Clinical Simulations in Health Professional Education: International Perspectives and Lessons Learned About Integration and Patient Safety

Session Room 6
Clinical Simulation
Introduction

• Our Group
  • Elizabeth Borycki, University of Victoria, Canada
  • Jorges Gonzales, Duoc, Chile
  • Carola Hullin, Duoc, Chile
  • Andre Kushniruk, University of Victoria, Canada
  • Kendall Ho, University of British Columbia, Canada

• Our work includes:
  • developing and extending the use of clinical simulation in the area of health informatics.
  • Identifying methods that can be used to improve health professional knowledge, skill and judgement
Clinical Simulation

• A *methodology and educational strategy* that can be used to educate health professionals about electronic health records prior to entering real-world practice settings

• Involves health professional students:
  • Interacting with a system(s)
  • Using representative devices
  • In a typical workplace
  • Carrying out representative tasks
    • (Borycki et al., 2005; Borycki et al., 2010)
What does a Clinical Simulation Involve?

- Health information system
- Clinical simulation
  - Mannequins
  - Clinical scenarios
  - Representative users
  - Health Information system
  - Medical devices

Health Informatics and Clinical Simulation

(Borycki et. al., 2011)
Example: Clinical Simulation

Figure 1. Video recording of a subject interacting with health information systems during a clinical simulation.
Levels of Clinical Simulations Involving Health Information Technology

Level 1: User Interacting With the System in Isolation

Level 2: User Interacting Individually with the System and their Environment to Carry Out a Work Task

Level 3: Multiple Users Interacting with Each Other and the System to Carry Out Multiple Tasks as part of the Organization

(Adapted from Kushniruk & Borycki, 2008)
How have Clinical Simulations been Used in Health Informatics?

• Procurement
  • Systems selection

• Design and Implementation of Systems
  • Data is used as inputs for making:
    • Modifications to the HIS
    • Modifications to devices
    • Developing policies and procedures
    • Developing training
      • (Borycki & Keay, 2010)

• Safety
  • Certification of systems for safety
  • Input to systems improvement
  • Determining the cause of an error after it has occurred
    • (Borycki & Keay, 2010)
Use of Clinical Simulations in Health Professional Education Involving Health Information Systems

• Healthcare organizations are currently implementing health information systems

• There is a need to educate health professionals about how to use these systems in a healthcare setting before they begin to practice in real-world situations

• Clinical simulation has been introduced as a methodology for teaching health professionals about electronic health records and other types of health information systems
Use of Clinical Simulations in Health Professional Education and Training

• Differing methods have been used to educate health professionals about information systems
  • Students have been provided access to EHRs within the context of courses (desktop EHRs)
    • Limited portability and accessibility
  • Students have been provided with access to EHRs using portals over the WWW
    • Student access anytime and anywhere
    • Can be used in a lab setting, in class or in the home environment
Use of Clinical Simulations in Health Professional Training
Use of Clinical Simulations in Health Professional Education and Training

• Complex
  • Need to move the focus beyond the technology

• Targeting Learning
  • Opportunity to learn about the technology (e.g. EHR)
  • Opportunity to learn about practice
  • Opportunity to combine both and achieve an understanding of how the technology can be used to support practice
Continuum form Fixed Simulation Laboratories to Portable/Virtual Simulation Labs

• Exist on a continuum from fixed simulation laboratories to portable/virtual simulation labs

Fixed Laboratories

e.g. found in some hospitals and educational institutions

Important for the environment to:
• replicate the conditions present in real environments
• place individuals in environments and situations that are similar to the "real world”
• highest level of fidelity is when study is carried out in real (naturalistic) setting (Kushniruk et. al., 2006)

Portable/Virtual Simulation Labs

e.g. virtual portals
Clinical Simulations in Health Professional Education: International Perspectives and Lessons Learned About Integration and Patient Safety

Workshop: Wednesday August 21\textsuperscript{st}, 2013 from: 13:45-17:15

Session Room 6
Simulation lab technologies for health
Electronic health records and training

• Documentation
• Error prevention
• Development of solutions
• Legal and Ethical Framework
Clinical Simulation in Health Professional Education: 
*International Perspectives and Lessons Learned About Integration and Patient Safety*

