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Infusing Informatics into Interprofessional Education: The iTEAM (Interprofessional Technology Enhanced Advanced practice Model) Project

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Abstract. The iTEAM goal is to prepare advanced practice nurses, physicians and pharmacists with the interprofessional (IP) core competencies (informatics, patient centric, quality-focused, evidence based care) to provide technology enhanced collaborative care by: offering technology enhanced learning opportunities through a required informatics course, advanced practice courses (team based experiences with both standardized and virtual patients) and team based clinical experiences including e-health experiences. The innovative features of iTEAM project will be achieved through use of social media strategies, a web accessible Electronic Health Records (EHRs) system, a Virtual Clinic/Hospital in Second Life, various e-health applications including traditional telehealth tools and consumer oriented tools such as patient portals, social media consumer groups and mobile health (m-health) applications for health and wellness functions. It builds upon the schools' rich history of IP education and includes clinical partners, such as the VA and other clinical sites focused on care for underserved patient populations.

Keywords. Informatics education, interprofessional education

Introduction

The University of Colorado Anschutz Medical Campus (AMC) has a long history in Interprofessional Education (IPE) education. In the late 1990s, the campus embarked on its initial venture into IPE by offering an orientation on ethics and professionalism to entering first year Physician Assistants, Dentistry, Genetic Counseling, Medicine, Nursing, Pharmacy, and physical therapy students. This led to a required IP ethics course in 1998. Current students from all AMC professional programs work in small groups and consider cases focused on ethical issues and professionalism. Three IP tracks are also part of the course (developing health care leadership and advocacy skills, providing team-based care in rural settings, and providing team-based care in urban, underserved areas.

With our campus move to a new location (AMC), our commitment to IPE was more fully realized as we serve as a model of what an academic medical center should

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look like today. Completed in 2007, the campus is a state-of-the-art health sciences center that fosters interprofessional education, patient care, and research. What follows are examples of our IPE initiatives on the new campus. A one-year pilot program was developed to educate 4th year medical and senior nursing students together for shared learning experiences and shared clinical rotations at either University of Colorado Hospital or the Children's Hospital to complete a quality improvement project. Based on these results, the University implemented REACH—Realizing Education Advancement for Collaborative Health. REACH is an IP curriculum involving all health professions schools—medicine, nursing, physician assistant, physical therapy, dentistry, and pharmacy— and is focused on helping students develop competencies in teamwork, collaborative care, and quality and safety. Under REACH, all health professions students will have to participate in the *quality improvement and safety curriculum*, necessitating expansion of the clinical training sites to at least three additional hospitals in Denver.

An additional program is the CU-UNITE **C**olorado **U**rban **UN**derserved **I**nterprofessional Health **Training** & **E**ducation, a longitudinal track for students at the University of Colorado Denver School of Medicine, College of Nursing Nurse Practitioner program and the Physician Assistant program. It is designed for students interested in working with urban underserved communities. The track provides the skills and support needed for future health care providers serving those urban populations.

There are also opportunities for IP students to engage in high fidelity simulations in the Center for Advancing Professional Excellence and in the College of Nursing's (CON) Clinical Education Center. The new learning spaces not only facilitate students participating in clinical simulations but also with standardized patients. The design of the campus was to encourage and represent IP collaboration in teaching, research and practice. To this end, the campus also provides students with ample informal learning spaces and student are encouraged to develop Student Academic Communities (SAC's) which are theme-based student-run organizations that foster IP collaboration in developing programs and activities which enrich students' campus life**.** These SACs use and maintain sixteen highly visible gathering spaces on campus. Lastly, new IP clinical rotations at the Sheridan Health Services, a federally qualified health center operated by the College of Nursing, provides students with IP clinical experiences.

Despite our progress, there remain several challenges and gaps in our student's IPE. One such challenge that continues is the scheduling of IP teams for clinical rotations given the different academic schedules across the disciplines and the potential competition for clinical placements across on-campus and off campus clinical sites. Another challenge is the preparation of our students to use information technology tools to mitigate errors, promote quality, improve team based communication and facilitate EBP clinical decision making. With the HITECH Act of 2009 requiring health care professionals to become meaningful users of health information technology, it is a necessity to begin to more systematically address this issue within the IPE context. We need to prepare the next generation of health care professionals to have the necessary knowledge and skills as outlined by the Institute of Medicine's (IOM) five core competencies and the American Association of Colleges of Nursing's (AACN) *Essentials for Master's Educatio*n and the *Core Competencies for Interprofessional Collaborative Practice* identified by the Interprofessional Education Collaborative Practice (IPEC). As the IPEC Report noted, "patient centered care is the goal of IP teamwork… and is central to the competency development for IP Collaborative

