

SKILLS-BASED EDUCATION

COMMENTARY

Electronic Health Records in Pharmacy Skills-based Curricula

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Electronic health records (EHRs) are integral to contemporary pharmacy practice. The use of EHRs and associated skill development in curricula across pharmacy education is variable. Skills-based courses in the Doctor of Pharmacy curriculum are ideal areas to develop these competencies' and integrate EHR use and skills with the Pharmacists' Patient Care Process. Consideration should be given by each school and college of pharmacy for having an EHR curriculum embedded within skills-based courses to prepare students for advanced pharmacy practice experiences as well as professional practice after graduation. A consensus on what skills or competencies should be consistently included in pharmacy curricula should be developed across pharmacy education to increase consistency in the delivery of EHR skills education and assessment. Emphasis on EHR skills and incorporation of them into national pharmacy education standards would help further guide development and assessment, as well as ensure new pharmacists are on the cutting edge of patient care and technology.

Keywords: electronic health record, clinical skills, digital, technology, curriculum development

INTRODUCTION

Digital health technology and pharmacy informatics encompasses a wide range of tools, including mobile applications, electronic health records (EHRs), e-prescribing, digital therapeutics, consumer wearable technology, and bots, to name just a few.¹ These digital health technologies are revolutionizing health care, in various degrees, across the United States and the world. The uptake and use of digital technologies are advancing rapidly, even more so in the last year due to the 2019 coronavirus (COVID-19) pandemic.² Electronic health records are an important piece of pharmacy informatics education and often integrate with other types of digital technology. Efficient use of EHRs is integral to pharmacy students being practice ready.

The Health Information Technology for Economic and Clinical Health (HITECH) Act laid the groundwork for the incorporation of EHRs into the US health care system through innovations like electronic prescribing and called for "meaningful use" of EHRs in patient care.³ A 2016 survey of over 1300 United States hospitals and health systems

found that over 99% of the respondents had either partially or completely implemented EHRs, and almost 96% used computerized provider order entry.⁴ Although there is little data summarizing EHR use in the community pharmacy setting, there are several innovative models that highlight the growing use of EHRs in this evolving pharmacy practice setting.^{5,6} Given the widespread use of EHRs today, the ability to learn and practice skills within an EHR is essential for pharmacy students to be ready for advanced pharmacy practice experiences (APPEs) and for a rapidly evolving pharmacy practice environment. While strict competencies and standardized assessments may not be feasible given variable use of academic EHR platforms and resources, the authors feel that a national expert consensus on incorporation of EHRs and skills related to EHR use would help guide the development of EHR curriculum at pharmacy schools and provide more consistency on skills students possess upon entering APPEs and graduation.

DISCUSSION

Use of EHRs in Pharmacy Education

There is significant variation in how schools and colleges of pharmacy are integrating academic EHRs into their curricula, as well as what skills are taught and assessed using

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EHRs. VanLangen and colleagues surveyed all accredited US pharmacy schools in 2017 and found that 37 of 59 responding schools were using EHRs in the didactic curriculum. Roughly half of respondents stated this use occurred in patient care laboratory courses, with collection and documentation of patient information being the most common activities performed and assessed. Approximately one third of schools had students use EHRs for medication order entry/verification, medication reconciliation, and errors and omissions activities.⁷ The uses described by VanLangen are supported by several studies describing EHRs in skills-based curricula (Table 1).⁸⁻¹² On an international level, recent survey findings from the International Pharmaceutical Federation (FIP) Digital Health in Pharmacy Education Report found that 53% of responding academic institutions from around the world were covering EHRs in some form within the curriculum and 25% of respondents were interested in incorporating EHR education into their curriculum. The survey provided limited information about the methods or depth of coverage.¹

There is a paucity of literature discussing trends with regards to educational EHR adoption, as well as guidance on what skills are essential. The studies referenced in Table 1 used different EHRs, activities, and assessments. This variation makes it difficult to define best practices for EHR use in curricula, as well as to determine what EHR skills most pharmacy graduates possess. Academic EHRs have been adopted in many pharmacy programs, but the method and scope of incorporation is unclear. Evaluating published literature to determine best practices for incorporation of EHR skills into curricula is limited by the lack of consensus on which EHR skills and objectives should be evaluated. Consensus on the core EHR skills and competencies students should possess is needed. There are many areas across the pharmacy curricula in which the EHR can be incorporated. Courses focusing on skills development (eg, “skills labs”) and the Pharmacists Patient Care Process (PPCP) are ideal settings for the EHR to be used for education and assessment of students’ abilities given how closely they relate to practice, and will be the focus in this article. Faculty teaching these courses are key to leading establishment of a consensus on this topic.

