The Impact of Technology on the Development of Core Entrustable Professional Activities (EPAs)

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Advances in technology have benefited clinical practice as well as medical education in many ways. Information technologies have been used to improve health care quality through several approaches. For example, breakdowns in communication, particularly, during transitions of care, are among the most common factors contributing to adverse events. Technology has provided the opportunity to implement computerized coverage systems for “hand offs” as well as wireless access to electronic health records (EHR). Information systems have been developed to standardize symptom and diagnosis specific order sets, monitor trends and aberrancies in laboratory data, and to assist in identification of potential drug interactions and medication reconciliation to enhance quality care. Furthermore, information technology has offered health care providers and students accessibility to reference information through online textbooks and evidence-based clinical decision support resources such as UpToDate® and DynaMed® [1]. Educational technologies such as the mannequins found in simulation laboratories have provided controlled environments that create safer contexts for learning and assessment by reducing risks to patients. However, it is important to consider the integration of technology and its effect on professional skills from a developmental standpoint.

There are potential unintended consequences to these technological advances in medical education such as the “flipped patient,” a term describing the first clinical encounter for a learner as an electronic visit with the EHR or the “iPatient” [2]. For the student, this virtual encounter

reveals the chief complaint, history of present illness, physical exam, and often a defined assessment and plan before actually meeting the patient. This virtual encounter with pre-populated data and reasoning has essentially become the student’s first “real” encounter resulting in less critical thinking by the learner. In addition, clinical reasoning by residents and attending occurs independently during the electronic “pre-rounding” of the medical record prior to team rounds. This solo mental exercise that occurs in the minds of the preceptors during review of the EHR excludes the learner from the conversation that previously occurred during rounds when charts were reviewed together [3]. This diminishes teachable moments for learners at varying levels of training and affects the development of clinical reasoning skills. Furthermore, technology has proven to be an essential component of health care and millennials have embraced it as their generation not only views it as part of the norm, but sees inefficiencies in its absence. However, with more time at the computer and less time at the bedside coupled with decreased critical thinking being modeled, practiced, and taught, medical educators need to evaluate more formally the true impacts of technology on the learner. With a move toward integrating competency-based assessments of students into the context of clinical practice to determine attainment of entrustable professional activities (EPAs) [4], the question becomes one of identifying the issues and not deciding “if” technology should be incorporated into medical school education, but “when”. With the primary goal of achieving EPAs prior to entering residency and continuing a learner’s development through the Accreditation Council for Graduate Medical Education (ACGME) milestones, it is important to determine the critical competencies that are affected by technology that potentially impact the attainment of EPAs.

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EPAs require integration of competencies in the setting of clinical performance. The Physician Competency Reference Set (PCRS) includes the following domains of competence: Patient Care, Knowledge for Practice, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, Systems-Based Practice, Interprofessional Collaboration, and Personal and Professional Development [5]. Any one domain of competence may be a component of multiple EPAs needed for entering residency. It is significant to note that Interpersonal and Communication Skills (ICS) are integrated throughout the core EPAs [4]. It is this domain of competence that technology in medicine may have its greatest unintended influence and require specific intervention by preceptors and residents to prevent delayed development of multiple EPA skill sets in the medical student.

The domain of ICS consists of seven critical competencies, several of which are impacted by the use of EHR. The consequences of bedside rounds focused on individual computer screens or smartphones negatively interfere with interaction and interpretations between patients and physicians, and learners and preceptors. With eye contact being focused on computer screens filled with patient data rather than the patient, and smartphones with search engines that quickly answer clinical questions that arise, visual cues revealed by both patients, learners, and preceptors are easily missed. This alters the entrustable behavior of “anticipating, reading, and reacting to emotions in real time with appropriate and professional behavior in typical medical communication scenarios.” This developmental skill is necessary to successfully “demonstrate sensitivity, honesty, and compassion in difficult situations (ICS 6).” Failure to recognize this gap in professional development will result in a lack of “insight and understanding of emotions and human responses to emotions that allow one to develop and manage interpersonal interactions (ICS 7).” Successful communication with other health professionals or health-related agencies also requires not only a comprehensive view of the clinical case, but also an appreciation of the patient’s psychosocial circumstances. For instance, when determining a patient’s discharge disposition, case managers and social workers often need to be involved in the care early in the discussion to ensure that all aspects of the case are addressed. This includes the need to investigate social circumstances that affect medical care and outcomes. Learners can only develop skills in discovering and managing these issues by conversing with the patient and caregivers at the bedside, by asking the appropriate questions, and listening to both verbal and nonverbal answers.

