

## RESEARCH

### Health Informatics Competencies for Pharmacists in Training

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**Objective.** To gather feedback from focus groups regarding health informatics competencies that should be taught in a Doctor of Pharmacy (PharmD) curricula and to revise the competencies based on this feedback.

**Methods.** The pharmacy informatics task force of the American Association of Colleges of Pharmacy (AACP) used 11 sources to create a list of pharmacy informatics competencies. Subsequently, faculty feedback about the competency list was obtained via two synchronous online focus groups in August 2015. The list was then revised based on the feedback.

**Results.** Eight people (a department chair, six faculty members and a graduate student) participated in the focus groups (six were from private and two were from public institutions). Participants felt the list had too many competencies to be covered in a timely manner and some indicated that basic computer and Internet competencies should be considered pre-requisites. Participants also recommended that competencies be split by proposed curricular placement (eg, prerequisite, required, elective, didactic, experiential) for each objective. The competency list was revised in response to focus group feedback.

**Conclusion.** The proposed curriculum aligns with the new Accreditation Council for Pharmacy Education (ACPE) standards requiring that professional pharmacy curricula cover multiple aspects of health informatics. The proposed competencies list can serve as a reference to assist in the development of the curriculum and ensure compliance with the new standards.

**Keywords:** health informatics, technology, curricular standards, focus group

## INTRODUCTION

The importance of health informatics was brought to national attention with the Institute of Medicine's (IOM's) 2001 report "Crossing the Quality Chasm (IOM 2001)."<sup>1</sup> This report presented recommendations for changes in health care delivery in the United States and the role of informatics as tools for achieving outlined aims.<sup>1</sup> The IOM later included "utilize informatics" as one of the five core competencies for health professionals (IOM 2003).<sup>2</sup>

The US government created a strategic plan to implement the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which was finalized in 2013 (IT plan).<sup>3</sup> Successful completion of this plan to comply with the requirements of this

law requires the informed cooperation of every health care professional and organization; this includes pharmacists and pharmacy informaticists.

The terminology in this domain is diverse; however, the US National Library of Medicine defines health informatics as "the interdisciplinary study of the design, development, adoption, and application of information technology (IT)-based innovations in healthcare services delivery, management, and planning."<sup>4</sup> In 2006, the Healthcare Information and Management Systems Society defined health informatics in the context of pharmacy as "the scientific field that focuses on medication-related data and knowledge within the continuum of healthcare systems – including its acquisition, storage, analysis, use and dissemination – in the delivery of optimal medication-related patient care and health outcomes."<sup>5</sup>

Competency in health informatics has also been included in the Accreditation Council for Pharmacy

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Education (ACPE) 2007 and 2016 standards and the Center for the Advancement of Pharmacy Education (CAPE) 2013 educational outcomes.<sup>6-8</sup> Specifically, the 2016 ACPE (Appendix 1) standards for clinical sciences in the health informatics category state that students should be able to retain, recall, build upon, and apply knowledge for “effective and secure design and use of electronic and other technology-based systems, including electronic health records, to capture, store, retrieve, and analyze data for use in patient care, and confidentially/legally share health information in accordance with federal policies.”<sup>7</sup> These standards state required elements of a didactic pharmacy curriculum are given “at the level of broad learning outcomes.” Further, the goal of the 2016 Standards is “students will develop the comprehensive knowledge base required to be ‘practice ready.’”<sup>7</sup>

In 2008, Fox and colleagues published findings on the state of health informatics curricula in PharmD ACPE-accredited programs using 2007 ACPE Standards and Guidelines as a comparison. Following a review of syllabi, the study concluded that only 39% of courses met the guidelines. Based on these findings and using ACPE Standards as a framework, core competencies were recommended.<sup>9</sup>

In 2011, Fox and colleagues published a core set of activities, knowledge and skills students should possess along with source materials and learning activities for pharmacy education.<sup>10</sup> These core competencies for all PharmD programs were developed using a consensus-based process and compiled in resource books.<sup>10,11</sup> These authors suggested that core competencies could be aligned using a framework of the medication use process and seamlessly integrated into pharmacy practice.