practice." [1 (p14)] The other three IOM competencies, "in the context of IP teamwork, includes the use of 21st century technologies for communication and coordination, rely on the evidence base to inform teamwork processes and team based care and highlight the importance of continuous quality improvement."[1 (p.14)] It is our belief that evidence based practice and continuous quality improvement are based on an informatics infrastructure that will create what the IOM refers to as the *learning healthcare system*.[2] This "learning healthcare system that is designed to generate and apply the best evidence for the collaborative health care choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and to ensure innovation, quality, safety, and value in health care".[3] In essence it is a healthcare system that learns from itself. It is therefore important that schools prepare a workforce capable of "innovating, implementing, and using health communications and information technology.[4]

In the CON, our work with the *Quality and Safety for Nursing Education* (QSEN) initiative has facilitated the incorporation of the informatics competencies differently for the undergraduate and graduate programs. In the undergraduate program, we have implemented the use of EHRs in our simulation experiences to provide quality and real-life experiences to nursing students. The introduction of EHRs allows students to learn and train to implement informatics into their everyday routines. Providing experience with EHRs early in student clinical education assists in valuing data as a resource for patient care and moves well beyond the 'which button do I press?' mentality that characterizes current 'computer training' in many health care facilities. For the graduate programs, there was only an informatics module embedded in one of the core courses required for all graduate students. The module provided some knowledge about informatics but falls short of meeting the competencies outlined in the QSEN Competencies of Graduate Students and the new AACN's *Essentials for Master's Education*. To this end, the CON now requires the Foundations of Healthcare Informatics for all graduate students. This course was adapted to include other disciplines in health care as a part of an Office of the National Coordinator for Health IT training grant to the College of Nursing. The *Health Information Technology Education Collaborative (HITEC)* provided accessible IP learning opportunities in health care informatics. The *Colorado HITEC* promotes interdisciplinary education of health care professionals and business students in a collaborative learning environment to gain not only the necessary knowledge but also skills related to team development, communication, collaboration and mutual recognition of disciplinary knowledge. As a result of this grant, the various staff from the Schools of medicine, dentistry, pharmacy and public health has noted the lack of informatics education in their respective schools.

As a part of this work, it is a logical next step to not only continue our work in IPE but also to address the issue of informatics education for all health care professionals on the AMC. A secondary consequence of this grant was the identification of training needed to explore the use of e-health applications in the health care delivery system. Our rural partners on this grant were intrigued with our distance learning opportunities and indicated the need to train more health care professionals about the potential of telehealth applications. The HITEC students have also identified the need to learn more about consumer-centric HIT tools and mobile-health (m-health) applications being used by many consumers on their smart phones or tablets. This is of particular importance to both eligible providers and institutions and critical access hospitals meeting the Meaningful Use Criteria set by *Medicare and Medicaid Electronic Health Records (EHR) Incentive Programs.*

Therefore, the iTEAM project is a direct result of our rich history in IP and informatics education. This project extends our previous work and addresses three specific gaps that hinder our mission to prepare a cadre of advanced practice nurses with the requisite IPEC competencies to provide technology enhanced collaborative care within the health care system. The first gap is the expansion of both didactic and clinical IP education opportunities for our graduate students. The second gap is to address a significant need to prepare our health professions students to use innovative communication and information tools to mitigate errors, promote quality, improve team based communication and facilitate EBP clinical decision making. The third gap is to prepare health care professionals to use 21st century tools that will facilitate the transformation of health care. This transformation will include the use of e-health applications that provide increased access to health care for underserved and rural areas, extend the reach of IP Collaborative Practice teams beyond the walls of an institution and promote the use of consumer centric tools that will engage consumers in their health and insure patient and family engagement in critical health care decisions.

1. Methodology

The overall goal of the iTEAM Project is to provide enhanced technology IP learning experiences through the use of simulations with standardized patients (physical and virtual), e-health (telehealth & mobile health) experiences, the integration of informatics and the use of Electronic Health Records (EHRs) within graduate education.

