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ABSTRACT

To give students hands-on experience in the HIT space, we have tried and analyzed several options. After the unsuccessful implementation of an EHR system that required substantial programming to build interfaces and the database itself, we decided to change course. We describe the process after this restart, which covers selection, implementation and post-implementation phases of adopting eClinicalWorks EHR. Due to HIPAA regulations on real patient data, we chose to write elaborate mock patient scenarios and manually enter data. The importance of training cannot be overstated as it provides knowledge and resources necessary for a smooth transition among all individuals who will be using the EHR system. Other educational programs may decide to select an open source EHR or a vendor that provides access to the backend. Our experience, nevertheless, informs the process of bringing the EHR, a record that is central to healthcare operations today, to students in the classroom.

Keywords

Electronic health record system, implementation, health informatics program

INTRODUCTION

The National Library of Medicine defines health informatics as "the interdisciplinary study of the design, development, adoption, and application of IT-based innovations in healthcare services delivery, management, and planning" (HIMSS 2014). When it is clinically focused, depending on the targeted audience, the field can be referred to as clinical informatics or nursing informatics. At Northern Kentucky University, our interest is in the applied health informatics as it is taught to prepare health IT managers and the HIT workforce. Our health informatics program, which offers the master's degree, the certificate and soon the bachelor's degree, is housed in the Business Informatics Department within the College of Informatics. As such, the program entails an information systems focus. The program works closely with the Nursing and the Allied Health Departments in the College of Health Professions. Radiologic science, respiratory care and health science constitute the Allied Health Department. Both departments, nursing and allied health, offer the master's and bachelor's degrees. Additionally, the Nursing Department offers the Doctor of Nursing Practice (DNP).

While housing health informatics in the Department of Business Informatics brings the benefits of an in-depth focus on information systems and information technology, we have had to work hard toward leveraging the expertise available within the College of Informatics and the College of Health Professions. One example of striving to offer robust, health information technology (HIT) based learning experiences is the college's desire to offer access to and use of an Electronic Health Record (EHR) system to its students. The field of health informatics is moving beyond implementation and toward optimizing systems for better patient care, improved patient engagement and robust data analytics to inform practice efficiencies. However, the initial adoption and basic application of the system remain important because these stages provide the foundation for students to develop a deeper understanding of the system. For instance, without understanding the components and processes of an EHR system, it is difficult for a student to start thinking about innovative solutions to problems in everyday practice.

As such, EHR implementation and its basic application are central to healthcare and to health informatics education. Without an EHR system, students become limited in thinking about complex data, system integration, security and subsequent workflow redesign for optimal application to realize efficiencies in their future workplaces (Wagner et al. 2013). This

conference paper relates our experience with the selection and acquisition phase and the implementation and post-implementation phases of EHR in our health informatics program, so other IS departments that may be interested in health informatics can be aware of the options for providing hands-on training to students in HIT education (Hartley et al. 2012; HealthIT.gov n.d.).

Selection and Acquisition

An EHR system was installed in the health informatics program approximately five years ago; however, we struggled to complete implementation due to issues in employing the resources required for substantial programming to build interfaces and the database itself. The advantage of this EHR system, however, was the ability to work with the backend. The preceding presented a complicated situation, given that we do not have a medical school that is affiliated with a hospital where an EHR system would contain clinical data from actual patient records. Even if we did have a medical school, due to HIPAA regulations, students in our program would not have access to the EHR maintained by a university-affiliated hospital.

We started over by reviewing other options for an EHR system, including options for populating the database. Making the right choice that meets the needs of a healthcare organization or an educational program is an important part of the implementation process. To populate the database, we briefly considered de-identified data collected by the Cabinet for Health and Family Services (CHFS) in the state of Kentucky. This option offered us limited use because the de-identified data on each patient was minimal. The state records contain mainly diagnosis and procedural codes and limited demographic information. As such, the records were not useful for populating an EHR due to the lack of core data elements of a patient record, such as problem lists, medications, and history. Additionally, the state required that a process be in place for data use agreements, so guidelines specifying the application in teaching and learning and the importance of confidentiality, even though the data was de-identified, were clear to the university and our students. As these hurdles seemed to be cumbersome for teaching purposes, we populated the database with test/mock clinical data when we selected another EHR system.

