LibreHealth EHR - Litrature review

Summary

- Enriching data with GIS datasets
- Enrich with billing data
- Simulation case studies for the EHR Education project
  - Medication reconciliation
  - Terminology and standards
  - Clinical decision support
  - Usability design
  - CPOE
  - Interoperability and messaging - HL7
  - Billing and medical coding
  - IOT and connected home and Apps
  - Maybe consider use in a MOOC
  - Social media
- Expand domain - medical students , pharmacists etc
- Case studies cross platform with residents and medical students vs informatics students - for multidisciplinary education
- Keywords
  - curriculum transformation
  - *Index Terms*—Health informatics education, virtual training, educational software.
- Closely related articles
  - http://www.ijiet.org/vol7/845-JR186.pdf
  - https://cdn.intechopen.com/pdfs-wm/18392.pdf
- errors and simulation - from OHSU

Table 1

Fourteen errors developed throughout the 5-day ICU course

Error safety issue	EHR category
Changes in patient condition	
25% Drop in mean arterial pressure, 25% increase in heart rate	Structure and time, cognition and customisation
Recurrent sepsis	Cognition
Increasing plateau pressure to >30	Overcompleteness, data finding
Increase in WBC*	Structure and time, cognition and customisation
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Inappropriate antibiotic dose (2)	Data finding, cognition
Low antibiotic trough	Data finding, cognition
Use of D5W in hyperglycemic patient	Data finding and overcompleteness
Failure to adhere to best practice	
Glucose>200 mg/dl	Overcompleteness and data finding
Tidal volume of 8 cc/kg IBW in acute respiratory distress syndrome	Data finding and cognition
Over-sedation	Data finding
Lack of daily awakenings	Data finding
Recognition of fluid balance†	Data finding

- They include improper medication dosing or administration, failure to adhere to ICU best practices and inability to identify dangerous patient trends. EHR categories are defined as in Ash *et al.*[46]
- *Net 30% increase in WBC from days 3 to 5.
- †Net 16 litres positive since admission.
- D5W, EHR, electronic health record; IBW, ideal body weight; ICU, intensive care unit; WBC, white blood cell count.

Simulated Electronic Health Record (Sim-EHR) Curriculum: Teaching EHR Skills and Use of the EHR for Disease Management and Prevention

Dr. Christina E. Milano, MD, Dr. Joseph A. Hardman, MD, Dr. Adeline Plesiu, MD, Ms. Rebecca E. Rdesinski, MSW, MPH, and Dr. Frances E. Biagioli, MD

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4035239/

Abstract

Physicians in the 21st century will increasingly interact in diverse ways with information systems, requiring competence in many aspects of clinical informatics. In recent years, many medical school curricula have added content in information retrieval (search) and basic use of the electronic health record. However, this omits the growing number of other ways that physicians are interacting with information that includes activities such as clinical decision support, quality measurement and improvement, personal health records, telemedicine, and personalized medicine. We describe a process whereby six faculty members representing different perspectives came together to define competencies in clinical informatics for a curriculum transformation process occurring at Oregon Health & Science University. From the broad competencies, we also developed specific learning objectives and milestones, an implementation schedule, and mapping to general competency domains. We present our work to encourage debate and refinement as well as facilitate evaluation in this area.

Keywords: curriculum transformation, clinical decision support, patient safety, health care quality, patient engagement

Integrative Biological Chemistry Program Includes The Use Of

Informatics Tools, GIS And SAS Software Applications

Wesley College is a private, primarily undergraduate minority-serving institution located in the historic district of Dover, Delaware (DE). The College recently revised its baccalaureate biological chemistry program requirements to include a one-semester Physical Chemistry for the Life Sciences course and project-based experiential learning courses using instrumentation, data-collection, data-storage, statistical-modeling analysis, visualization, and computational techniques. In this revised curriculum, students begin with a traditional set of biology, chemistry, physics, and mathematics major core-requirements, a geographic information systems (GIS) course, a choice of an instrumental analysis course or a statistical analysis systems (SAS) programming course, and then, students can add major-electives that further add depth and value to their future post-graduate specialty areas. Open-sourced georeferenced census, health and health disparity data were coupled with GIS and SAS tools, in a public health surveillance system project, based on US county zip-codes, to develop use-cases for chronic adult obesity where income, poverty status, health insurance coverage, education, and age were categorical variables. Across the 48 contiguous states, obesity rates are found to be directly proportional to high poverty and inversely proportional to median income and educational achievement. For the State of Delaware, age and educational attainment were found to be limiting obesity risk-factors in its adult population. Furthermore, the 2004–2010 obesity trends showed that for two of the less densely populated Delaware counties; Sussex and Kent, the rates of adult obesity were found to be progressing at much higher proportions when compared to the national average.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4505611/