In 2010 and revised in 2014, the Pharmacy e-HIT Collaborative brought pharmacy organizations and stakeholders together under one strategic plan for health informatics in pharmacy.<sup>12</sup> The Pharmacy e-HIT Collaborative was originally formed by nine national pharmacy organizations to work on ensuring integration of pharmacy’s requirements and contributions into the electronic health record (EHR). In the revised report, the collaborative reported that there were some complete, partially complete, or no longer relevant strategies in the profession. The collaborative found that there are still areas that need continued focus under the main themes of pharmacist’s access and use, integration, support and assessment of technology’s impact on quality of care.<sup>12</sup>

This strategic plan, its findings, periodic revisions and updates provide additional justification and a framework for pharmacy educators to look to for educating the next generation of pharmacists. In the same spirit of building consensus and periodic revision, a special task force including the authors and those listed in the

acknowledgements section of this manuscript was established after a call from AACP leadership to reevaluate health informatics in pharmacy education.

The profession of pharmacy has provided resources outlining core competencies and tools to execute the appropriate knowledge.<sup>10,11</sup> However, domains in this area can become quickly outdated, warranting ongoing assessment and periodic evaluation of these competencies. Also, expert educators in pharmacy informatics are few and, therefore, more specific and directive guidelines are needed for educators to distinguish between essential competencies and those reserved for students looking for additional specialized knowledge. In light of recent changes to the ACPE standards and guidelines, organizations such as AACP need resources to provide member schools a pathway toward a curricular framework in health informatics that is at least, in part, systematic across programs. In addition, resources for informing how these competencies can be integrated into existing coursework, specific didactic courses or elective courses will be important for these competencies to become integrated in pharmacy programs.

The first objective of this project was to develop a comprehensive and current list of health informatics competencies that should be taught in PharmD curricula. The second objective was to gather feedback from faculty focus groups on the competencies, which were subsequently revised.

## **METHODS**

The task force created an initial list of pharmacy informatics competencies between February and October 2014. The task force first identified sources related to health care and pharmacy informatics through use of both personal experience and literature searches. Based on the content, they eventually reviewed competencies and syllabi from numerous sources, including Fox and colleagues, Partners in E curriculum, International Computer Driver’s License (ICDL) modules, Technology Informatics Guiding Education Reform (TIGER) modules, the Association of College and Research Libraries Information Literacy Competency Standards for Higher Education and syllabi from the University of California San Diego, Lipscomb University, Western University, and Tuoro University PharmD programs.<sup>9-11,13-16</sup> The Pharmacy e-Health Information Technology Collaborative and American Medical Informatics Association guidance were also reviewed.<sup>12,17</sup> The members of the task force met six times to incorporate and consolidate the relevant aspects into a main list presenting domains, subdomains, competencies and place in the curriculum. Subsequently, faculty feedback about the competencies

list was obtained via online focus groups. Two synchronous focus groups were conducted in August 2015. The input from the focus groups was used to finalize the content, presented here in figures and tables.

Any AACP member of any rank who taught or did research in health informatics was eligible to participate in this study. Members may recommend other participants. An invitation with information about the study was sent to the AACP membership roster. Interested faculty were sent a survey (Qualtrics, Provo, UT) asking basic demographic questions and the informed consent document (Appendix 1). The competencies list was provided along with information on how to access the focus group web-portal. Consent was obtained when participants logged in for the online focus group. The University of Wyoming Institutional Review Board approved this research study.

The AACP task force investigators developed the discussion questions and moderated focus groups guided by the assigned charges (Appendix 2). The questions assessed participants' perceptions of the competencies scope; their level of alignment with the ACPE 2016 standards; the proposed classification (ie, didactic vs experiential, required vs elective); and which competencies would be a priority for implementation in the next two years. After logging in to the web-portal, participants were asked to self-identify and provide affiliation information. A poll question was embedded into the web-portal to gather information on participants' involvement in their colleges' health informatics curriculum. The focus group moderator gave a 15-minute overview of the competencies list to guarantee that all participants had at least minimum familiarity about the competencies. Once the researchers ensured that all participants had the opportunity to participate in the discussion, the moderator proceeded with the questions. Each online-focus group lasted approximately one hour.

The discussion was audio-recorded, transcribed verbatim and anonymized. An independent (non-task force) investigator reviewed the focus groups transcripts and used thematic analysis to identify themes. Identified themes were discussed among all investigators until consensus was achieved.

## RESULTS

Eight people (a department chair, six faculty members and a graduate student) participated in the focus groups; six were from private and two from public institutions. Three of the four participants in the first group had 4-5 years of health informatics involvement in their curricula, while all four participants in the second group had 3 or fewer years of experience.

