

Design Requirements of Educational EHR for use in Case Based Instruction of First and Second Year Medical Students

Michael Germain, Dr. Howard Silverman, 2012

ABSTRACT

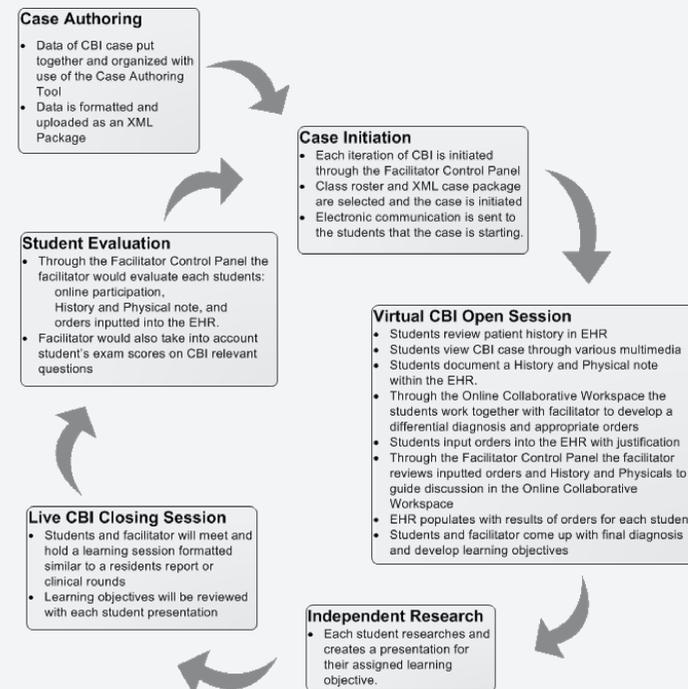
Case based instruction (CBI) in medical education is a well established alternative to lecture format in the training of first and second year medical students. There have been previous documented attempts to include technology in CBI that have received positive feedback from students. Electronic health records (EHR) are now being mandated by the federal government by 2014. Historically there have been many barriers to adoption including lack of EHR technical skills by physicians. As a result, biomedical informatics education is being integrated into medical school curriculum to prepare future physicians to utilize them. There has been no documented evidence of a successful utilization of a commercial grade EHR within CBI despite many potential benefits in doing so. The following is a design project with the aim of highlighting specific design requirements as well as a theoretical usage scenario of a commercial grade EHR in CBI. There will be many technological challenges that will need to be overcome as well as numerous resource requirements to get such a project functional. Completion of such a system could result in potential commercial benefit as well as provide a platform for further investigation of the effect of early EHR training on physician-EHR acclimation.

INTRODUCTION

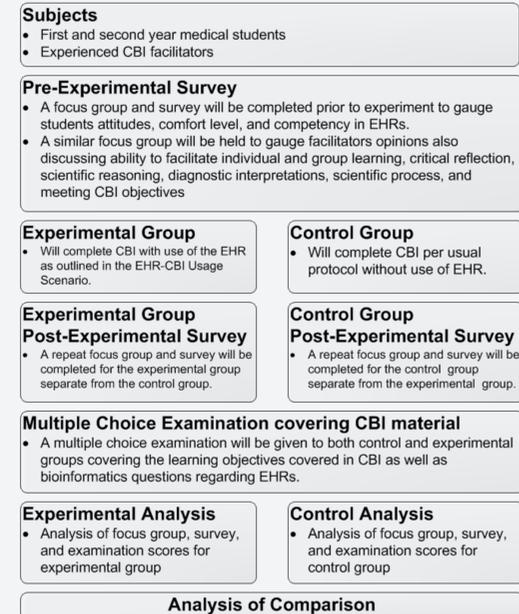
Case based learning, or small group problem based learned, allows students to learn in a context that is relevant to the method of education they will be utilizing in their clinical years as well as in their future profession^{[2][3]}. The educational goals of CBI are to provide integration between the clinical aspects of medicine and basic medical sciences and to amplify important basic science learning objectives. There are many variations in the manner in which CBI cases are presented including virtual cases. In the medical field there have been many barriers to the adoption of EHRs including resistance to learning new technology. In a national survey, 57% of medical practices reported physician skepticism in the adoption of EHR systems from lack of computer skills, technical support, and time to learn EHR systems^[13]. EHRs have many features that could act as a method of learning in context providing point of care education and clinical decision support systems. Placing orders helps students learn what tests and treatments patients need in certain clinical situations. An EHR could potentially be used as a platform for delivering clinical information during a CBI session, providing opportunity to interact with the simulated patient's record in a clinically relevant fashion. Exposure to an electronic charting system early in medical education will allow students to gain familiarity with electronic clinical record keeping, documentation, and ordering procedures. Using clinically used systems during a clinical encounter simulation can potentially add to value and better prepare for future clinical experiences.

