**LibreHealth Educational Electronic Health Record Project**

**Background**

By late 2016, 95% of US hospitals and over 60% of office practices had demonstrated meaningful use of certified electronic health records (EHRs). 1 Given the high adoption rates of EHRs, it would seem reasonable that clinical students should receive training on academic EHRs in medical, nursing and pharmacy schools. Johnson and Bushey defined the academic EHR as “providing extensive hands-on experience using state of the art EHR and information systems to provide students with learning opportunities in patient assessment, clinical knowledge, decision-making and documentation competencies.” 2

According to a 2009 survey of clerkship directors, 64% of medical students had access to an academic EHRs and 66% were permitted to write notes. 3 It is not known whether that percentage has increased and how many nurses and pharmacy students have EHR access for training and education.

Hands-on EHR experience could also be beneficial for non-clinical students. For example, health information management (HIM) students could use EHRs for coding and billing experience. Health science students could use a populated EHR for pathophysiology exercises. Health informatics (HI) and biomedical informatics graduate students could benefit by evaluating order entry, clinical decision support and EHR design and usability. Graduate level students could also query the backend database of an EHR for database management training, analytics and research.

Unfortunately, most of the non-clinical students do not have access to EHRs for education, training or research. A convenience sample survey of 400 health informatics instructors conducted in early 2017 (25% response rate) revealed that two thirds taught without access to an EHR. The majority taught general health informatics, but a substantial number also taught electronic health record courses. Most of the respondents who had access to an EHR, used a commercial EHR. The remainder tended to use open source EHRs. Respondents desired an educational EHR with demographics, lab results, medications, coded diagnoses, encounters and images. An interesting finding was that secondary use of EHR data was requested as follows: research (79%), database management (64%), machine learning (36%), natural language processing (33%) and predictive analytics (68%).4

The most common short comings are the fact that the software is not pre-populated with synthetic or real patient data. Additionally, several non-production EHRs used by faculty are associated with a moderate cost to either instructors or students. 5-6

**Objectives:** todevelop an open-source EHR for education of clinical and non-clinical students. LibreHealth EHR was created by prior developers of OpenEMR and OpenMRS in 2016 and adopted for this initiative. LibreHealth also includes a radiology platform and an open API. 7

**Methods:** Over 9600 de-identified patients from the 2011-2012 National Health and Nutrition Evaluation Survey (NHANES)8 were uploaded into the EHR and included demographics, diagnoses, labs and medications. Instructional guides and video tutorials were created. The educational EHR was beta-tested by four universities for the fall 2017 semester. Programs selected include Master of Science in Health Informatics, Bachelor of Science in Health Informatics, Associate in Science in Health Information Technology and undergraduate Public Health Informatics. A post implementation survey was sent to the four schools (instructors and students) post-usage.

**Results:** the survey was conducted with Qualtrics survey software. Response rate by students was x.

**Discussion:** an affordable EHR is a valuable tool for EHR training, health sciences education and research. Being open-source software has the advantages of being low-cost or no-cost and customizable, unlike commercial EHRs.

**Conclusion:** There is interest in using an educational EHR for more than just training. It has the potential to teach coding, health sciences education and basic descriptive statistics and analytics. With a robust patient base, research can also be conducted.

Future goals include using the open API to develop SMART apps using FHIR and adding encounter notes for natural language (NLP) exercises.

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