Thematic analysis of the data identified four overarching themes: too many competencies to cover within curricular constraints; some competencies are rudimentary and should not be incorporated into pharmacy curricula; certain domains needed bolstering; and the competencies are aligned well with ACPE standards.

One of the most prominent points expressed during the focus groups was that too many items were on the draft competency list to implement all components into their curriculum. One individual said, "I would drop a lot of the other things like email, things like that I think are fairly rudimentary and don't need to be mentioned." Similarly, another contributor said that they would "drastically scale down the basic ones" to allow more time for the advanced items. Another individual expressed that it would require at least two courses to present all the information to students.

Some of the participants agreed that many items were rudimentary, and it would be reasonable to assume that incoming pharmacy students should already possess this knowledge. One representative quote was "I think that some of these things can be moved out into the expected knowledge base of an entering pharmacy student." Similarly, there was agreement that many items could be incorporated into a prerequisite computer competency test to verify that incoming students possess this knowledge. While they agreed that some of the information should be included as prerequisite knowledge, participants expressed the potential benefit of this curriculum being implemented in their programs.

Focus group feedback indicated that the proposed curriculum aligned well with the new ACPE standards and will aid in meeting those objectives. However, one participant cautioned that having too many objectives to meet the ACPE standards could result in the loss of focus on more important health informatics topics. Another contributor suggested that more information was needed; expressing that bolstering the emerging technologies section would help to meet the ACPE objectives.

When asked how they would use this information, participants indicated they would incorporate these objectives into their programs in various ways. Some individuals suggested most information could be incorporated into a class such as health informatics. Alternatively, one participant expressed that these objectives could be spread out over the entire curriculum with special health informatics lectures in various courses. Another participant said that her school was working on developing technology laboratories with EMRs, and educating students on automation such as pharmacy robotics. Another suggestion was to briefly cover many of the objectives in the first two years of pharmacy education. Following this exposure, students could then select to have their concentration in health

informatics for the third and fourth years (selecting from courses using the didactic and experiential elective competencies) where these objectives could be covered in more detail.

High priority competencies for implementation included interoperability standards, biomedical informatics, emerging technologies, legal and regulatory, and general concepts that relay back to safety and computerized physician order entry (CPOE) systems. Participants agreed that it was important to focus on more complex competencies rather than the elementary topics. From past work experiences, one contributor suggested they would like students to be more comfortable using online data collection software to collect and analyze data on a fundamental level.

Other feedback suggested that certain domains, such as emerging technologies, needed bolstering; emerging technologies contain new parts, and areas where rapid change is being seen. The competency list was revised in response to this feedback. Recommendations were incorporated into a structural format where the first figure

is a flowchart to the second figure and the tables (Figures 1-2; Tables 1-4 available at <https://files.acrobat.com/a/preview/57009581-eccf-4868-8526-def02eff200b>). The four tables can be used separately to develop different areas of the curriculum.

## DISCUSSION

The primary goal of this project was to develop a list of competencies to aid the implementation of health informatics into pharmacy education. Fox and colleagues published their work in 2011, and this current project reflects the enduring competencies from their work as well as needed changes. This is in response to the quickly evolving field of health informatics that requires frequent updates in educational topics. Penm and colleagues recently surveyed preceptors for a PharmD program on the status of student pharmacy informatics competence and found that skills were still lacking.<sup>18</sup>

The focus groups were conducted to assess what was being done at various institutions and gather feedback on

