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Evaluating health information technology knowledge and skills among pharmacy students

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Abstract

In the ever-evolving healthcare industry, proficiency in Health Information Technology (HIT) is becoming a cornerstone for pharmacy students—the future torchbearers of the profession. This study probes into the HIT perceptions and competencies among these students across Saudi Arabia through a cross-sectional survey, ensuring a wide representation from various colleges. Initial findings underscore a robust awareness and significant enthusiasm for enhanced HIT-related education despite a clear shortfall in the current curricula's depth and breadth. The insights garnered here lay the groundwork for academic advancements, potentially steering curricular reforms to fortify the digital-age readiness of aspiring pharmacists.

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Introduction

The escalation of pharmacy education's prominence in recent decades is a testament to its essential role within the evolving healthcare sector. As pharmacists emerge as pivotal figures in patient care, the mastery of Health Information Technology (HIT) becomes imperative, shaping the skills and knowledge required for contemporary pharmacy students. The seamless adoption of HIT is pivotal for advancing pharmacy practice, offering substantial improvements in patient outcomes, healthcare efficiency, and medication safety.

However, existing literature reveals a pronounced gap in exploring the digital competencies of pharmacy students compared to their medical counterparts despite pharmacists' critical contributions to health information exchange and patient management through HIT. This discrepancy signals a pressing need to examine the readiness of pharmacy students to embrace a technology-driven healthcare environment.

In their landmark study, Fox *et al.* (2017) highlighted the transformative impact of healthcare computerization, advocating for an educational paradigm that emphasizes informatics principles to enhance patient outcomes. Similarly, Fuji and Galt (2015) recognized the need for advanced pharmacy informatics training, proposing the integration of online elective health informatics courses into PharmD curricula as a universal standard. Breeden and Clauson (2016) further reinforced this necessity, introducing a multitiered health informatics curriculum model to address the last decade's evolving educational standards.

Karodeh *et al.* (2022) explored the interplay between student success in non-traditional Doctor of Pharmacy programs and demographic factors, while Hailemeskel, Brooks *et al.* (2021) evaluated the impact of virtual learning on pharmacy students during the COVID-19 pandemic. Bootman *et al.* (2018) identified critical issues and recommendations for pharmacy education by analyzing the National Academy of Medicine's pivotal publication (Karodeh *et al.*, 2022) (Brooks *et al.*, 2021).

Alhur and Alhashash (2022) shed light on the unique challenges within the HIT education landscape in Saudi Arabia, which Alhur (2023) later expanded upon by assessing the efficacy of health informatics internships.

Building upon these foundational works, our study endeavors to delve into pharmacy students' perceptions and experiences with HIT within their educational journey. By assessing their knowledge and skills in HIT, we aim to distill valuable insights into the current landscape of HIT education across pharmacy colleges. Our cross-sectional quantitative research, leveraging an online survey, intends to provide a comprehensive analysis of pharmacy students' interactions with HIT—both as a subject of study and as a tool for future practice.

This research holds the potential to significantly enrich the existing corpus of knowledge on HIT education within pharmacy colleges in the Kingdom of Saudi Arabia (KSA). The outcomes are expected to lay the groundwork for curriculum development, pedagogical enhancements, and strategic planning in pharmacy education. The ultimate goal is to equip future pharmacists with the competencies to adeptly wield HIT in their professional roles, thereby catalyzing the elevation of patient care and the overall efficacy of healthcare systems.

Materials and methods

Research objective and study design

The primary goal of this research was to evaluate the perceptions and experiences of pharmacy students regarding Health Information Technology (HIT) within their educational curriculum. Emphasis was placed on assessing their skills and knowledge pertaining to HIT. To capture this data effectively, we employed a cross-sectional quantitative research design. This approach was instrumental in obtaining a detailed snapshot of the current state of HIT knowledge, utilization experiences, and attitudinal perceptions among the students.

Data collection tool and sampling

An online questionnaire served as the data collection tool, meticulously crafted to gauge the level of HIT knowledge and understanding among pharmacy students.

Then, examine their experiences with HIT-inclusive coursework and evaluate their perceptions concerning the pertinence and efficiency of HIT education.