Use of Electronic Health Record Simulation to Understand the Accuracy of Intern Progress Notes

Background With the widespread adoption of electronic health records (EHRs), there is a growing awareness of problems in EHR training for new users and subsequent problems with the quality of information present in EHR-generated progress notes. By standardizing the case, simulation allows for the discovery of EHR patterns of use as well as a modality to aid in EHR training.

Objective To develop a high-fidelity EHR training exercise for internal medicine interns to understand patterns of EHR utilization in the generation of daily progress notes.

Methods Three months after beginning their internship, 32 interns participated in an EHR simulation designed to assess patterns in note writing and generation. Each intern was given a simulated chart and instructed to create a daily progress note. Notes were graded for use of copy-paste, macros, and accuracy of presented data.

Results A total of 31 out of 32 interns (97%) completed the exercise. There was wide variance in use of macros to populate data, with multiple macro types used for the same data category. Three-quarters of notes contained either copy-paste elements or the elimination of active medical problems from the prior days' notes. This was associated with a significant number of quality issues, including failure to recognize a lack of deep vein thrombosis prophylaxis, medications stopped on admission, and issues in prior discharge summary.

Conclusions Interns displayed wide variation in the process of creating progress notes. Additional studies are being conducted to determine the impact EHR-based simulation has on standardization of note content.

Information and informatics literacies of first-year medical students

Interesting survey tools
http://europepmc.org/articles/pmc4613382#mlab.1536-5050.103.4.008.sg001

Could be good pilot data for a grant

An Approach for All in Pharmacy Informatics Education

Read More: http://www.ajpe.org/doi/abs/10.5688/ajpe81238

Computerization is transforming health care. All clinicians are users of health information technology (HIT). Understanding fundamental principles of informatics, the field focused on information needs and uses, is essential if HIT is going to support improved patient outcomes. Informatics education for clinicians is a national priority. Additionally, some informatics experts are needed to bring about innovations in HIT. A common approach to pharmacy informatics education has been slow to develop. Meanwhile, accreditation standards for informatics in pharmacy education continue to evolve. A gap remains in the implementation of informatics education for all pharmacy students and it is unclear what expert informatics training should cover. In this article, we propose the first of two complementary approaches to informatics education in pharmacy: to incorporate fundamental informatics education into pharmacy curricula for all students. The second approach, to train those students interested in becoming informatics experts to design, develop, implement, and evaluate HIT, will be presented in a subsequent issue of the *Journal*.

The pharmacist and the EHR

The adoption of electronic health records (EHRs) across the United States has impacted the methods by which health care professionals care for their patients. It is not always recognized, however, that pharmacists also actively use advanced functionality within the EHR. As critical members of the health care team, pharmacists utilize many different features of the EHR. The literature focuses on 3 main roles: documentation, medication reconciliation, and patient evaluation and monitoring. As health information technology proliferates, it is imperative that pharmacists' workflow and information needs are met within the EHR to optimize medication therapy quality, team communication, and patient outcomes.

https://academic.oup.com/jamia/article/24/1/193/2631445/The-pharmacist-and-the-EHR

Participation in EHR based simulation improves recognition of patient safety issues

https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-14-224

Abstract

Background

Electronic health records (EHR) are becoming increasingly integrated into the clinical environment. With the rapid proliferation of EHRs, a number of studies document an increase in adverse patient safety issues due to the EHR-user interface. Because of these issues, greater attention has been placed on novel educational activities which incorporate use of the EHR. The ICU environment presents many challenges to integrating an EHR given the vast amounts of data recorded each day, which must be interpreted to deliver safe and effective care. We have used a novel EHR based simulation exercise to demonstrate that everyday users fail to recognize a majority of patient safety issues in the ICU. We now sought to determine whether participation in the simulation improves recognition of said issues.