To accomplish this goal, there are three major strategies used to provide the necessary knowledge and skills necessary to demonstrate IPEC competencies. The first are didactic course work. A foundational course on IPE was developed for online access. Other didactic courses included: Foundations of Healthcare Informatics course, Advanced Health Assessment, Pharmacology, Patient-Centered Communication 1 and 2, and Pharmacy Clinical Rotations. As part of these courses, students are introduced to the Cerner Academic Education Solution (AES) system, an electronic health care record system that facilitates IP communication and documentation. The AES system is a fully functioning clinical information system that enables nursing, medical, pharmacy, and allied health students to develop their knowledge and skills highlighted by the IOM core competencies. Students have access to view patient data to evaluate status, document assessments and treatments, develop plans of care, perform chart reviews and access links to EBP care. The AES system facilitates conceptual and practical applications of HIT tools as an integral component of the learning process. It is an essential tool to prepare them for participation in IP team collaboration. The tool supports the attainment of informatics competencies identified by QSEN, AACN Essentials and the informatics standards of the Accreditation Council for Pharmacy Education.

The second component is the simulated experiences associated with the Advanced Health Assessment and other clinical specialty courses. As part of the iTEAM project, students in nursing, medicine and pharmacy programs interact with each other in simulations using standardized patients and also virtual patients. Students will begin using virtual patients designed in the grant to present three common health issues facing veterans: Post Traumatic Stress Disorder (PTSD), traumatic brain injury and depression. This innovative approach will have learners interacting with each other in

the virtual world of Second Life. To interact in Second Life, a user must create a personal avatar that can walk, run and even fly. Avatars can interact with each other through Voice over Internet Protocol (VOIP) or text-based messaging. SL is all about experiential learning, being immersed in a virtual environment. This immersive environment adds another dimension to simulations and allows for role-playing, collaboration and interactions between students and faculty in real time, and the ability to experiment. Many health profession schools are using Second Life for community health experience, informatics, clinical simulations and for virtual offices hours. The pilot work pioneered through various grants created a Virtual Clinic/Hospital consists of: clinical exam rooms for observation and interaction; medical surgical unit patient rooms; a psychiatric unit with sound proof walls; pharmacy; medical records room; patient registration; a nursing station; an auditorium for grand rounds; numerous administrative offices; and conference rooms complete with whiteboards for brainstorming, poster board for presentations, a presentation wall for PowerPoint slides or streaming videos, and web access for students to use during their clinical conferences.

Figure 1. Clinical exam room in Second Life

A final technology enhanced component will be the inclusion of e-health opportunities as an IP clinical experience. The iTEAM will work with Veterans Administration's Rocky Mountain Telehealth National Training Center for IP teams to be trained in the conduct of a telehealth visit and the use of various telehealth tools. Student IP collaborative clinical care teams will also be equipped with iPads (complete with digital stethoscopes, Blood Pressure Monitor, digital octoscope. spirometer, Pulse Oximeter) to practice the use of mobile e-health tools with patients being seen at the Sheridan Health Services, a nurse operated federally qualified health center. In addition, the team will be exposed to patient portals and other mobile health apps that can be used with various patient populations.

2. Results

To start the infusion of technology into the IP experience, the staff developed a module to provide foundational information and an introduction to skills that promote effective collaboration with patients, their families, and their healthcare team. This course introduces learners to various health professions and their roles, fundamental communication techniques, interprofessional (IP) health care delivery focused on responsible and professional behavior meeting the interests of patients, and informatics as a way to facilitate communication and teamwork. This course specifically focuses

enhancing communication and teamwork through informatics. Additional modules will be developed to introduce e-health tools and the role of the patient/consumer as a partner in collaborative team care.

For the first pilot project, graduate nursing student in an Advanced Health Assessment course were required to perform a physical assessment of a patient and document in the Cerner AES system. The nurses were also asked to request a consult with the pharmacist regarding the medication therapies for this particular patient. Both student groups were given access to the Interprofessional Practice and Informatics module. There were 12 graduate nurses and 11 pharmacy students who participated. Here are some highlights of their comments regarding the experience: "It is always beneficial to communicate with other health care professionals when taking care of a patient and the Cerner system helped to make this process easier/ " (graduate nurse) and "I thought this exercise was beneficial because it seems a little bit more realistic in terms of teamwork in the same environment. It is good to be able to access everything about a patient just as a physician or nurse practitioner would be able to." (PharmD student)