USAGE, ASSESSMENT, AND DESIGN SUMMARY

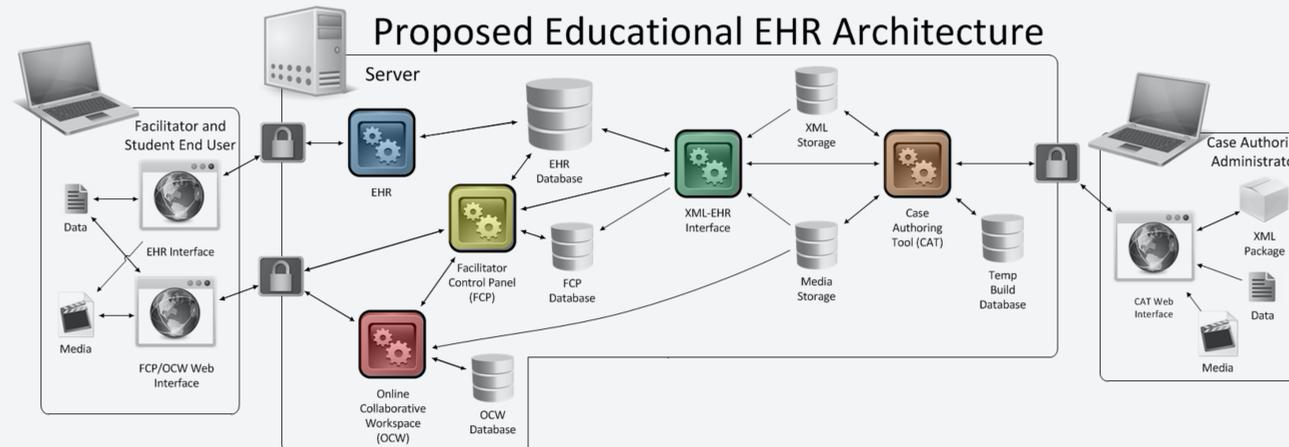
EHR-CBI Usage Scenario



System Assessment



Proposed Educational EHR Architecture



Case Authoring Tool Technical Summary:
The case authoring tool's function is for organizing and inputting clinical data in the creation process of the CBI case.

- Easy data entry and a template for creation of CBI cases.
- Visual representation of the case timeline.
- New cases as well as modifying existing cases.
- Cases should be able to be exported to an intermediate storage package in the form of a standardized MedBiquitous XML file.

XML - EHR Interface Technical Summary:
XML-EHR interface allows for a communication pathway between the XML packages, multimedia, EHR, and facilitator control panel.

- Push and pull information to/from the EHR database.
- Communicate with the EHR for modifying the current displayed timeline set point.

Online Collaborative Workspace Technical Summary:
The Online Collaborative Workspace is a virtual discussion forum with multimedia capabilities for presentation and discussion of the CBI case by students and the facilitator.

Facilitator Control Panel Technical Summary:
The Facilitator Control Panel is an end user tool that will give the facilitator control over the case throughout the CBI.

- Initiation of the CBI case iteration with EHR setup routines.
- Management of the class roster and communication with the students upon each iteration of CBI.
- View and add comments to student documentation within the EHR and provide feedback for student documentation.
- Return student orders within the EHR and allow for student feedback.
- Communicate with the online collaboration environment providing statistics on student participation.
- Control the timeline moving it forward and backward modifying which information is available for display in the EHR.

CBI Capable EHR Technical Summary:
Educational EHR would carry the standard functions of a typical EHR with additional functionality to be utilized in an iterative learning environment of CBI.

- Allow data to be modified through third party software.
- Well documented structure for proper placement of data without interfering with EHR function.
- Allow for batch imports of data for incremental release.
- Accommodate multiple editors of same record so the student may access record while software is updating record.
- Ability to release information in increments on an imaginary timeline with the ability to move forward and backwards along that timeline.
- Allow students input orders and have results returned for those orders per the case XML package instructions.

DISCUSSION

There would be many potential educational benefits to the use of an EHR in CBI instruction. Students will gain hands on familiarity with EHR systems in a way that will benefit both active and passive learners. It will also allow for better understanding of student thought processes and be able to guide them to meeting the learning objectives. The system will also allow for more objective evaluation of student participation and performance. Multiple organizations can share cases, increasing the pool of available cases and objectives to be covered. There is also the potential for commercialization of distributable cases or providing service which software with this functionality could be utilized remotely through a subscription basis. Using the system outlined will require a larger time commitment from both the students and the faculty. The resources needed to manage such an educational project may limit the availability of such a program to large academic centers that have sufficient resources to develop and maintain such a system. Changes necessary to existing EHRs will radically modify the foundation of EHR structure and will result in heavy modification of an EHR system. In developing a system to meet these requirements, the authors will have to make the choice of developing the system from the ground up or modify an existing system to include the necessary functionality. Also the decision between an open source and a commercial systems will need to be made. Modifying a commercial system was previously attempted by the University of Missouri School of Medicine but was unsuccessful. Lessons learned from this attempt were that a vendor willing work alongside the academic developers in a timely manner is crucial. Whichever pathway of development a developer chooses to follow the development of such a system is feasible with current technology. All aspects of such a system could be implemented through modification of existing software or with a web based system. Initial costs of development, hardware, and resources to overcome networking challenges would be high. Added costs would also come from maintenance and upgrades to EHR system. Potentially modifications to the system would need to be redesigned or reapplied with each update to the EHR. Challenges aside, the value and potential of such a system is intriguing enough to at least warrant development and investigation.

FUTURE RECOMMENDATIONS

In the development of such a system, there will likely be refinement of the technical requirements. Upon completion of such a system, experimental evaluation of the system should be completed. The analysis of such a system should first be evaluated for usefulness and student and faculty attitudes towards the system in CBI. Longer term studies could then be used to evaluate long term effect it has on student acceptance and acclimation of skills necessary for EHR full usage.