The study population consisted of pharmacy students enrolled in various institutions across the Kingdom of Saudi Arabia (KSA). To achieve a representative sample that reflects the diversity of this population, a stratified random sampling method was utilized. This ensured the inclusion of participants from different academic years and colleges, thereby enhancing the generalizability of our findings.

Data analysis

Responses from the completed surveys were analyzed using the statistical software SPSS. Descriptive statistics provided a summary of the participant demographics and their responses to survey items. Inferential statistical techniques were then applied to discern underlying patterns and relationships within the data, facilitating a deeper understanding of the complex factors influencing HIT competency among pharmacy students.

Ethical considerations

The study was approved by the Ethical Approval Committee from the Research Department at Hail Health Cluster No. 2023-96. The study was conducted in strict adherence to ethical standards. Prior to data collection, participants were fully briefed on the study's objectives, and informed consent was acquired. We guaranteed anonymity and confidentiality for all participants, ensuring that individual responses would remain unidentified throughout and after the research process.

Rationale for Methodology

The methodology adopted for this study was intended to equip us with empirical evidence on the readiness of pharmacy students in the KSA to integrate HIT into their future clinical practice. It is anticipated that the insights gained will be pivotal in enhancing the quality of patient care and the operational efficiency of healthcare services through informed curriculum development and strategic educational planning.

Results and discussion

The demographic information of the study participants is presented in Table 1. Gender distribution revealed that 30.30% (93) of the participants were male, while 69.70% (225) were female. In terms of study year, the majority of participants were fifth-year pharmacy students, accounting for 33.40% (108) of the sample. This was followed by graduate students, comprising 32.20% (104) of the participants. The remaining participants were distributed across different years, with 6.20% (20) in the first year, 5.00% (16) in the second year, 11.10% (36) in the third year, and 12.10% (39) in the fourth year of pharmacy studies.

Table 1. Demographic information

Category	Sub-category	Percentage	Count	*p*-value
Gender distribution	Male	30.30%	93	0.447
	Female	69.70%	225	
Study year	First-Year Pharmacy Student	6.20%	20	
	Second-Year Pharmacy Student	5.00%	16	
	Third-Year Pharmacy Student	11.10%	36	0.744
	Fourth-Year Pharmacy Student	12.10%	39	
	Fifth-Year Pharmacy Student	33.40%	108	
	Graduate	32.20%	104	

Table 2 displays the coefficient values of Cronbach's Alpha for various key variables. The assessment of Knowledge and Understanding of Health Information Technology yielded a Cronbach's Alpha of 0.813, with four items contributing to this dimension. Experiences with Health Information Technology-related Coursework demonstrated a high internal consistency, as evidenced by a Cronbach's Alpha of 0.869, derived from five constituent items. The domain of Perceptions of the Relevance and Effectiveness of Health Information Technology in Education exhibited a Cronbach's Alpha of 0.693,

based on five items. Lastly, the General Perceptions category achieved a Cronbach's Alpha of 0.737, comprising five items. These Cronbach's Alpha values indicate good to excellent internal consistency reliability for the respective variables, reinforcing the robustness of the survey instrument.

Table 2. The coefficient value of Cronbach's Alpha

No	Variables	Cronbach's Alpha	Number of items
1	Knowledge and Understanding of Health Information Technology	0.813	4
2	Experiences with Health Information Technology-related Coursework	0.869	5
3	Perceptions of the Relevance and Effectiveness of Health Information Technology in Education	0.693	5
4	General Perceptions	0.737	5

Table 3. Knowledge and understanding of health information technology

Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean	SD
I am familiar with the basic concepts and terminologies related to Health Information Technology (HIT).	18.60%	32.50%	29.10%	13.60%	5.30%	2.53	1.105
My pharmacy curriculum has adequately covered the principles of Health Information Technology.	17.30%	30.00%	22.60%	22.30%	6.80%	2.71	1.193
I can differentiate between various Health Information Technology tools and platforms used in the healthcare sector	15.50%	33.70%	24.70%	18.00%	7.40%	2.68	1.161
The Importance of Health Information Technology in modern pharmacy practice has been emphasized in my education.	22.30%	42.40%	16.70%	11.80%	5.60%	2.35	1.122