Jorge A. González-Moreno, M.D.  
Director DuocUC School of Health  
Santiago de Chile
CLINICAL SIMULATION
Our experience at DuocUC School of Health

2003
Creation School of Health
2 Sim Centers
560 students

2013
6 Sim Centers
8,500 students

2020
Integration with UC Sim Center
International Collaborative projects
14,000 students?
## SIM CENTER IMPLEMENTATION PROCESS

Remodelación San Carlos 2014 – Apertura Escuela de Salud  
Dirección de Infraestructura

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Clinical Simulation Center at DuocUC San Bernardo Campus
Laboratorio de Bacteriología & Parasitología
Laboratorio de Neónatología
Unidad Simulada de Primera Ayuda
Unidad Simulada de Atención Maternal y Neonatal
Simulación de Unidad de Hospital
Simulación de Centro de Salud
Simulación de Ambulancias
Centro de Simulación de Atención Primaria
Centro de Simulación de Urgencias
Centro de Simulación de Cirugía Básica
Centro de Simulación de Medicina Interna

Nebulización, Inyección, Medicación, Manipulación de Vía Aérea, Vía Intravenosa, Apnea, Dolor, Necrosis, Sangrado, Calor, Frío, Informe Médico, Fisioterapia, Radiología

Diseño de Escuela de Salud
Escuela de Salud
Instituto de Salud
Universidad de Salud

INSTITUTO DE SALUD
UNIVERSIDAD DE SALUD
ESCUELA DE SALUD
Diseño de Escuela de Salud
Clinical Simulation Center at DuocUC San Bernardo Campus
NEONATOLOGY
ANATOMY SIMULATION LAB.
GYNECOLOGY SIMULATION
QUALITY CONTROL: DEBRIEFING
Thank you.......
MedInfo 2013 Copenhagen

August 21, 2013

Clinical Simulations in Health Professionals Education: EMR Training in UBC Faculty of Medicine Curriculum

Kendall Ho, MD FRCPC
Professor, Emergency Medicine
Director, eHealth Strategy Office

eHealth Strategy Office
Good driving

Good eHealth/Health Informatics (eHI)?

Experiential

Foundational

Privacy, Confidentiality
Secondary use of data
Data sharing & meaningful use
Level of evidence & searching
Engaging patients & public

....
EMR Objectives for health professionals

Collection, collation, analysis of data
Manage and utilize data for decision support
Develop skills in EMR in clinical care
Patient centred EMR use
Interprofessional collaboration in EMR
Population health monitoring and surveillance
Principles of data (privacy, coding, interoperability...)

How to **embed** EMR training into a Medical Curriculum?
1 wk Case Study: EMR story board

**DIABETES**
- Patient Hx & log
- Track Blood (A1C)
- Medications
- Prescribing
- Med Interactions
- OR Record

**BACK PAIN**
- DI (X ray, CT, MRI)
- Referral letter
- Confidentiality
- Pre-op assess
- OR Record

**RECOVERY**
- Post-op care
- Medication use
- Emergency (ECG)
- Interprof record
- Discharge sum.
Curriculum Renewal: Tactics

• Integration into clinical case management
• eHI lectures, skills workshops, forums
• On line modules: compulsory and optional
• Assessment (e.g. OSCE)
• ePortfolio to track attainment of objectives
• Scholarship: elective/projects/research
Clinical Simulations in Health Professionals Education: 
Towards an interoperable EHR

Kendall Ho, MD FRCPC
Professor, Emergency Medicine
Director, eHealth Strategy Office
Health Professionals & Patient Centred Care
Exploring iEHR: UBC, UVic, UA, AFMC*

• Environmental scan: IP EHR education
• Forum with stakeholders^:
  ✓ Practical and literature based issues
  ✓ Canadian contexts
  ✓ Solutions & collaborations
  ✓ Path forward in Canada
• Synthesis of report (March 2014)

*Funded by Health Canada

^Policy makers, Education policy makers, educators, clinicians, researchers

eHealth Strategy Office
What makes a GREAT piano?