Incorporation of Electronic Health Records Use Into Educational Standards

The Accreditation Council for Pharmacy Education (ACPE) Standards 2016 mentions the importance of student competence in using health care technology, contemporary skill development, and utilization of current educational technology.¹³ Appendix 1 of the ACPE standards refers to use of EHRs within two different content areas.

Within the section on Health Informatics, the learning expectations state that pharmacy graduates should explore technology-based communication tools, as well as design and use EHRs to provide patient care. Daily use of EHRs for patient care is only a small component of this much broader competency that encompasses a wide range of applications of digital health technology which are outside the scope of this article. Electronic health records are also briefly mentioned within the learning expectations for Medication Dispensing, Distribution, and Administration.¹³ The North American Pharmacist Licensure Examination (NAPLEX) Competency Statements effective January 2021 outline in Area 1 of the blueprint that pharmacy graduates should be able to obtain, interpret, and assess data from medical records.¹⁴ Additionally within the recent (FIP) Digital Health in Pharmacy Education Report, the need for more established standards and formalized education and training of pharmacy students in digital health were included in the key messages.¹

When comparing pharmacy educational standards related to EHR, medical, nursing, and physician assistant standards vary in their incorporation of EHR skills and/or digital health education. The most recent Liaison Committee on Medical Education (LCME) Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the MD Degree, do not specifically mention digital health technologies or EHR skills.¹⁵ In an article in the Journal of the American Medical Informatics Association, Takesue and colleagues discuss the need to better prepare medical students for practice by teaching core EHR competencies; however, these competencies do not exist within medical education standards of practice.¹⁶ In comparison, the Commission on Collegiate Nursing Education (CCNE) Standards for Accreditation of Baccalaureate and Graduate Nursing Programs address digital health technology more extensively than does medicine or pharmacy. The Essentials of Baccalaureate Education for Professional Nursing provides 12 skills outcomes within Essential IV: Information Management and Application of Patient Care Technology that help link the use of digital technology to patient care, listing EHR/physician order entry as sample content.¹⁷ In addition, The Essentials of Master’s Education in Nursing provides five broad areas within Essential V: Informatics and Health Care Technologies, with “Facilitation and use of electronic health records to improve patient care” as one of the five broad areas to encompass.¹⁸ The Accreditation Review Commission on Education for the Physician Assistant standards effective as of September 2020 specifically mentions establishing a strong foundation in health information technology during the program curriculum, but lacks specific guidance.¹⁹ The degree to which health education programs incorporate

Table 1. Summary of Selected Studies Describing Electronic Health Record Activities in Skills-Based Courses

Study/Reference	Description/Setting	Assessment Method	Findings
Frenzel <i>Am J Pharm Educ.</i> 2010;74(4):71.	Students used an academic EHR to collect information on a simulated patient and documented interventions in a SOAP note within the EHR	18-item pre-course and 21-item post-course survey administered to students.	Study revealed perceived gains in student knowledge about and improved perceptions of using an EHR in the pharmacy practice setting.
Kirwin, et al. <i>Am J Pharm Educ.</i> 2013;77(3):62.	Students used an academic EHR to follow a hospitalized patient over time from admission to discharge. The EHR was primarily utilized to collect information on a simulated patient for activities completed outside the EHR.	Pre- and post-module survey administered to assess student work experience and confidence using an EHR. Course assessments were used to evaluate student performance.	Study displayed increased comfort and confidence in using an EHR to complete typical hospital pharmacist tasks from low levels of comfort and confidence to moderate levels of comfort and confidence. Course assessments confirmed achievement of course learning objectives.
Smith, et al. <i>Curr Pharm Teach Learn.</i> 2018;10(12):1624-1630.	During a practice lab course, students used an academic EHR to both collect and assess patient information and then created a handwritten progress note.	Student performance on acute care and ambulatory APPE prior to implementation of the EHR activity was compared to students with the new exposure to the simulated EHR activity. Both groups also completed a post-APPE survey regarding their perception of preparedness to use an EHR prior to starting APPEs.	Students' scores on acute care and ambulatory care experiential rotations were not significantly different between groups, but student perceptions of preparedness to use an EHR in the experiential setting improved.
Gibson, et al. <i>Curr Pharm Teach Learn.</i> 2019;11(7): 736-741.	Students used a homegrown academic EHR to collect information prior to creating a written SOAP note.	16-item pre- and post-assessment student survey administered to obtain perception on efficiency and confidence using an EHR as well as perceived benefit of preparing them for experiential rotations. Open-ended questions regarding the EHR activity were also utilized to gather student perceptions.	Students' perceived efficiency and confidence increased post-activity, but students' perceptions did not change regarding the benefit of the EHR activity as preparation for experiential rotations. Qualitative data revealed students' thought the activity was meaningful and realistic, was enjoyable, and would aid in transitioning to the clinical setting. Students also expressed need for increased EHR exposure.
Ives, et al. <i>Am J Pharm Educ.</i> 2020;84(8):ajpe7534.	Students used an academic EHR to process inpatient medication orders	Pre- and post-implementation surveys focusing on confidence in medication order processing and student opinion regarding use of the EHR. In addition, student performance scores pre- and post-exposure were compared.	Students' perceived confidence about medication order processing doubled to tripled after EHR implementation. Students had a favorable opinion of EHRs prior to the assessment that did not change post-assessment. Student opinion on the EHR activity preparing them for IPPEs/APPEs decreased after the activity. Performance on the assessment improved with implementation of the EHR activity as compared to paper-based medication order entry forms.

