Health Informatics

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What are the obstacles to the implementation of electronic medical records?
What are Standards?
What are Standards development organizations?
Why do we need standards?
How do standards contribute to Patient Safety?
Case studies
How do we create networks of medical devices?
Health Informatics

* Why are there so many e-health scandals?
* What is a Health Informatician?
“We have lots of information technology we just don’t have any information”
A standard is an agreed, repeatable way of doing something. It is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition.
How writes standards?

- Written by committees that have a vested interest in the content of the standard.
- Committees members consist of manufacturers, end-users, members of the public, government officials
- The Standards Council of Canada (SCC) certifies these groups as Standards Development Organizations
Standards Development

- Identification of the need for new standard
- Preliminary study and preparation of a draft outline
- Establishment of a committee (pre-existing or new)
- Committee meetings and consensus building on the draft
- Vote on the draft standard
- Publication of the standard
Standards

- Federal, provincial and territorial MOH
- Physicians, nurses, lab clinicians, pharmacists and dentists
- Private and public payers
- Vendors
- Standards organizations: IHTSDO, HL7, ISO, CIHI, CSA, SCCC
- Infoway investments projects
- Non-Infoway, non-EHR projects
- Standards experts
- Health Service Delivery Organizations (HSDO)
- Academic institutions
Standards Council of Canada

* www.scc.ca

* Recognises standards as “National Standard of Canada”
Inhalational anaesthesia systems —
Part 4:
Anaesthetic vapour delivery devices

Systèmes d'anesthésie par inhalation —
Partie 4: Dispositifs d'alimentation en vapeur anesthésique
Why do we need standards?
Why do we need standards?

- Improve safety (drive on the right side of the road)
- Facilitate trade (metric vs imperial sizes)
- Improve ease of use (usb)
- Reduce costs (greater competition)
Standards in Healthcare

- Equipment standards
- Electrical safety
- Building codes
- Management standards-good manufacturing practices (GMP)
- Health Informatics
Health Care Information Technology; Canada 1999
Consumer Electronics
Problems

- Proprietary electronic interfaces
- Expensive custom software needed for each device
- Difficult to connect medical devices
- No currently usable standards for the electrical interface, syntax nor semantics
- Liability Issues
Absence of Interoperability is a Roadblock to Innovation
Healthcare providers are inadequately empowered by information technology
Current Operating Room Interoperability

CAUTION!
HANDLE WITH EXTREME CARE

PROLONGED EXPOSURE MAY RESULT IN DESPAIR, CYNICISM, POSSIBLY EVEN AWARENESS.
Let’s learn from other industries
Interlocks and Smart Alarms

- Automobiles
- Aircraft
- Individual medical devices
  - Example: Vaporizer interlocks
- Generally, NOT across medical device systems
Safety Interlock

Brake / Automatic Transmission
Forcing Function
Intelligent warnings/alarms require contextually aware systems!

Contextual awareness and safety interlocks require data from several device and systems
Why does the pulse oximeter alarm when the blood pressure cuff inflates?
Interoperability

- There are two distinct – but closely related – capabilities of medical device interoperability:
  - Reporting
  - Medical Device command and control
Critical events that could be prevented by automation
Ventilation stopped during intraoperative cholangiography

Benefit of medical device interoperability
Synchronization to mitigate hazard and improve quality
Forgotten to ventilate after CPB?
Smart system would provide warning of ventilator off and CPB pump flow = 0.
Latent System Failure

- Lack of supervision
- Communication
- Inadequate training and staffing skills mix
- Inadequate patient monitoring
- Ventilator turned off for x-ray
BP is low -> Stop Infusion

Run down the hallway, see sign on door
“Isolation Precautions!”
- Hat  - Gown
- Mask  - Gloves

Blood pressure is still dropping while you get dressed!

Why not pause the infusion with a control from the nursing station?
MD Plug and Play

- www.mdpnp.org
- CIMIT: Center for Integration of Medicine and Innovative Technology
- $10 Million NIH Quantum Grant Awarded to Interoperability Team Led by Dr. Julian Goldman
- *Program designed to make quantum improvements in health.*
Standards for Interoperability
ISO 11073

* Work in progress
* Lead by IHE
* In cooperation with
  * IEEE
  * ISO
  * IEC
  * HL7
  * SNOMED CT (IHTSDO)
ISO 11073

- Formerly IEEE 1073
- Hardware and software for medical device communication
- Based on ISO 7 layer IT transport protocols
- Overly complex, archaic
- Insufficient safety for closed loop controls
- Not plug and play
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## ISO 11073 Data Packets