ICS 2 requires effective communication “with colleagues within one’s profession or specialty, other health professionals, and health-related agencies.” In order to accomplish

this task, participants must have a thorough understanding of the clinical situation and reasoning of treatment plans. For example, when requesting a consultation from a specialist, the clinical information must be conveyed accurately with a well-developed assessment of the patient’s current condition in order to allow the consultant to fully evaluate the request for a consult. The pre-entrustable behaviors of students often results in communication from a template or prompt including order sets within EHRs that are designed to ensure quality core measures. Students and residents become accustomed to templated notes and electronically prompted orders without necessarily questioning where the templates and orders were derived from and for what clinical reasons. This affects their ability to communicate their rationale for recommendations and treatments for patients and to engage in clinical discussions that go beyond the templated note or the structured order sets. Furthermore, the acquisition of knowledge for practice may also be affected [6].

Ultimately, the ICS domain both informs and shapes formal entrustment decisions throughout the continuum of medical education. Current curricular development is focused on mapping curriculum to the specific competencies that need to be attained and integrated in order to demonstrate attainment of EPAs. The impact of technology can also be mapped to the critical competencies that can affect the EPAs revealing a potential widespread consequence on skill and professional role development. It is therefore essential for medical educators to consider curricular interventions to ensure that the anticipated developmental timeline for the EPAs is not delayed because of these issues. For the more novice learner, it may be beneficial to initially restrict the uses of technology to ensure adequate exposure to direct patient and preceptor encounters in order to develop the necessary, fundamental verbal and nonverbal communication skills, and critical clinical reasoning. Then, based on a learner’s individual rate of competency attainment, comparable to the milestones in graduate medical education, technology can be introduced without interfering with attainment of the EPAs as well as preparing the learner to use technology in clinical practice that will also be a prerequisite for entering residency training.

One of the primary challenges facing medical educators is although several medical schools have published their curricular and assessment processes related to medical informatics training, none have longitudinal outcomes data [7, 8]. This issue may be exacerbated by the fact that there are still no competency or EPA-based expectations specific to incorporation of EHR or technologies into health care making the end goal somewhat amorphous. However, there appears to be some agreement that the curriculum needs to be developmental, theory-based, and skill-based, as well as involving reflection coupled with pre-clinical and clinical practice [7, 8]. Understandably, the process is somewhat easier to design and implement

in the pre-clinical years. Opportunities for focused didactics related to communication theory and processes as well as opportunities to practice interviewing a standardized patient while incorporating EHR ergonomic training (e.g., positioning the laptop to integrate the patient into the EHR experience for reviewing information and teaching) followed by reflection can be incorporated into courses focused on “Doctoring” [7]. What becomes somewhat more challenging is carrying this training forward into the clinical years in order to scaffold or build upon existing knowledge schemas and skill sets. First, there are any number of EHR systems and there is no standard format for how EHRs or other technologies are incorporated into various types of clinical practices from private physician offices to hospital-based settings. Second, unlike the control that medical schools have over the formal curricular environment, the informal curriculum is far less predictable. There are no medical licensing standards related to a physician’s ability to utilize EHRs and other technologies and remain patient-centered in their communication skills making it impossible to predict the level of appropriate modeling that any learner is exposed to in the clinical milieu. It is perhaps here that reflection may have the greatest role in reinforcing training especially if the appropriate knowledge and skills were developed during the pre-clinical years [8]. Yet collectively, what has been posited in the literature is thought provoking, well-intentioned, and pedagogically sound. However, without specific EPA-related behavioral expectations associated with EHR and other technologies, this ubiquitous facet of modern healthcare will remain relegated to the periphery of medical education innovation despite the ever

growing need that it be addressed and competency achieved before entering residency training.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there is no conflict of interest.

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