EHR=Electronic Health Record; SOAP=Subjective, Objective, Assessment, Plan; APPE=Advanced Pharmacy Practice Experience; IPPE=Introductory Pharmacy Practice Experience

digital health technology outcomes and standards is widely variable not only between schools within one profession but also between health programs. Specific competencies, example tasks/activities, and national consensus on how to ensure students are achieving these standards may assist institutions in selecting an academic EHR platform and designing their skills-based curricula with that platform. Pharmacy education has an opportunity to lead by developing national guidance on incorporating EHRs into curricula and contributing to educational standards related to EHR skills.

Prior to strengthening the language in educational standards, national consensus is needed across pharmacy education on what skills a pharmacy graduate should possess related to EHRs. Faculty focused on skills-based courses are key leaders in the development and strengthening of educational standards surrounding use of the EHR through task forces or workgroups within major pharmacy organizations. Through the work of these groups, consensus could be developed to determine what skills are the most important to be connected to the EHR. As core skills related to the EHR are developed, these skills can be mapped to existing entrustable professional activities (EPAs), pre-APPE domains, standards, and the PPCP. This roadmap could serve as a way to assess how skills in the EHR connect with current or new standards and identify gaps where new language is needed. A position paper including the perspectives of leaders in skills-based courses across several institutions on these topics is needed.

Pontefract and colleagues have described competencies and learning outcomes that all health care professionals, including pharmacists, would need to thrive in the digital setting. The agreed upon competency domains included digital health, accessing data, communication, generating data, multidisciplinary working, and monitoring and audit.²⁰ Although specific competencies for EHRs do not currently exist in pharmacy education in the United States, the addition of more specific language in the new version of the ACPE Standards or guidance document could be helpful. Specifics could also be added to Standard 10.8 Pharmacists' Patient Care Process (PPCP), which describes the skills needed to provide patient-centered care, and to the section on pre-APPE domains, which explains the skills students are expected to have prior to participating in APPEs.^{13,21,22} A possible additional EPA centered on pharmacy informatics could include EHR skills as a component that would benefit both learners and their patients.²³

There are skills and abilities already laid out in the standards that can be taught and assessed within the EHR, for example, collecting patient information, performing medication reconciliation, practicing order verification, or completing documentation. Many of these activities can be created outside of the academic EHR to teach and assess these skills (ie, using patient cases presented in a

word-processed document); however, in practice the ability to perform those skills within the EHR are necessary. There are also skills that are related to how one uses the EHR, like efficiency, clinical decision support, maintaining good communication while using an EHR, or data query targeted to impact population health. Consensus from faculty teaching in skills-based courses is needed in both areas. Example activities/skills within the EHR are provided in Table 2 and can serve as a starting point for a wider discussion.

Integration of The EHR Into Skills-Based Curricula

After developing consensus on EHR skills and mapping for pharmacy graduates, individual schools and colleges of pharmacy will need to ensure that skills, learning activities, and assessments align with the consensus at a national level. Each pharmacy school faces unique challenges and has unique strengths, and there will be variation in the depth and breadth to which an EHR curriculum can be implemented at a school. Skills-based courses should aim to incorporate the EHR into all steps of the PPCP and into all activities where EHR is used in practice. Objective structured clinical examinations (OSCEs) and clinical skills assessments that serve as milestone assessments to pass a course or move on to APPEs are often integrated into skills-based courses. Assessment of students' skills should be incorporated into these examinations for all activities for which an EHR would be used in practice. Increased integration of the EHR across various skills will help students recognize how integral the EHR is for pharmacy practice, increase students' comfort level with and navigation skills within the EHR, and possibly increase their APPE readiness.