- Purity of each note
- Depth/warmth
- Connectivity/Harmony between notes
UBC Faculty of Medicine
eHealth Strategy Office

- Internet:  www.eHealth.med.ubc.ca
- Facebook:  @UBC eHealth Strategy Office
- Twitter:   @ehealthstrategy
- E-mail:    ubcehso-g-assistant@ubc.ca
- Telephone: +1.604.875.4111 x69153
Portable/Virtual Simulations for Health Professional Training about Health Information Technology

Andre Kushniruk, PhD, Professor

School of Health Information Science
University of Victoria, Victoria, British Columbia
How Can We Improve Adoption Using Education and Training?

- We can increase adoption by:
  - exposing students and practitioners to EHRs through hands on access, through remote, widespread and easy access working systems
  - Enabling students, practitioners and managers to distinguish between systems and see how they can be used in their practice and educational settings
  - Increasing understanding of use of systems, decision-making knowledge

- This is expected to result in:
  - Reduced financial and human resources burden on universities, colleges and regional health authorities for e-health application education and training
    - (Borycki et al., 2009; Otto & Kushniruk, 2009; Kushniruk et al., 2010)
An Virtual Simulation Solution

- Development of a server and portal that will support simulation-based training of students with health information technology (HIT) – a virtual EHR Simulator:
  - To let students remotely access and interact with real EHR software (from anywhere and anytime)
  - To obtain the latest information about EHRs and actually try them out in their educational or clinical practice settings
  - To learn about the use of the EHR
    - Educational modules focused around EHR and related e-health applications
      - (Borycki et al, 2009; Kushniruk et al, 2010; Kushniruk et al., 2012)
Users of the Portal and EHR Simulations

• Health professional students
  – Medical, nursing, pharmacy, nutrition, physiotherapy, social work, health services and information science
  – Potentially thousands of students

• Practicing professionals wanting continuing education

• Managers and decision makers

• Health professionals selecting amongst available EHR systems
  • (Borycki et al., 2009; Kushniruk et al., 2010; Kushniruk et al 2012)
Integrating Electronic Medical Records (EMRs) into Medical Education – UBC/UVic Work

• Need to introduce medical students to EMRs (and related technologies) in problem-based curriculum, however few examples in Canada

• TEKTIC pilot project (collaboration with UBC and UVic – December 2007)
  o Introduced all BC 4th year medical students to EHRs (integrated into problem based learning)
  o Case of “Tom’s back pain” delivered to students via an EHR modified for teaching purposes (based on storyboard developed at UBC)
  o Over 200 medical students and staff from across BC participated and accessed case of the week using the EHR (rather than on paper)
  o Training about EHR and related technology (e.g. coding of patient data, decision support, etc.) integrated within context of problem based learning
  o Student feedback positive but some indicated they wanted earlier integration into curriculum

• How do we assess student EHR and IT competencies?
  • (Borycki, Kushniruk, Joe, Armstrong, Ho, Silverman, Otto, 2009; Kushniruk et al., 2012)
Welcome to the University of Victoria Electronic Health Record (EHR) Educational Portal

School of Health Information Science
University of Victoria

This web portal is meant as a gateway to showcase the research and education into electronic health record (EHR) and electronic medical records (EMR) technology, and is a project managed by the School of Health Information Science of the University of Victoria, British Columbia.

Generous funding/sponsorship has been provided by:

BC Ministry of Health
http://www.gov.bc.ca/health/
School of Health Information Science
University of Victoria

Educational EHRs
Digital Health Designs EMR [requires username/password]
POND - Pediatric Oncology Networked Database
OSCAR McMaster [hosted version coming soon]
WorldVista

Health Records Technology in BC
Physician Information Technology Office (PITO)
EMR Toolkit
BCHealthGuide Online
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Findings

- EMR technology could be practically integrated into a problem-based medical education module.
  - Simulation features included timed release of information to students over the week

- Coupling of information technology within a problem-based learning (PBL) module allowed students to gain knowledge about EHRs at the same time as learning about medical cases

- Students learned about the biomedical aspects of patient’s cases with little extra time expenditure.