Methods

Two ICU cases were created in our EHR simulation environment. Each case contained 14

safety issues, which differed in content but shared common themes. Residents were given 10 minutes to review a case followed by a presentation of management changes. Participants were given an immediate debriefing regarding missed issues and strategies for data gathering in the EHR. Repeated testing was performed in a cohort of subjects with the other case at least 1 week later.

Results

116 subjects have been enrolled with 25 subjects undergoing repeat testing. There was no difference between cases in recognition of patient safety issues (39.5% vs. 39.4%). Baseline performance for subjects who participated in repeat testing was no different than the cohort as a whole. For both cases, recognition of safety issues was significantly higher among repeat participants compared to first time participants. Further, individual performance improved from 39.9% to 63.6% (p=0.0002), a result independent of the order in which the cases were employed. The degree of improvement was inversely related to baseline performance. Further, repeat participants demonstrated a higher rate of recognition of changes in vitals, misdosing of antibiotics and oversedation compared to first time participants.

Conclusion

Participation in EHR simulation improves EHR use and identification of patient safety issues.

Use of simulation to assess electronic health record safety in the intensive care unit: a pilot stud

Table 1

Fourteen errors developed throughout the 5-day ICU course

Error safety issue	EHR category
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- They include improper medication dosing or administration, failure to adhere to ICU best practices and inability to identify dangerous patient trends. EHR categories are defined as in Ash *et al.*[46]
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- †Net 16 litres positive since admission.
- D5W, EHR, electronic health record; IBW, ideal body weight; ICU, intensive care unit; WBC, white blood cell count.

Beyond information retrieval and electronic health record use: competencies in clinical informatics for medical education

Abstract

Physicians in the 21st century will increasingly interact in diverse ways with information systems, requiring competence in many aspects of clinical informatics. In recent years, many medical school curricula have added content in information retrieval (search) and basic use of the electronic health record. However, this omits the growing number of other ways that physicians are interacting with information that includes activities such as clinical decision support, quality measurement and improvement, personal health records, telemedicine, and personalized medicine. We describe a process whereby six faculty members representing different perspectives came together to define competencies in clinical informatics for a curriculum transformation process occurring at Oregon Health & Science University. From the broad competencies, we also developed specific learning objectives and milestones, an implementation schedule, and mapping to general competency domains. We present our work to encourage debate and refinement as well as facilitate evaluation in this area.

Keywords: curriculum transformation, clinical decision support, patient safety, health care quality, patient engagement

Information and communication technology to facilitate learning for students in the health professions: Current uses, gaps, and future directions

Changes in the US Healthcare System along with the need for institutions of higher education to prepare a work force ready to address the challenges of today and tomorrow have highlighted the need to incorporate technology in its broadest sense as part of the student learning experience. In health professional education, this becomes challenging as programs have traditionally relied on face-to-face instruction along with internship experiences which provide hands on patient care. In addition, learning activities that incorporate higher order critical thinking must be incorporated in order to meet competency based professional expectations as well as

expectations in the work place environment. This article will address current technology use in health professional education programs and identify opportunities to incorporate technology to enhance the student learning experiences with emphasis on the critical thinking, communication, and psychomotor skills required of today's health professional graduate.

http://hsrc.himmelfarb.gwu.edu/cgi/viewcontent.cgi?article=1030&context=smhs_physther_facpubs

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Towards an Effective Framework for Integrating Educational Software into Health Informatics Curricula

Abstract—In the last few years, the use of information technology to improve the quality of healthcare services has challenged healthcare organizations to adjust to these new developments. Consequently, there is an increasing demand to prepare health informatics professionals to be a driving force in the adoption and implementation of health information technology projects. This paper presents the results of an exploratory study conducted to gain insight into the potential benefits and challenges related to the integration of an educational health information system into an introductory course on health informatics. The study aims to achieve an effective framework for embedding educational software into undergraduate health informatics courses. The students who participated in this study used the system to gain practical experience with how a health informatics system performs its core functions and to discover the importance of integration between different parts of the system. The results of the study revealed that integrating health informatics software into undergraduate courses has positive impacts on the learning process. However, the study identified various barriers that should be taken into consideration to achieve educationally effective integration of health informatics software into the teaching environment.

http://www.ijiet.org/vol7/845-JR186.pdf

Towards the Development of a Framework for Integration of an Electronic MedicalRecord into an Undergraduate Health Informatics Curriculum

Thesis

https://dspace.library.uvic.ca/bitstream/handle/1828/3466/Bassi_Jesdeep_MSc_2011.pdf?sequence=7&isAllowed=y

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Intelligent Simulation Model To

Facilitate EHR Training

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4765600/

Abstract

Despite the rapid growth of EHR use, there are currently no standardized protocols for EHR training. A simulation EHR environment may offer significant advantages with respect to EHR training, but optimizing the training paradigm requires careful consideration of the simulation model itself, and how it is to be deployed during training. In this paper, we propose Six Principles that are EHR-agnostic and provide the framework for the development of an intelligent simulation model that can optimize EHR training by replicating real-world clinical conditions and appropriate cognitive loads.