To select the system, we evaluated EHR software by reviewing vendor booths at Healthcare Information and Management Systems Society (HIMSS) and in KLAS Research which is a service that provides EHR vendor performance reports (Mooney et al. 2011). Subsequently, we had demos for two products. The first product came with test data for teaching purposes but required a monthly subscription fee. The second product, we evaluated was a donation from the company but did not come with test clinical data. Also, the second product was far superior in functionality and had been implemented in several practices. For students to gain a working knowledge of the system with hands-on exercises on full, robust functionality of the system, we decided to acquire the second product. We selected the EHR system, eClinicalWorks, which is ranked one of the top five products on the market. One of the main reasons for our selection was the company's generous donation of the EHR system to the university for teaching purposes; however, as it is proprietary software, we did not have access to the backend.

Implementation

After signing the contract with the company, we commenced installation. Although the product was donated for educational purposes, there was a relatively small charge ($750) for installation. We chose the client-server option over the cloud/SaaS option as the latter would have incurred a monthly charge for hosting the system on the company's cloud server. The client/server option allows us to host the system at the university and to do so without the additional cost. Our systems analyst worked with the company's engineers to install the EHR software which took approximately 8 hours. The installation was facilitated via phone calls and remote connectivity to the server with no major issues.

In the interim, we worked with a family medicine physician from a hospital system in our community to obtain clinical data in the form of elaborate mock patient scenarios to populate the EHR system. This form of clinical data was collected due to HIPAA regulations which do not allow unauthorized users access to real clinical data. We had an initial meeting to test our EHR system with one mock patient scenario to gauge feasibility of the approach. The following are the components of our mock patient scenarios which comprise core clinical data elements: Chief Complaint, Medications, Medical History, Allergies, Surgical History, Family History, Social History, Vitals, History of Present Illness (HPI), Review of Systems (ROS), Physical exam, Tests (Labs/Radiology), Assessment, Treatment, Visit code, Follow-up, Computerized Physician Order Entry (CPOE), Problem list and Preventive medicine.

As the process worked smoothly, the physician proceeded to provide 50 mock patient scenarios and several follow-up scenarios. A student in the Master of Health Informatics (MHI) program entered these patient scenarios into the system because we would have had to, again, pay to import through the backend. We would have incurred this charge because data imports were not included in our contract. We started in the front office module and entered administrative data including demographics, insurance information and contact/next of kin. Then, we entered clinical data based on the mock patient

scenarios and did billing to close the loop. Hence, full patient encounters are documented in the system from front office to billing.

Post-Implementation Training and Teaching

The training phase of post-implementation is important as it informs all individuals who will be using the new EHR system and its functionalities. In a healthcare organization, it is critical to invest in training to ensure a smooth transition from paper to electronic patient records as well as to receive support and to lower anxieties among all who are involved in the process (HIMSS n.d.). In our program, we use the system for teaching purposes, so we, too, participated in training to create the most effective and engaging assignments for students to work on in our classes.

To get its clients started, the company offers limited amounts of data import and set-up training, including billing set-up. To better acquaint ourselves with the EHR system, we had more in-depth, week-long training sessions designed for both system administrators and users. The training included the following components: administrative set-up, front office, EMR, and billing. We incurred a charge for remote training which we deemed a suitable option for us as it allowed more people from the College of Informatics and the College of Health Professions to attend. After the training, we developed assignments to give students hands-on experience. To start, we created a simple assignment for undergraduate students to go into the EHR system and look up information on a patient. As many of our students are online students, our systems analyst had made the system available on a virtual machine for remote login. Another option was for students to do the assignment in our Health Informatics Lab as the client is installed on all of the lab's computers. Many College of Health Professions students took the latter option as it was easier for them to come to the Health Informatics Lab than to install VPN and VMWare to do the assignment remotely.

A more in-depth use of robust functionality afforded in the EHR system is in the works as we are designing an undergraduate course on healthcare information systems to be offered in fall 2018. The course will include several in-depth exercises in using our EHR system as well as the concepts and trends in the implementation of clinical information systems. We continue to use the donated software and work with the company which provides us maintenance, upgrades and troubleshooting, all free of charge for educational purposes.

DISCUSSION AND CONCLUSION

In this conference paper, we offer our experience of implementing an EHR system for educational purposes. Although it may not be the best approach for all IS programs interested in adopting EHR to train their students for job readiness skills in the HIT space, it does provide ideas for such implementation, and more importantly, our experience should create an awareness of obstacles we encountered and the decisions we have had to make to bring the EHR to the classroom. For instance, IS programs that are more interested in the programming and database management aspects of the EHR system may decide to select a vendor that allows working with the backend or an open source EHR software that is available for download. Ultimately, the implementation of the EHR system brings HIT experience closer to the student. For instance, seeing the use of clinical decision support, even in a lecture, adds to the learning experience of the student who otherwise would have depended entirely on readings to understand the system and its concepts.

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