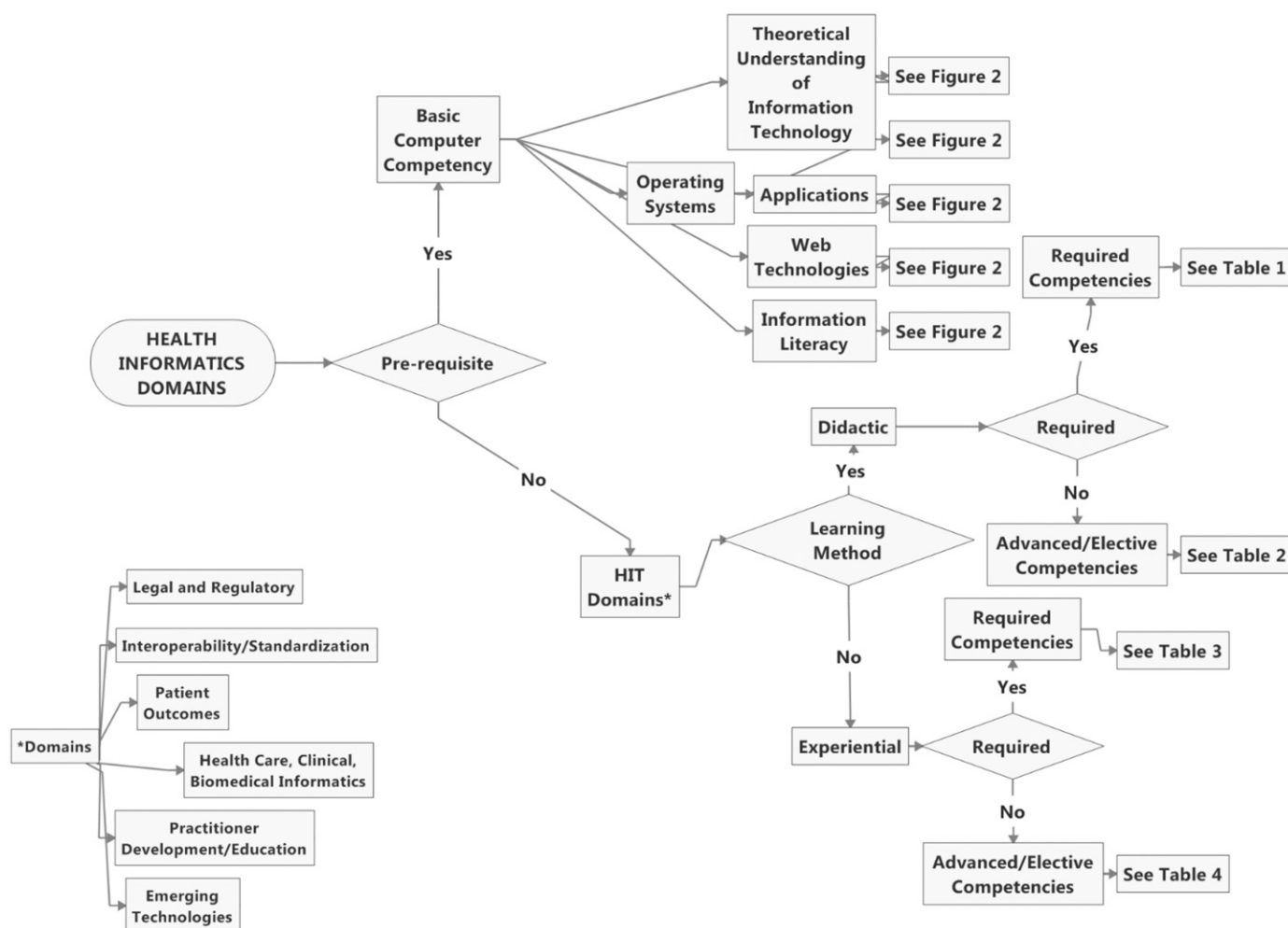


Figure 1. Flowchart of Health Information Domains and Competencies

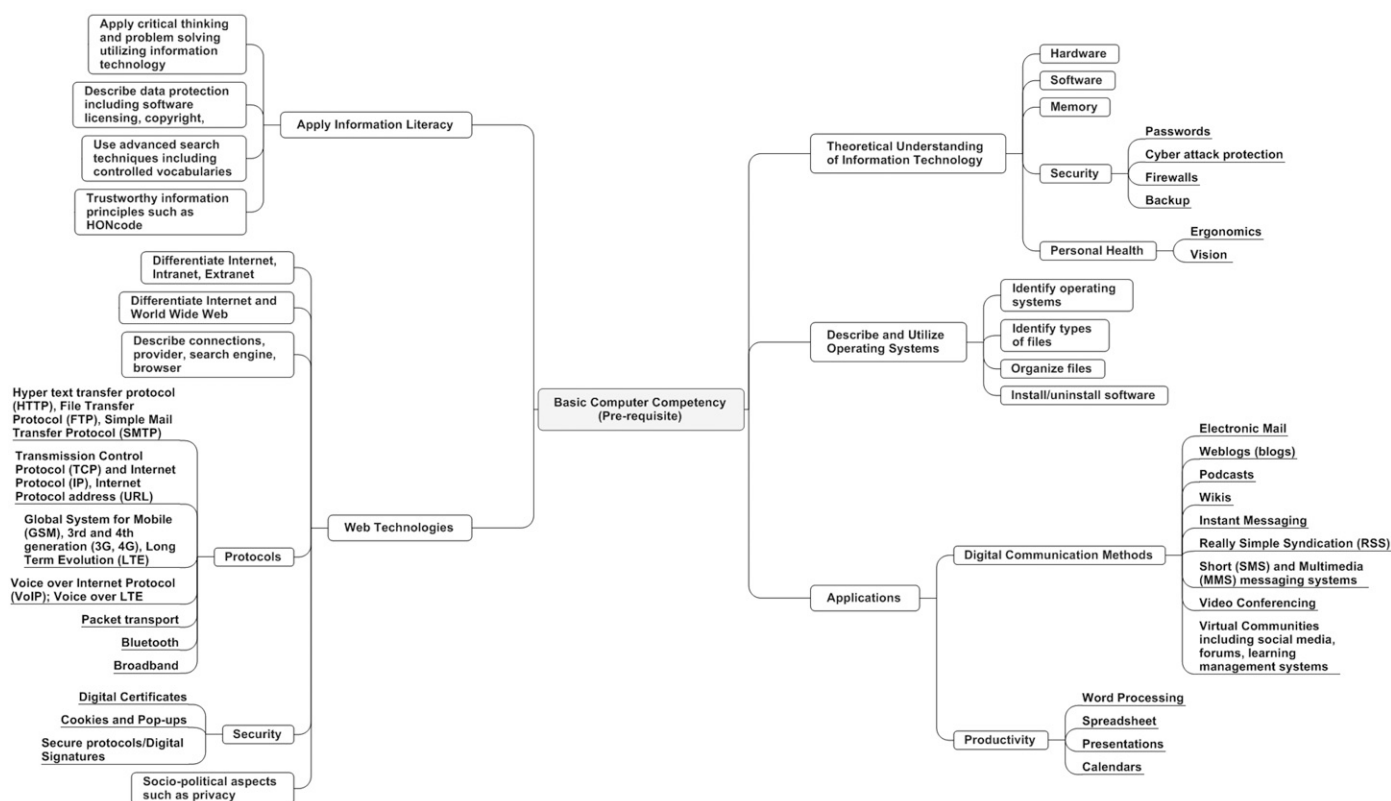


Figure 2. Pre-requisite Informatics Competencies

the proposed draft list of domains/objectives created by the task force. There is a need to develop and refine health informatics education to achieve compliance with upcoming ACPE standards and prepare students for a future with rapidly changing technologies. Focus group participants agreed that the drafted competencies were very thorough and would be beneficial as framework for curriculum development.

Feedback from the focus groups suggested that the list of objectives might be too comprehensive, and it would be difficult to incorporate all the material, especially the basic competencies. Based on their recommendations, alterations have been made to the list with an important addition of classifying some elements as pre-requisites. However, incoming student knowledge has a wide spectrum and thus a mechanism to assess knowledge of competencies deemed pre-requisites needs to be developed. Figures 1-2 and Tables 1-4 present the revised recommendation of the primary location in the curriculum where the different domains and competencies should be included. These components are at a more detailed level than Fox and colleagues,<sup>10</sup> but match their foundations. Further, the domain components organized here align further with specific methods of curriculum integration as described by Fox and colleagues and Flynn and colleagues in 2017.<sup>19,20</sup>

For PharmD programs to prepare “practice ready” pharmacists in the domain of health informatics, the 2016 Standards state that students must be able to “capture, store, retrieve, and analyze” patient data. Most of the competencies confirmed herein align with knowledge retention and recall of various aspects related to capturing and storing health informatics. It appears that fewer of the competencies point to application of retrieval and analysis of health informatics data. Nevertheless, more complicated competencies such as application of data coding, data classifications, and data architecture are important for application skills of data retrieval, using software to generate reports and subsequent analysis. These “retrieval” and “analysis” competencies were less noted in previous works; nonetheless, they are listed as the same level of importance as “capturing” and “storage” by the 2016 Standards. Previous lists of competencies of health informatics and its subdomains may be insufficient to meet the 2016 standards.