Quantitative Findings

- Students were asked about their overall experience.
  - Students rated the session favorably
    - (Kushniruk, Borycki, Joe, Otto, Armstrong, Ho, 2012)
Findings

- **Qualitative Findings**
  - reflected strategies for improving EHR integration into existing curricula.
  - decreasing the amount of didactic information about EHRs
  - increasing the amount of hands-on exposure to EHRs themselves.
  - some students commented that by their fourth year:
    - they would like to have had experience with a range of different systems
    - in particular the specific vendor systems that the provincial government is providing funding for purchasing in their medical practice upon their graduation.
  - students suggested an alternative activity:
    - critiquing the EHR in use
    - reflecting on the benefits offered by this technology.

(Kushniruk, Borycki, Joe, Otto, Armstrong, Ho, 2012)
Further Applications of Portal

- **Health Informatics Education**
  - Used by over 100 health informatics students in design and testing of a Web-accessible international EMR for pediatric cancer care – POND (in collaboration with St. Judes Research Hospital, Memphis)
  - Accessed from anywhere in the world
  - Served as centerpiece of courses on electronic health records at UVic

- **Nursing Education**
  - Was used over several years in the education of hundreds of nursing students throughout the province of BC and across Canada (e.g. Quebec)
    - On-campus and distance education program
Multiple Applications

- The portal allowed access to several open source EMRs
- Was extended to access to Veteran’s Affairs OpenVISTA
- Was extended to access OpenMRS and several personal health record systems
- These applications were used by medical, nursing, health informatics students
- Used in on-campus and distance education across Canada
School of Health Information Science
University of Victoria

Educational EHRs
Digital Health Designs EMR [requires username/password]
POND - Pediatric Oncology Networked Database
OSCAR McMaster [hosted version coming soon]
WorldVista

Health Records Technology in BC
Physician Information Technology Office (PITO)
EMR Toolkit
BCHealthGuide Online
Consult: PHARMACY CONSULTS

Consultant's choice: Vancomycin

For treatment of serious infections caused by beta-lactam-resistant gram-positive microorganisms.

Vancomycin Order:
- DOSAGE: Per Pharmacy Consult
- ROUTE: IV Piggyback
- FREQUENCY:
- PRIORITY: Routine
- COMMENTS:
  - A PHARMACIST WILL REVIEW ALL ORDERS. IF AN ORDER IS APPROVED, THE DOSAGE WILL BE DISPENSED. AN UNAPPROVED ORDER WILL BE FORWARDED TO THE CHAIRMAN OF INFECTION CONTROL OR INFECTIOUS DISEASE PHYSICIAN AND NO DOSE WILL BE DISPENSED UNTIL APPROVED BY ONE OF THESE PHYSICIANS.

Inter-facility Information:
This is not an inter-facility request

Status: COMPLETE
Last Action: COMPLETE/UPDATE

Facility Activity
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- Entered By: MANAGER, SYSTEM

Note # 208
A Continuum for Considering Integration of EHR into Health Professional Education

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<td>Standalone unit about the EHR in a class</td>
<td>Integration of EHR into key points in the curriculum</td>
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</tbody>
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Kushniruk et al., 2010
Current UBC/UVic Work in EMR Integration into Curriculum

• Extended previous work to include both introducing students to EMRs and also designing OSCEs for assessing medical student EMR related competencies:
  o Electronic access and retrieval of patient data
  o Use of decision support
  o Interaction with patient while using an EMR
    o (Borycki, Kushniruk, Khan, Zibrik, Campbell, Ho, 2012)
Several phases:

- Interviews with stakeholders about information technology competencies needed (conducted in 2010-2011)

- Participatory design focus groups to arrive at design of OSCE test stations to assess EMR competencies (2011 and 2012)

- Piloting with medical students expected to take place in current academic year
Directions – UBC/UVic Collaboration on Curriculum

• Continuing to explore ways of integrating information technologies into medical education training
  o Including technologies such as electronic medical records, mobile devices and evidence-based medicine (EBM)

• Issue of when and how to integrate information technologies into curriculum being explored

• Exploring insertion into new curriculum
Summary

- There is need for increased exposure of health professional students to EHR (and related technology and e-tools)
- Allowing **flexible access** to a range of different **real working systems** allows both students and working professionals to explore this technology in a safe and user-friendly environment
- Can be done in their **own practice and learning contexts, and can be done remotely making access easy and virtual**
- Other educational resources (e.g. on-line courses) can be integrated with virtual simulations
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