Achieving Connectivity for Vital Signs
"A Clinical Engineer is a professional who supports and advances patient care by applying engineering and managerial skills to healthcare technology."

ACCE Definition, 1992
Advancing patient care by implementing Clinical Information Systems technology. Applying engineering and managerial skills.
Why we implement CIS in Critical Care

Should we implement CIS in Lower Acuity Wards?

Share some experiences in bringing CIS out of Critical Care
Critical Care before Implementing CIS
Critical Care before Implementing CIS

Clinical Workflow

Patient

Clinicians

Chart

Transcription

Patient Admin Systems

Bedside Devices

Lab & PACS Systems

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Critical Care before Implementing CIS

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Critical Care after Implementing CIS
Benefits of Implementing CIS

- Patient
- Workflow
- Clinicians
- Information
- Data
- Technology
Benefits of Implementing CIS
Benefits of Implementing CIS

Timely integration of data
Manage data
Provide better ways of looking at the data
Automatic scoring and decision support
Improves information available to clinicians
Improves documentation and accountability
Standardise care
Support clinical audit & research
Staff satisfaction
Challenges to Implementing CIS

Looks like technology, in fact it is a new way of working

Implementation requires interdisciplinary team effort

Implementation involves change management of clinical practice

Implementation is a complex technical project

On going support is an interdisciplinary process

On going support needs human resources

High capital investment cost (typically £25,000 per bed)
Clinical Information Systems in Critical Care Environments

Quality of care improvement through new ways of working supported by technology

Complex and expensive to implement and support

1. Clinical Leadership
2. Existing interdisciplinary team
3. Relatively small defined area
4. Staff familiar with technology and change

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Should we implement CIS in Lower Acuity Wards?

Patients are not as acutely ill?
Data management not as much of an issue?
Should we implement CIS in Lower Acuity Wards?
Should we implement CIS in Lower Acuity Wards?

Transcription

Chart

Medications

RR
FiO2
Pain Score
Bowel
Urine

Lab Systems

Patient Admin Systems

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Should we implement CIS in Lower Acuity Wards?

Diagram:
- Patient
- Clinical Workflow
  - Transcription
  - Chart
  - Lab Systems
  - Patient Admin Systems

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Should we implement CIS in Lower Acuity Wards?

Kause et al. 2004 - 60% of primary events were preceded by documented abnormal physiology.

Goldhill and McNarry 2004 mortality increased with the number of abnormalities.
Should we implement CIS in Lower Acuity Wards?

Table 2: Advantages and disadvantages of different types of track and trigger system

<table>
<thead>
<tr>
<th>Track and trigger system</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</table>
| Aggregate scoring system (EWS, MEWS, The Worthing Physiological Scoring System) | • Allow monitoring of clinical progress  
• Allow for a graded response strategy  
• Widely used in UK hospitals | • May lack reproducibility and reliability because systems are prone to human calculation errors  
A range of sensitivities and specificities depending on the cut-off score used, but it is possible to achieve high sensitivity and specificity at defined cut-off point |
2.1.6 Physiological parameters to be used by track and trigger systems

Recommendation 1.2.2.5
Multiple-parameter or aggregate weighted scoring systems used for track and trigger systems should measure:

- heart rate
- respiratory rate
- systolic blood pressure
- level of consciousness
- oxygen saturation
- temperature.

Recommendation 1.2.2.6
In specific clinical circumstances, additional monitoring should be considered; for example:

- hourly urine output
- biochemical analysis, such as lactate, blood glucose, base deficit, arterial pH
- pain assessment.
Should we implement CIS in Lower Acuity Wards?
Should we implement CIS in Lower Acuity Wards?

Should we implement CIS in Lower Acuity Wards?
Benefits of Implementing CIS in ICU

- Timely integration of data
- Manage data
- Provide better ways of looking at the data
- Automatic scoring and decision support
- Improves information available to clinicians
- Improves documentation and accountability
- Standardise care
- Support clinical audit & research
- Staff satisfaction

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Should we implement CIS in Lower Acuity Wards?

Yes

Why do we not do it?