As schools begin to think more in depth about EHR curriculum development in skills-based courses, a variety of stakeholders should be included. Input and involvement from faculty, preceptors, students, and affiliated health care partners is key to creating a curriculum that represents a broad range of practice settings. Faculty focused on skills-based teaching should be leaders on teams developing the EHR curriculum. Focus groups and surveys to gather baseline data from students, faculty, and preceptors on EHR experiences and current abilities of students can help inform development of curricula. A team representing the groups mentioned may use this data and work with the school's curriculum committee to develop institution-specific objectives for an EHR curriculum, a map of the different activities in their curriculum, a timeline, and the skills assessments that link back to national standards. Programs will need to determine what is the best process for them, but consideration should be given to introducing EHRs in the first professional year and, ideally, prior to introductory pharmacy practice experiences (IPPEs) in which EHRs will

Table 2. Example Skills/Competencies to Teach and/or Assess in the Electronic Health Record^a

Skill/Competency	Example Tasks
Accessing and interpreting patient data	Collecting data from various areas of the EHR Assessing patient care and/or follow-up on a care plan Confirming patient data found in the EHR Analyzing data to make clinical decisions/recommendations
Entering, verifying and modifying orders	Identifying and managing errors and omissions in medication orders (eg, incorrect dose/route/frequency, range orders, drug interactions, timing, etc.) Ordering appropriate labs during the visit and follow-up in the EHR Determining intravenous drug compatibility and appropriate drug administration timing Calculating/verifying drip rates and weight-based medication doses
Performing an accurate medication history and reconciliation	Locating and interpreting the medication administration record, medication lists from various sources, future medications scheduled, and prescription fill data in the EHR to develop an accurate medication list and assess medication adherence
Documenting a clinical encounter	Writing SOAP notes and pharmacokinetics consults in the EHR Communicating with a provider in the EHR via written SBAR Utilizing patient education documentation Updating/verifying allergies, vaccinations, and social histories in the EHR Communicating protocol based therapeutic decisions based on collaborative practice agreements
Communicating effectively and integrating the EHR into a patient encounter	Establishing rapport and eye contact while using the EHR during a patient visit Sharing information from the EHR with the patient to show progress on health goals
Collaborating with an interprofessional team	Integrating information from documented encounters in the EHR when two or more professions are actively engaged in the EHR to make appropriate clinical decisions Communicating with other professions in the EHR on patient status
Performing a medication use evaluation	Extracting data from the EHR for all patients within a health system that are taking a specific high-risk medication or have lab values that increase risk for adverse drug-related events
Analyzing data for population-based care	Utilizing data from the EHR to assess data on patients who have received or have indications to receive a specific vaccination Identifying patients who may benefit from MTM services
Reporting safety events and/or adverse drug reactions	Documenting and extracting documented adverse drug events, adverse drug reactions, and medication errors to evaluate severity and need for reporting, education, and/or process changes
Developing clinical decision support	Creating a protocol in the EHR to appropriately dose a medication in patients with renal dysfunction Updating a protocol in the EHR to align with new guidelines or emerging clinical data

^a These example skills/competencies are the ideas/opinions of the authors and do not represent an all-inclusive, evidence-based list of skills necessary for inclusion in the pharmacy curriculum.

EHR=Electronic Health Record; SOAP=Subjective, Objective, Assessment, Plan; SBAR=Situation, Background, Assessment, Recommendation; MTM=Medication Therapy Management

be encountered. Currently there is little information in the published literature regarding translating simulated EHR activities in the classroom to their use in patient care. Most of the literature available in this area examines student self-perceptions of their skills and readiness to use EHRs rather than providing more objective measures. Evaluating student performance using the EHR on APPEs, following exposure to an EHR curriculum in the didactic setting, will be an important measure of success.

Integration of the EHR into skills-based courses and curricula is not without barriers. Survey findings from the

FIP Digital Health in Pharmacy Education Report identified the top three challenges faced by pharmacy schools that resulted in them not providing digital health education: lack of experts to facilitate learning experience (83%), lack of resources (79%), and lack of guidance (59%).¹

The cost of access to an educational EHR, fees, technology infrastructure requirements and support, and faculty and staff training specific to the chosen educational EHR can be significant. In addition, students' EHR skills must be developed over several years and reinforced through experiential experiences. An assessment of potential

barriers and a discussion of strategies to overcome these barriers is a critical step in implementation of an EHR curricula.

CONCLUSION

Skills in using electronic health records are an important part of the use of technology in pharmacy. Incorporation of the EHR into skills-based curricula is needed across all pharmacy programs, as well as a focus nationally on development and identification of key components of the EHR curricula, competencies, and assessment. Leaders in skills-based courses have the opportunity to not only lead in pharmacy in this area, but also across other health care professions.

Stronger emphasis on development of core EHR skills and reference to specific EHR skills in national standards would help further guide development and assessment of EHR curricula in skills-based courses. Attainment of these competencies will ensure that future pharmacists are on the cutting edge of patient care and technology.

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