Overcoming Electronic Medical Record Challenges on the Obstetrics and Gynecology Clerkship

Buery-Joyner, Samantha D. MD; Dalrymple, John L. MD; Abbott, Jodi F. MD; Craig, LaTasha B. MD; Forstein, David A. DO; Graziano, Scott C. MD; Hampton, Brittany S. MD; Hopkins, Laura MD; Page-Ramsey, Sarah M. MD; Pradhan, Archana MD; Wolf, Abigail MD; Mckenzie, Margaret L. MD

http://journals.lww.com/greenjournal/Abstract/2015/09000/Overcoming_Electronic_Medical_Record_Challenges_on.15.aspx

Training and Assessing Interprofessional Virtual Teams Using a Web-Based Case System

Purpose: Today, clinical care is often provided by interprofessional virtual teams—groups of practitioners who work asynchronously and use technology to communicate. Members of such teams must be competent in interprofessional practice and the use of information technology, two targets for health professions education reform. The authors created a Web-based case system to teach and assess these competencies in health professions students.

Method: They created a four-module, six-week geriatric learning experience using a Web-based case system. Health professions students were divided into interprofessional virtual teams. Team members received profession-specific information, entered a summary of this information into the case system's electronic health record, answered knowledge questions about the case individually, then collaborated asynchronously to answer the same questions as a team. Individual and team knowledge scores and case activity measures—number of logins, message board

posts/replies, views of message board posts—were tracked.

Results: During academic year 2012–2013, 80 teams composed of 522 students from medicine, nursing, pharmacy, and social work participated. Knowledge scores varied by profession and within professions. Team scores were higher than individual scores ($P < .001$). Students and teams with higher knowledge scores had higher case activity measures. Team score was most highly correlated with number of message board posts/replies and was not correlated with number of views of message board posts.

Conclusions: This Web-based case system provided a novel approach to teach and assess the competencies needed for virtual teams. This approach may be a valuable new tool for measuring competency in interprofessional practice.

The Gamification of Electronic HealthRecords: A Systematic Literature Review

http://www.amcleod.com/mcleod28.pdf

Abstract

The use of gamification and simulation in medical education is increasing in efforts to accelerate andimprove learning outcomes. The purpose of this literature review is to examine game design elements forpossible inclusion in an electronic health record (EHR) simulation game (EHRsim). Games are becomingimportant learning tools in higher education, and numerous organizations use games to teach skills andconcepts in medicine, science, and technology. Many in the

healthcare professions have questioned thebenefits of EHRs and have expressed concern that healthcare professionals who use EHRs without a fullunderstanding of these systems could cause harm to the patient. We explore the literature to determinewhether game design elements could be beneficial in creating a learning simulation in which active ratherthan passive learning about EHRs occurs among teams of practitioners in role-based activities. To findpreliminary answers to this question, we conducted a literature review on game design and the benefitsthat have been realized in other fields from the use of gamification. Our literature review indicates that theaddition of game design elements to an EHR system would be beneficial to improve learning and providetraining options for health information management professionals.

Keywords: game design elements, electronic health records, gamification, simulation, game genre,game type, educational gaming, EHRsim

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https://cdn.intechopen.com/pdfs-wm/18392.pdf

Integrating the ElectronicHealth Record into Education:Models, Issues and Considerationsfor Training Biomedical Engineers

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http://www.jgme.org/doi/full/10.4300/JGME-D-16-00628.1
TO THE EDITOR: COMMENTS

Teaching Electronic Health Record Documentation to Medical Students

Valerie E. Niedermier, MD

After reflecting on the recent article "The Electronic Health Record and Education: Rethinking Optimization,"[1] the importance of teaching thoughtful documentation in note writing becomes apparent with the challenges of electronic health record (EHR) use and the current generation of learners. Medical students or new residents may fear that lack of information could cause billing or legal issues, leaving them pulling unnecessary chart information or inaccurate problem/medication lists without even processing the content. Documentation skills begin in medical school and carry into practice. Thus, small steps to formally teach appropriate documentation should be a focus of medical student educators.