Clinical Champions

Existing interdisciplinary teams

Scale and change management

Cost
Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Unit: 9 Endoscopy rooms (awake sedation)
28 bed Endoscopy recovery/stepdown ward in Day Hospital

Existing System: Fujinon ADAM Endoscopy EPR

Drivers: Post sedation monitoring / JAG Accreditation

Deliverable: Automated recording of Vital Signs and Pain Score integrated into existing EMR (Endoscopy)
Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Clinical Workflow

Patient

Clinicians

Chart

IT

Diagnosis & Medications

Images

Vital Signs

Endo

GP

Transcription

Patient Admin Systems
Lab & PACS Systems

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Network

Fujinon Endoscopy Management System ADAM

Welch Allyn Connex Database

Cerner Hospital EMR

HL7 PAS Interface

SJH VM Ware

GP

PC

Clinicians

Network

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Technical Team

IT Server Support (internal & outsourced Redstone)

IT Network Support

IT Interface Support (internal & Cerner)

M.D.I. Vendor (Welch Allyn agent)

Welch Allyn System Engineers

Fujinon System Engineers

Estates T.S.D.

E.B.M.E.

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Workflow Team
- Doctors
- Recovery and Step Down ward Nurses
- Finance Procurement Unit
- M.D.I. Vendor
- Welch Allyn Application Support
- Fujinon Application Support
- Infection Control
- E.B.M.E.

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

**Technical Team**
- IT Server Support
- IT Network Support
- IT Interface Support
- M.D.I. Vendor
- Welch Allyn System Engineers
- Fujinon System Engineers
- Estates T.S.D.
- E.B.M.E.

**Workflow Team**
- Doctors
- Ward Nurses
- Finance Procurement Unit
- M.D.I. Vendor
- Welch Allyn Application Support
- Fujinon Application Support
- Infection Control
- E.B.M.E.

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

User Team
- Doctors
- Ward Nurses
- Infection Control

In-House Supplier
- IT Server Support
- IT Network Support
- IT Interface Support
- Estates T.S.D.

Supplier A
- M.D.I. Vendor
- Welch Allyn System Engineers
- Welch Allyn Application Support

Supplier B
- Fujinon System Engineers
- Fujinon Application Support

Supplier C
- Cerner
- System Engineers

Supplier D
- Redstone

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Timeline

Approval
Sept 2010

Order Placed
December 2010

Procurement

Devices Delivered
Jan 2011

Commissioned Mounted & Networked
April 2011

Commissioning

VM Ware and Server
Commissioned May 2011

W.A. Connex & Interface
Commissioned June 2011

Fujinon Upgrade
Commissioned July 2011

Interface & Test
Aug 2011

interface & Test
Aug 2011

Go Live
Sept 2011

Train

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Case Study
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Timeline

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Case Study
Vital Signs integration with EPR in an Endoscopy Day Unit

Budget

37 bed locations

10 PC viewing stations

€191,000

or

€5,162 per bed location

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1. To realise the full benefits both clinical workflow and technology need to be designed to compliment each other

2. Implementation is complex not like “box drop” projects
   Many partners and complex business structures
   Requires formal project management structure

3. Expensive

4. It takes time to design, implement and effect change

5. EBME play a pivotal role acting as synergists
Proven Benefits

New & improved workflow supported by technology

Existing technology infrastructure

Clinical Champion

Interdisciplinary teams

Unit Culture

Expensive per bed

Not many beds

High resource unit

Identified Needs

Expensive per bed

Very many beds

Low resource unit

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Interfaces to other clinical system

Interface to Patient Billing

Hospital Wide IT System

Interfaces to other clinical system

Medical Device

Medical Grade IT Interface Gadget

€ 250,000 per institution

€ 4,000 per bed space
COMPLETE THE PICTURE

Hospital Wide IT System

Interface to Patient Billing

Interfaces to other clinical system

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COMPLETING THE PICTURE

Hospital Wide IT System

Interface to Patient Billing

Interfaces to other clinical system

Medical Device

Medical Grade IT Interface Gadget

EBME
1. Economics, Quality and Accreditation will drive CIS systems from critical care to lower acuity ward.

2. With CIS projects the deliverable is a new workflow rather than a new technology.

3. Consequently implementing CIS is different from “box drop” type equipping projects.

4. Clinical Engineers are well placed to lead such projects and act as “agents for change”.

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