<table>
<thead>
<tr>
<th>Packet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDC_CONC_SEVOFL</td>
<td>Measured partial pressure of sevoflurane in airway gas</td>
</tr>
<tr>
<td>MDC_CONC_SEVOFL_BREATH</td>
<td>Measured partial pressure of sevoflurane in airway gas during a breath</td>
</tr>
<tr>
<td>MDC_CONC_SEVOFL_INSP</td>
<td>Partial pressure of sevoflurane in airway gas measured during inspiration</td>
</tr>
<tr>
<td>MDC_AWAY_SEVOFL_INSPI</td>
<td></td>
</tr>
<tr>
<td>MDC_CONC_SEVOFL_EXP</td>
<td>Partial pressure of sevoflurane in airway gas measured during expiration</td>
</tr>
<tr>
<td>MDC_CONC_SEVOFL_ET</td>
<td>Partial pressure of sevoflurane in airway gas measured at the end of expiration</td>
</tr>
</tbody>
</table>

Measurements, Settings and remote functions
Integrated Clinical Environment

F2761-09
Medical Devices and Medical Systems —
Essential safety requirements for equipment
comprising the patient-centric integrated clinical
environment (ICE) — Part 1: General
requirements and conceptual model
Integrated Clinical Environment

- ECG and Capnography
- Decision Support Application
- PCA Infusion Pump
- Pulse Oximetry
- ICE Manager
IEC 80001-1
Application of risk management for IT-networks incorporating medical devices
Part 1: Roles, responsibilities and activities
Continua Health Alliance
Continua Health Alliance

http://www.continuaalliance.org/about-the-alliance/continua-vision-video.html
Goal is to Reduce Complexity through use of standards
Keep It Simple and Safe
Bar Codes Medication Safety Systems

Prints All TJC 2010 Required Elements*

*Prints diluent and dilution if required per NPSG 03.04.01
Bar Codes
Anesthesia Cockpit

- Anesthesia Delivery
- Patient Monitoring
- Decision Support Systems with smart Alarms
- Closed loop control
- Ultrasound and TEE
- Anesthesia Information Management System
- PACS
- EHR
Draeger Zeus

- Closed loop control of ventilation and anesthetic delivery
Wireless Monitors
Interactive Video Walls
Status Quo is unacceptable
Technology for the sake of technology is unacceptable
How are we going to get to the connected OR of the future?
Need for open software and hardware standards for interoperability
Increase the number of health informatics programs in Canadian Colleges and Universities
Solutions must be developed for the unique requirements of healthcare.
Systems must be usable-easy to learn, easy to remember, efficient and fun to use
Hospitals need to work together more to share modules and implementation expertise
Why is e-health such a mess?
EHealth scandal a $1B waste: auditor

Last Updated: Wednesday, October 7, 2009 | 6:10 PM ET CBC News

Ontario Auditor General Jim McCarter's report on eHealth criticizes the agency for reying too much on consultants and for lacking strategic direction. (Frank Gunn/Canadian Press)

A scathing report on the eHealth Ontario spending scandal charges that successive governments wasted $1 billion in taxpayer money.

Ontario Auditor General Jim McCarter released his investigation into the eHealth agency on Wednesday morning.

His report says the board of directors at eHealth Ontario felt it had little power over CEO Sarah Kramer because she had been hired by chair Alan Hudson "with the support of the premier." That, McCarter said, gave Kramer the impression she had approval to ignore normal procurement procedures.
Why is e-health such a mess?

- Blind leading the blind
- Inadequate health informatics standards
- Not trained in health informatics
- No government leadership
AMIA 10x10 Goal

- strengthening the breadth and depth of the biomedical and health informatics workforce is a critical component in the transformation of the American health care system.
- education and training of a new generation of clinical, public health, research, and translational bioinformatics informaticians to lead the transformation of the American health care system through the deployment and use of advanced clinical computing systems of care by the end of the decade.
- AMIA's 10x10 program aims to realize the goal of training 10,000 health care professionals in applied health and medical informatics within 10 years.

http://www.amia.org/education/10x10-courses
Educational Opportunities

* University of Victoria
* University of Toronto
* Western University
* McGill
* Columbia
* University of Pennsylvania
* Oregon State Health University
JULY 1977

Modems and multiplexers
The computer industry lobby
The computer as diagnostician

Computer Decisions

A Hayden Publication DISTRIBUTED COMPUTING FOR MANAGEMENT

Computers and medicine
Conclusions

- Inadequate or no standards hampering systems
- Inadequate numbers of trained individuals in health informatics
- Need for better coordination and sharing between healthcare centres and government
- Better leadership
- We are making progress, but it’s slow
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