Table 3 presents the results regarding participants' knowledge and understanding of Health Information Technology (HIT). It is evident that participants' familiarity with basic HIT concepts and terminologies varied, with 18.60% strongly agreeing, 32.50% agreeing, 29.10% expressing a neutral stance, 13.60% disagreeing, and 5.30% strongly disagreeing. The mean score for this item was 2.53, with a standard deviation of 1.105, indicating a moderate level of agreement overall.

Similarly, perceptions of whether the pharmacy curriculum adequately covered HIT principles varied, with 17.30% strongly agreeing, 30.00% agreeing, 22.60% remaining neutral, 22.30% disagreeing, and 6.80% strongly disagreeing. The mean score for this item was 2.71, and the standard deviation was 1.193, indicating a somewhat positive but diverse range of responses. Regarding the ability to differentiate between various HIT tools and platforms, 15.50% strongly agreed, 33.70% agreed, 24.70% were neutral, 18.00% disagreed, and 7.40% strongly disagreed. The mean score for this item was 2.68, with a standard deviation of 1.161, suggesting a moderate level of agreement with some variability.

When asked about the emphasis on the importance of HIT in modern pharmacy practice during their education, 22.30% strongly agreed, 42.40% agreed, 16.70% remained neutral, 11.80% disagreed, and 5.60% strongly disagreed. The mean score for this item was 2.35, with a standard deviation of 1.122, indicating a generally positive perception of HIT's importance in pharmacy education, although with some diversity in responses.

Table 4 sheds light on participants' experiences with Health Information Technology (HIT)-related coursework in their pharmacy education. Notably, 15.20% of respondents strongly agreed, and 36.20% agreed that they had hands-on experience with HIT tools during their pharmacy education. A similar pattern emerged when assessing the alignment of HIT-related coursework with current healthcare trends, with 13.30% strongly agreeing and 35.00% agreeing. When it comes to their confidence in applying HIT principles in real-world pharmacy settings based on coursework, 15.80% strongly agreed, and 31.90% agreed. Practical sessions involving health IT tools were perceived as helpful by 18.90% who strongly agreed and 27.90% who agreed. In contrast, the availability of workshops or seminars specifically focused on HIT appeared to be less common, as only 15.20% strongly agreed and 25.10% agreed to have such opportunities. These results collectively suggest a positive overall perception of HIT-related coursework experiences, with participants valuing hands-on experiences and practical sessions. However, there is room for improvement in terms of offering additional HIT-focused workshops or seminars to enhance students' exposure to this domain. The mean scores and standard deviations further highlight the participants' diverse range of experiences and perspectives on HIT-related coursework.

Table 5 offers valuable insights into participants' perceptions regarding the relevance and effectiveness of Health Information Technology (HIT) in their education. The majority of respondents strongly agreed (44.30%) and agreed (43.00%) that integrating HIT into the pharmacy curriculum is essential for the evolving role of pharmacists. Additionally, a significant portion believed that proficiency in HIT would be crucial for their future careers, with 33.70% strongly agreeing and 43.70% agreeing. However, when evaluating the current HIT education in their college, opinions varied, with 12.70% strongly agreeing, 34.70% agreeing, but a notable 26.00% remaining neutral. Moreover, there was a perceived need for more advanced HIT courses within the pharmacy curriculum, as indicated by 33.40% strongly agreeing and 36.80% agreeing. Furthermore, participants generally viewed HIT education as equally important as other core areas of pharmacy education, such as pharmacology or therapeutics, with 32.80% strongly agreeing and 41.80% agreeing. These results collectively highlight a strong recognition of the importance of HIT in pharmacy education and future pharmacy practice while also suggesting room for enhancements and advanced coursework in this field. The mean scores and standard deviations underscore the diversity in participants' perceptions regarding the relevance and effectiveness of HIT in their education.