The Alliance for Clinical Education led the change in medical training, and in 2012 issued a collaborative statement that called for a new approach of closer assessment of medical students' competency in use of the EHR.[2] The initiative focuses on the progression from early learner to a soon-to-be resident through the use of educational sessions and a learning environment that has a learner interface with an actual or simulated EHR.[2]

Educational sessions ranging from fundamental to advanced practice standards in medical documentation will improve future physicians' communication using the EHR. These sessions will provide EHR-specific standard templates and offer examples of high-quality notes. By implementing EHR communication guidelines, medical educators are setting a standard to improve overall note score and reduce note clutter from interns and residents.[3]

In addition to educational sessions, a simulated EHR environment may offer an alternative way to teach learners about appropriate and accurate documentation in the EHR. Medical schools, such as Oregon Health & Science University, have implemented such a program and demonstrated promising results with students able to identify missing key components from notes; students have also shown increasing comfort with locating, updating, and documenting in the EHR.[4] With variable levels of medical student involvement in the actual EHR used in the health care settings where they learn, this could provide students with an enhanced interactive experience to develop their EHR documentation skills, and receive feedback on it.

Overall, a dual didactic and simulated approach to teaching note writing would collectively assist in enhancing the EHR documentation of the next generation of physicians. Future physicians need to understand how to communicate and document information in an accurate and useful manner while considering the content being placed in a patient's EHR. In order to ensure this development happens, medical educators must play a key role in ensuring future colleagues are prepared for each level of practice.

. Gagliardi JP, Turner DA. The electronic health record and education: rethinking optimization. *J Grad Med Educ*. 2016;8(3):325–327. [Abstract]

2. Hammoud MM, Dalymple JL, Christner JG, et al. Medical student documentation in electronic health records: a collaborative statement from the Alliance for Clinical Education. *Teach Learn Med*. 2012;24(3):257–266. [CrossRef]

3. Dean SM, Eickhoff JC, Bakel LA. The effectiveness of a bundled intervention to improve resident progress notes in an electronic health record. *J Hosp Med*. 2015;10(2):104–107. [CrossRef]

4. Milano CE, Hardman JA, Plesiu A, et al. Simulated electronic health record (Sim-EHR) curriculum: teaching EHR skills and use of the EHR for disease management and prevention. *Acad Med*. 2014;89(3):399–403. [CrossRef]

Enhancing Prelicensure Nursing Students' Use of an Electronic Health Record

http://www.nursingsimulation.org/article/S1876-1399(15)00100-0/fulltext?cc=y=

Professional and interprofessional differences in electronic health records use and recognition of safety issues in critically ill patients

ABSTRACT

During interprofessional intensive care unit (ICU) rounds each member of the interprofessional team is responsible for gathering and interpreting information from the electronic health records (EHR) to facilitate effective team decision-making. This study was conducted to determine how each professional group reviews EHR data in preparation for rounds and their

ability to identify patient safety issues. Twenty-five physicians, 29 nurses, and 20 pharmacists participated. Individual participants were given verbal and written sign-out and then asked to review a simulated record in our institution's EHR, which contained 14 patient safety items. After reviewing the chart, subjects presented the patient and the number of safety items recognised was recorded. About 40%, 30%, and 26% of safety issues were recognised by physicians, nurses, and pharmacists, respectively ($p = 0.0006$) and no item recognised 100% of the time. There was little overlap between the three groups with only 50% of items predicted to be recognised 100% of the time by the team. Differential recognition was associated with marked differences in EHR use, with only 3/152 EHR screens utilised by all three groups and the majority of screens used exclusively only by one group. There were significant and non-overlapping differences in individual profession recognition of patient safety issues in the EHR. Preferential identification of safety issues by certain professional groups may be attributed to differences in EHR use. Future studies will be needed to determine if shared decision-making during rounds can improve recognition of safety issues.

http://www.tandfonline.com/doi/abs/10.1080/13561820.2016.1193479

manual of
simulation in healthcare

edited by **Richard H Riley**

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