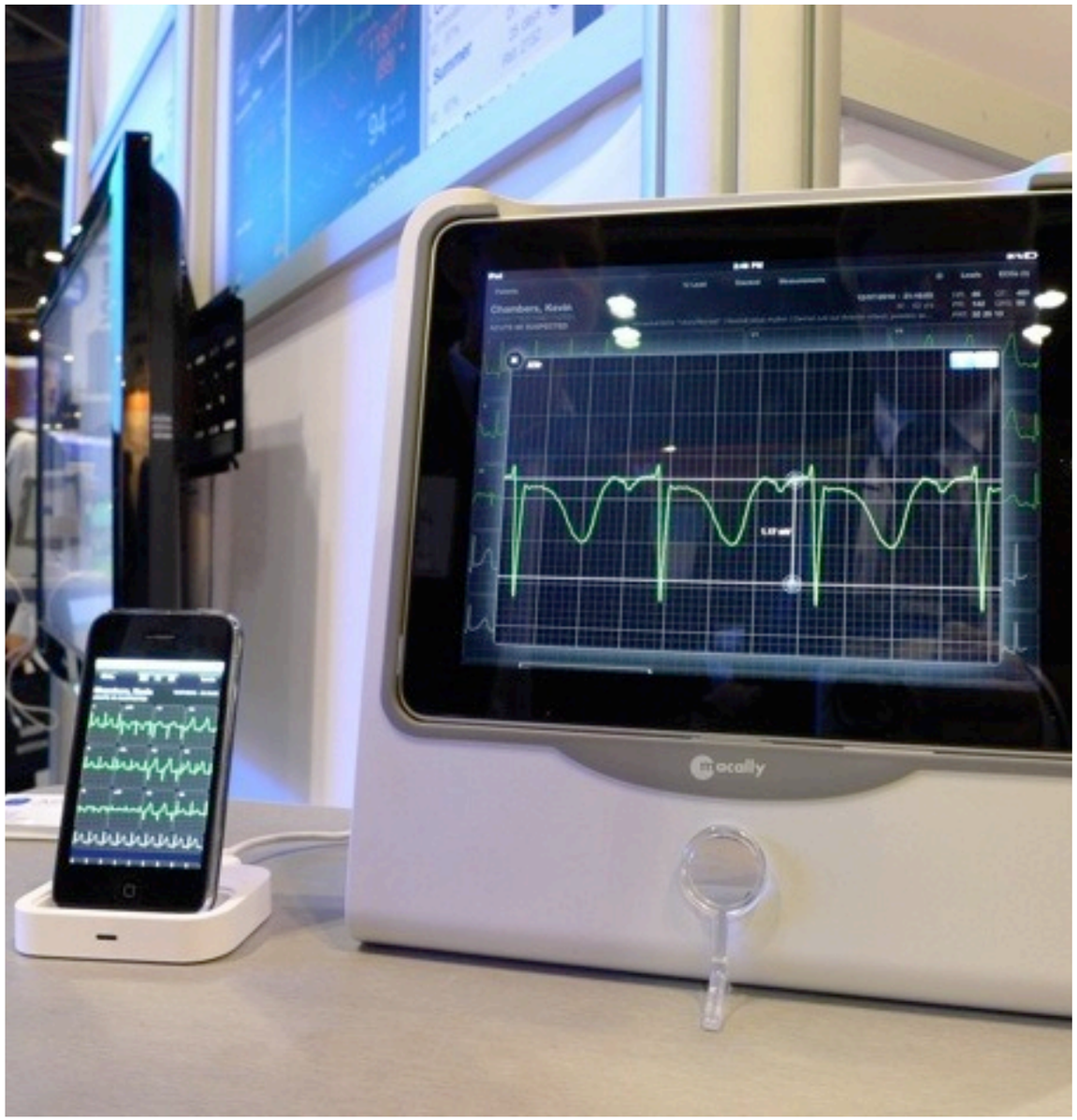
Can be continuous, periodic or both

Acquired data can include multiple data sets

Can include data annotation - both automatic and manual

Acquired data is often edited for reporting or clinical documentation

Data Analysis

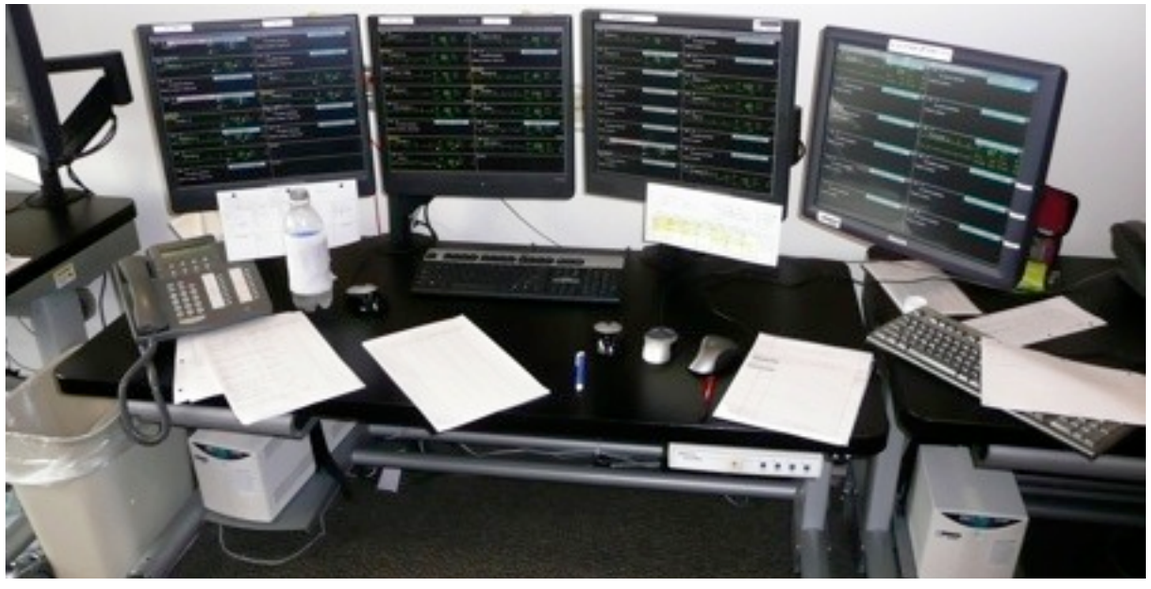


- Proprietary algorithms extract physiological data and improve data quality
- Data analysis to render proposed diagnosis
- Can be done in embedded device or via network
- Can be automated or user directed

Clinical Documentation

- EMR or procedure documentation
- Subset of medical device data is often used
- Combination of automated or user-generated data
- May require data validation step

Surveillance

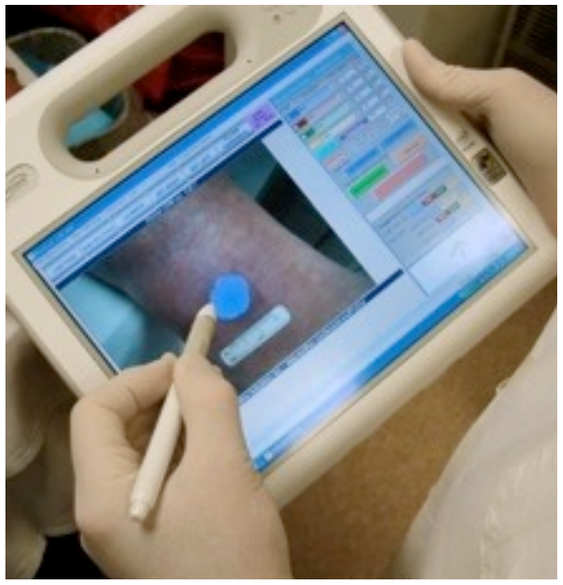


- Display of device data in locations beyond the medical device
- Continuous steam of data
- Near real time requirement
- Highly variable transmission distances
- Wide variety of client devices
- Implemented as “slave” monitor or part of broader workflow

Messaging

- Can include audio, text data and waveforms
- Broadcast or narrow cast
- Contextual clinical data often required
- May require escalation
- May track event driven messages to conclusion
- May include complex rules-driven
- Wide variety of client devices

Report Generation



- Fulfillment of order workflow
- Diagnostic report generation
- Procedure documentation
- Report generation, review and approval workflow
- Structured or unstructured data
- Management reporting

Data Management

- Supports patient management and order workflow
- Event review
- May include annotation or editing of data
- Data queueing for review or analysis
- Storage and retrieval
- Data archiving with appropriate retrieval
- Teaching file generation
- Clinical trial and research support

Device Specific Workflows

Basic templates: diagnostic, monitoring, and therapeutic

Device specific variations and combinations of preceding workflows

IV pump Drug Error Reduction Systems (DERS)

QA requirements