Table 4. Experiences with health information technology-related coursework

Survey question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean	SD
I have had hands-on experience with Health Information Technology tools during my pharmacy education.	15.20%	36.20%	22.90%	17.30%	6.80%	2.638365	1.144748
The Health Information Technology-related coursework in my curriculum is up-to-date with current healthcare trends.	13.30%	35.00%	23.80%	17.60%	9.90%	2.757764	1.185459
I feel confident in applying Health Information Technology principles in real-world pharmacy settings based on my coursework.	15.80%	31.90%	27.60%	16.10%	7.70%	2.678125	1.155397
Practical sessions involving health IT tools were helpful in enhancing my understanding.	18.90%	27.90%	31.30%	13.90%	7.70%	2.636646	1.166094
I have had opportunities to attend workshops or seminars specifically focused on Health Information Technology.	15.20%	25.10%	16.10%	22.60%	19.80%	3.068966	1.378727

Table 6 provides a comprehensive view of general perceptions held by participants regarding Health Information Technology (HIT). A significant portion of respondents strongly agreed (36.50%) and agreed (39.30%) that the increasing reliance on HIT in the healthcare sector will significantly impact the role of pharmacists. However, when assessing their confidence in leveraging HIT for better patient care, opinions were more diverse, with 13.90% strongly agreeing, 31.60% agreeing, and 30.30% remaining neutral.

Table 5. Perceptions of the relevance and effectiveness of health information technology in education.

Survey question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
Integrating Health Information Technology into the pharmacy curriculum is essential for the evolving role of pharmacists.	44.30%	43.00%	8.00%	3.10%	1.50%	1.74613	0.850982
I believe that proficiency in Health Information Technology will be crucial for my future career as a pharmacist.	33.70%	43.70%	16.10%	4.00%	2.20%	1.968944	0.926739
The current Health Information Technology education in my college prepares me well for the demands of the modern healthcare sector.	12.70%	34.70%	26.00%	20.10%	5.60%	2.709375	1.099974
There is a need for more advanced courses on Health Information Technology within the pharmacy curriculum.	33.40%	36.80%	20.10%	6.80%	2.80%	2.086687	1.026924
Health Information Technology education is as important as other areas of pharmacy education, such as pharmacology or therapeutics.	32.80%	41.80%	15.20%	6.20%	3.40%	2.049844	1.02042

The literature and resources provided during their HIT coursework were generally viewed positively, as 38.40% strongly agreed and 38.70% agreed that these materials were comprehensive and helpful. Similarly, there was strong agreement (38.40%) and agreement (38.80%) that further emphasis on HIT in the pharmacy curriculum for future students is warranted. Nonetheless, perceptions regarding the integration of HIT in pharmacy education in the Kingdom of Saudi Arabia (KSA) in comparison to global standards were somewhat mixed, with 22.60% strongly agreeing, 47.40% agreeing, and 20.40% expressing neutrality. These findings highlight a generally positive attitude toward the importance of

HIT in pharmacy practice, with participants recognizing its significance and advocating for its inclusion in education while also noting room for improvement in confidence levels and global alignment. The mean scores and standard deviations emphasize the diversity in participants' general perceptions of HIT.

Table 6. General perceptions

Survey question	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
The increasing reliance on Health Information Technology in the healthcare sector will significantly impact the role of pharmacists.	36.50%	39.30%	18.60%	3.70%	1.90%	2.09	0.97358
I am confident in my ability to leverage Health Information Technology for better patient care.	13.90%	31.60%	30.30%	19.50%	3.70%	1.950464	0.931184
The literature and resources provided during my Health Information Technology coursework were comprehensive and helpful.	38.40%	38.70%	17.60%	2.50%	2.50%	2.671875	1.060175
I would recommend further emphasis on Health Information Technology in the pharmacy curriculum for future students.	38.40%	38.80%	17.70%	2.50%	2.50%	1.916149	0.93850
Integrating Health Information Technology in pharmacy education in the Kingdom of Saudi Arabia (KSA) is on par with global standards.	22.60%	47.40%	20.40%	6.50%	2.80%	2.192547	0.95386

One of the noteworthy findings from our study is that while students generally possessed a foundational understanding of HIT, there was a noticeable gap in the comprehensiveness of HIT education within their curriculum. This observation resonates with the work of Breeden and Clauson, who examined the evolving standards for informatics education in pharmacy curricula, emphasizing the need for a more comprehensive approach to HIT education (Breeden and Clauson, 2016).