This study has limitations. First, all focus group participants were health informatics educators and/or researchers associated with PharmD programs. Other stakeholders were not part of this project. Therefore, there may be variations on how some definitions are presented in this study compared to classification and definitions of experts on informatics outside pharmacy. For example,

what is considered as emergent technology for pharmacy faculty might be viewed as established by other disciplines. Additionally, it may be interesting to sample others in the health informatics community or in pharmacy practice to obtain their perspectives on what health informatics components need to be taught to students. However, the end users of these competencies are pharmacy schools and colleges. Second, a very small sample of AACP members participated in the focus groups. Thus, it is important for further research to gather feedback from a larger sample. Despite these limitations, this study provides an extensive review of competencies that members in the academy can build upon in the future as schools look to meet the current and future health informatics standards. This listing also shows that elements of retrieval and analysis may currently be less of a focus in PharmD programs.

## CONCLUSION

New 2016 ACPE standards require that professional pharmacy curricula cover multiple aspects of health informatics. The results of the focus groups provide clarification and specifications surrounding proposed competency statements. These newly clarified competencies can serve as a reference to assist in the development of the curriculum and ensure compliance with the new standards, with a particular focus on competencies that are underrepresented such as those related to data retrieval and analysis.

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## REFERENCES

1. Committee on Quality of Health Care in America, Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Press; 2001.
2. Greiner AC, Knebel E, eds. *Health Professions Education: A Bridge to Quality*. Washington, DC: National Academies Press; 2003.

3. The Office of the National Coordinator for Health Information Technology (ONC) Office of the Secretary, US Department of Health and Human Services. Federal Health IT Strategic Plan: 2015-2020. <https://www.healthit.gov/policy-researchers-implementers/health-it-strategic-planning>. Updated March 8, 2016. Accessed February 11, 2018.
4. Healthcare Information and Management Systems Society (HIMSS). Health Informatics Defined. <http://www.himss.org/health-informatics-defined>. Published January 7, 2014. Accessed February 11, 2018.
5. What is Pharmacy Informatics? Healthcare Information and Management Systems Society. <http://www.himss.org/library/pharmacy-informatics/what-is>. Accessed February 11, 2018.
6. Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. <https://www.acpe-accredit.org/pdf/FinalS2007Guidelines2.0.pdf>. Accessed February 11, 2018.
7. Accreditation Council for Pharmacy Education. Accreditation standards and key elements for the Professional program in pharmacy leading to the doctor of pharmacy degree. <https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>. Accessed February 11, 2018.
8. Medina MS, Plaza CM, Stowe CD, et al. Center for the Advancement of Pharmacy Education 2013 educational outcomes. *Am J Pharm Educ*. 2013;77(8):Article 162.
9. Fox B, Bongiorno Karcher R, Flynn A, Mitchell S. Pharmacy informatics syllabi in doctor of pharmacy programs in the US. *Am J Pharm Educ*. 2008;72(4):Article 89.
10. Fox BI, Flynn AJ, Fortier CR, Clauson KA. Knowledge, skills, and resources for pharmacy informatics education. *Am J Pharm Educ*. 2011;75(5):Article 93.
11. Fox BI, Thrower MR, Felkey BG. *Building Core Competencies in Pharmacy Informatics*. Washington, DC: American Pharmacists Association; 2010.
12. Pharmacy eHealth Information Technology Collaborative. Roadmap for pharmacy health information technology integration in US health care. [http://pharmacyhit.org/pdfs/RoadmapUpdate\\_2015.pdf](http://pharmacyhit.org/pdfs/RoadmapUpdate_2015.pdf). Accessed February 11, 2018.
13. Partners in E. Healthcare Information and Management Systems Society. <http://www.himss.org/library/pharmacy-informatics/partners-in-e>. Updated 2018. Accessed February 11, 2018.
14. ICDL Modules, International Computer Driving Licence (ICDL USA). <http://www.icdlusa.org/modules>. Updated 2015. Accessed February 11, 2018.
15. The TIGER Initiative. Healthcare Information and Management Systems Society. <http://www.himss.org/professionaldevelopment/tiger-initiative>. Updated 2018. Accessed February 11, 2018.
16. Association of College and Research Libraries. Framework for Information Literacy for Higher Education. <http://www.ala.org/acrl/standards/ilframework>. Adopted January 11, 2016. Accessed February 11, 2018.
17. American Medical Informatics Association. <https://www.amia.org/>. Updated 2018. Accessed February 11, 2018.
18. Penm J, Ivey M, Boron M. Pharmacy preceptors views of pharmacy students' competency in pharmacy informatics. *Curr Pharm Teach Learn*. 2016;8(4):549-554.
19. Fox BI, Flynn A, Clauson KA, Seaton TL, Breeden E. An approach for all in pharmacy informatics education. *Am J Pharm Educ*. 2017;81(2):Article 38.
20. Flynn A, Fox BI, Clauson KA, Seaton TL, Breeden E. An approach for some in advanced pharmacy informatics education. *Am J Pharm Educ*. 2017;81(9):Article 6241.