In the summer, we experimented with graduate students preparing to be Psychiatric Mental Health Nurse Practitioners. They were responsible for interviewing a mother and an adolescent with multiple psychiatric issues. The patient data was available in the Cerner AES and student could access the patient information before their visit with the mother and the adolescent in the Second Life™ Virtual Hospital/Clinic. Students created their avatars and would meet with the mother and adolescent avatars. The adolescent avatar was the course instructor and the instructional designer played the mother. After interviewing the dyad, the student reviewed the chart to re-assess the current medication regime. To do this, they were able to seek a consult with the pharmacist on duty. While in the virtual world of Second Life,™ graduate nurses could either use the virtual phone to call the pharmacist or ask the pharmacist avatar to meet outside the clinic room for a consult. A total of three pharmacists and five nurses responded to the evaluation. All but one nurse thought the interprofessional experience was beneficial. Here are some highlights of their comments regarding the experience: "It was great to have this practice opportunity before the real life scenario encroaches! It allowed me to collaborate, which is essential in best patient care outcomes! (graduate nurse)" and "It was interesting to gain a sense of what knowledge base the nurse practitioners had. (PharmD student)."

When asked if the experience changed their perception of their colleagues, the nurses were divided. Three were affirmative and this quote expressed their thoughts (I felt that I was respected by my colleague and loved the collaborative aspect of providing patient care, it confirmed my medication choice, which is confidence building. I have full respect for my pharmacists colleagues!). The other two nurses reported that it did not change their perceptions. Of the pharmacists, two did not change their perceptions and one stated a changed perception (It allowed me to gain a better understanding on what nurse practitioners do. For example, I did not know that nurse practitioners is very involved in obtaining the patient's HPI and gets to decide on an appropriate drug regimen much like a physician.)

As a result of the two pilots, several changes were made in the assignments and a decision was made to survey the students using the Interdisciplinary Education Perception Scale (IEPS).[6] In this tool, students read 18 statements that relate to perceptions about their own discipline and the other disciplines. Student use a Likert

scale from 1 to 6 indicating their degree of agreement or disagreement with the statement. We are administering the IEPS at the start of their IPE experience as well as after each successive experience. Our goal is to assess any changes and if there is a dosing factor, meaning the more experiences you have not only in course work but in the clinical should facilitate your change in perceptions.

The Foundations of Health Care Informatics course, a required course for all graduate students, is being offered as an IP experience this fall. This course included the introduction of the Cerner AES system and an IP experience around consumer engagement tools with the PharmD first level student enrolled in Patient-Centered Communication 1 course. IPE activity that will foster communication using the electronic health record and identify tools to help engage patients in their care and breaking down barriers for medication adherence. Since there are more pharmacy students (greater than 150), they will work in teams and be connected to 1 of the 29 nurses in the informatics course. Both groups of students have to complete a navigation activity involving a patient's chart in the Cerner AES. Students are working as a collaborative team in a busy clinic. In the first part of the scenario, the nurse asks the pharmacist to help by obtaining and updating the medical history for their patient. The pharmacist team conducts an interview to elicit patient's medical history and update the patient's electronic health record. Later, the nurse reviews the updated health information and is tasked with finding types of consumer engagement technologies to recommend for this patient based on their charted demographics, socioeconomic status, and perceived health literacy level. These recommendations are posted in a note in the EHR and forwarded to the assigned pharmacy group. In the nurse's note, there is a request for the pharmacy team to recommend resources to help the patient break down barriers to taking their medication (e.g., cost, adherence, administration, adherence with therapeutic lifestyle). The pharmacy team resources are reviewed by the nurse, all recommendations are posted in the Cerner AES and in the future will be posted to the patient portal. This IP experience will provide valuable information as we move forward to incorporating pharmacy students into the Foundations of Health Care Informatics course next year.

There are two additional IP exercises this fall. The Advanced Health Assessment course will repeat their previous IP experience with the pharmacy students and also incorporate the medical student in the health assessment of the standardized patient that will be used in the IP experience. The Pharmacology course offered to graduate nurses is also including several IP experiences with the pharmacy students using the Cerner AES system.

3. Conclusions

With the success of our pilot projects and the incorporation of the Foundations of Health Care Informatics course into the graduate nursing program, the iTEAM project will continue the infusion of informatics and health IT tools in the IPE across the health professional schools. During the 2014 year, the Virtual Patients will be created for clinical experiences in Second Life. One virtual patient will make use of a Chatbot that students can interview whenever they want to assess the patient. In addition, clinical rotations focused on the use of e-health tools will begin with graduate nurse, residents and pharmacy students. All these technology enhanced learning opportunities are not possible without a strong faculty development program that will also continue in 2014.

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