They stressed that the evolving landscape of healthcare demands pharmacists to possess advanced informatics skills to support innovations in health information technology.

Our study indicated that students had some hands-on experience with HIT tools but expressed a desire for more current coursework and practical sessions. This aligns with the findings of Fuji and Galt, who explored the potential integration of an online elective health informatics course into PharmD curricula (Medina *et al.*, 2013). Their research underscored the demand for more practical, hands-on training in HIT, which our study corroborates.

Notably, a significant majority of students recognized the importance of HIT in the evolving landscape of pharmacy. This consensus aligns with the work of Yu and O'Brien, who emphasized the development and sharing of informatics tools to enhance healthcare processes (Yu and O'Brien, 2020). Their findings underscored the critical role of HIT in modern healthcare, which our study supports.

Demographically, our data revealed a higher percentage of female students and a substantial representation of fifth-year students and graduates. This suggests that the findings may be more reflective of individuals closer to entering the workforce, who might possess a more immediate understanding of the significance of HIT skills.

The findings of this study carry several implications for pharmacy education:

Curriculum enhancement

There is a clear imperative for a more robust HIT curriculum that transcends foundational concepts to encompass advanced courses and practical experiences. This aligns with the evolving standards discussed by Breeden and Clauson, emphasizing the need for a multitiered health informatics curriculum model (Fox *et al.*, 2017). Additionally, the work of Fox *et al.* highlights the importance of informatics principles in improving patient outcomes and suggests a dual approach to informatics education in the pharmacy (Fox *et al.*, 2011).

Pedagogical strategies

Incorporating more hands-on experiences and keeping coursework current could better equip students to navigate the swiftly evolving healthcare landscape. Fuji and Galt's exploration of an online health informatics course highlights the potential for such pedagogical enhancements (Fuji and Galt, 2015). Furthermore, the study by Bootman *et al.* identified key issues and recommendations for pharmacy education and practice, emphasizing the importance of preparing pharmacists for the changing healthcare environment (Karodeh *et al.*, 2022).

Strategic focus

Educational institutions should consider these findings in their long-term planning, with an emphasis on producing graduates proficient in HIT. Strategic planning, as suggested, could encompass integrating HIT effectively into the pharmacy curriculum to align with the demands of modern healthcare. Additionally, Karodeh *et al.*'s study on non-traditional Doctor of Pharmacy programs and Hailemeskel's assessment of virtual learning's effects during the COVID-19 pandemic highlight the need for adaptability in pharmacy education (Alkhamees *et al.*, 2020; Pires, 2022).

Global benchmarking

The perception that HIT education in the KSA is on par with global standards presents an opportunity for international collaboration and the sharing of best practices. This global alignment, as indicated, can pave the way for benchmarking against global educational standards in pharmacy informatics (Fox *et al.*, 2017).

It is important to acknowledge the limitations of this study, primarily its focus on pharmacy students in the KSA, which may constrain its generalizability. Future research could broaden its scope to encompass other demographics, including pharmacy educators and professionals, to provide a more comprehensive perspective on HIT education in pharmacy. Additionally, investigating the specific components of HIT education that require enhancement could further refine the strategies for curriculum development and pedagogical improvements. Furthermore, longitudinal studies could track the impact of enhanced HIT education on the professional practice of pharmacy graduates,

providing valuable insights into the effectiveness of these educational interventions over time. These considerations underscore the importance of ongoing research in this field to ensure that pharmacy education remains aligned with the evolving landscape of healthcare, particularly in the context of Health Information Technology.

Conclusion

The findings highlight the need for curriculum development and pedagogical improvements to ensure that future pharmacists are well-equipped to leverage HIT effectively. As HIT continues to play an increasingly vital role in healthcare, it is imperative that pharmacy education evolves in tandem to prepare students for this changing landscape.

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