**Appendix 1. SAS AACP Curriculum Committee: Health Information Technology Task Force Focus Group**

Demographic Questionnaire

1. At what type of institution do you work? Check all that apply
  - Public university
  - Private university
  - Medical center/clinical site
2. How long has your school/college of pharmacy been accepting students? \_\_\_\_years
3. What is your gender?
  - Male
  - Female
4. What is your age? \_\_\_\_years
5. What academic position do you hold?
  - Tenure track
  - Non-tenure track
  - Adjunct/Instructor level
6. What is your primary discipline?
  - Social and Administrative Sciences
  - Pharmacy Practice/Clinical Sciences
  - Other\_\_\_\_\_
7. How does your institution currently cover health informatics?
  - In a standalone required class
  - In a standalone elective class
  - Integrated throughout the curriculum
  - We do not cover health informatics to a significant degree at this time
8. What is your perception of your own health informatics knowledge?
  - I have **very much** health informatics knowledge
  - I have **much** health informatics knowledge
  - I have **minimal** health informatics knowledge
  - I have **no** health informatics knowledge
9. Comments

## Appendix 2. SAS AACP Curriculum Committee: Health Information Technology Task Force Focus Group

### Discussion Guide

#### 1. Introductions and Informed Consent

Hello and welcome to our focus group. We would like to thank you for taking the time to meet with us. My name is Dr. XX. This focus group is being held by the AACP SAS Curriculum Committee. We have been charged with developing informatics and health information technology (HIT) competencies relevant to the practice of pharmacy that are consistent with the new ACPE Accreditation Standards. We have a draft of these competencies and we have convened this focus group to gather your opinions and reactions to our draft. You should have received a draft of these competencies in previous week for review. This focus group will last about 1 hour.

With your permission, the discussion will be audio recorded. (address any questions) Once again, all the information you share in the focus group will be treated as confidential and no names will be connected to the data. Your participation in this focus group will be considered consent.

#### 2. Demographic Questionnaire

Before we begin, you should have received a brief questionnaire with Qualtrix with some basic questions about your school/college and yourself. Please fill out the questionnaires now.

#### 3. Participant Introductions and Process of Discussion

Briefly introduce yourself by stating your name.

Thank you for introducing yourselves. We will now have about [*indicate time frame*] for discussion. We hope that each of you will provide some input during the discussion and we request each of you to keep your comments short so that everyone may have a chance to participate. I may need to interrupt to guide our discussion along, but I will try not to do so.

#### 4. Focus Group Discussion

We want to make sure that we don't miss anything you have to say; again this discussion will be recorded on audiotape. I will go ahead and turn on the recorder now and begin our discussion. Is this ok with everyone? At this point, are there any questions? (address any questions from the participants)

#### Specific Questions:

##### I. Warm-up explanation of focus groups/rules (5 minutes)

See script above

##### II. Introduction and overview of the draft objectives and the process by which they were created (10 minutes)

Define health information technology (HIT) and pharmacy informatics

Provide an overview of what the committee was trying to achieve

On the screen you will see a copy of the draft of the HIT competencies relevant to the practice of pharmacy that are consistent with the new ACPE Accreditation Standards

We have convened this focus group to gather your opinions and reactions to our draft.

##### III. Coverage Questions (20 minutes)

Is the document comprehensive?

Are there items that can/should be dropped?

How well aligned are the objectives with the new ACPE Standards?

What do you think of our classification system?

Are there items that should be reclassified?

##### IV. Integration of Information (20 minutes)

Considering your instruction of HIT at your institution:

How would you use this information?

Would you be likely to integrate into a current course or course series compared to development of a stand-alone course/elective?



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Based on your own experience, what would make this information more useful to ease integration or development of course objectives, content/material, and assessments?

V. Closing (5 minutes)

Additional thoughts, issues or concerns

Additional questions you have for me

Thanks for your time