

Informatics Competency and Technology Self-Efficacy Profiles in Saudi Undergraduate Nursing Students: A Cross-Sectional Study

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Abstract

Background: The Saudi Arabian healthcare sector is transforming under Vision 2030, with the goal of digitizing services. This necessitates a digitally prepared nursing workforce; however, evidence suggests that nursing students have limited informatics competency, and these skills are minimally covered in their training

Objective: To measure the baseline informatics competency and technology self-efficacy of Saudi undergraduate nursing students

Methods: Using a descriptive cross-sectional design, data were collected from 243 undergraduate nursing students from Hail University via an online survey. The survey content covered demographics, informatics competency (Canadian Nurse Informatics Competency Assessment Scale), and digital technology self-efficacy. Data analysis employed descriptive statistics, t-tests, analysis of variance, and hierarchical multiple regression analysis

Results: Students reported a moderate level of informatics competency, with a mean Canadian Nurse Informatics Competency Assessment Scale score of 2.16 (out of 4). They also showed moderate-to-high self-efficacy for digital technology, with a mean score of 2.7 (out of 4). Competency informatics scores were significantly higher among students with prior informatics training and frequent electronic health record exposure. Additionally, self-efficacy for digital technology was positively associated with informatics competency

Conclusions: There is a substantial gap between the informatics competencies of Saudi undergraduate nursing students and the expectations of Vision 2030. The findings indicate the need for improvements in informatics training and clinical electronic health record experience in the nursing curriculum to create a digitally competent workforce in the future Clinical Trial: NA

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Original Manuscript

Original Paper

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Conclusions: There is a substantial gap between the informatics competencies of Saudi undergraduate nursing students and the expectations of Vision 2030. The findings indicate the need for improvements in informatics training and clinical electronic health record experience in the nursing curriculum to create a digitally competent workforce in the future.

Keywords: informatics competencies; digital health; nursing education; self-efficacy; electronic health records

Introduction

Saudi Arabia's healthcare sector is currently undergoing a major transformation as part of the Vision 2030 initiative to modernize healthcare services and infrastructure. Vision 2030 aims to digitize healthcare delivery by further developing electronic health systems, focusing on the use of telemedicine and artificial intelligence in patient care [1-3]. Key initiatives, such as the Health Sector Transformation Program, have served as catalysts for improved access, quality, and efficiency in public and private healthcare [4,5]. This full-scale digitization is a significant pivot toward a more innovative health delivery model for developing adequate responses to current health demands and

patient needs [6,7].

Advancements in digital health technologies will require the nursing workforce to build on their informatics competencies. The nursing workforce is at the front lines of patient care. In Saudi Arabia, specifically, the nursing workforce is now expected to competently utilize digital tools such as electronic health records (EHRs), telehealth services, and health information management systems [8-10]. The World Health Organization indicates that digital literacy is important for nursing staff and has significant implications for achieving effective patient strain management and quality patient outcomes [6,11]. However, the literature suggests a gap in the incorporation of informatics in nursing education [8,12]. Moreover, while research shows that nursing programs worldwide fail to impart adequate training in digital competency, Saudi Arabia has fallen far behind more developed regions [13,14].

Global evidence suggests that nurses with adequate informatics competencies can better leverage technology in clinical practice, which can result in better decision-making and care [5,10,15]. Countries that develop digital health capabilities have clinicians who demonstrate higher informatics competency [10]. The literature has generally examined educational or nursing experiences in the Western world, and there is little detailed descriptive research on the informatics competency of nursing students in the Saudi Arabian context [16,17]. Thus, more foundational descriptive research is required in Saudi Arabia to inform the necessary curriculum reforms to support the changing healthcare environment in the region.

The focus of the current cross-sectional study was to investigate nursing students' baseline informatics competency and preparedness. The results will help inform educators and policymakers who are modernizing nursing education to meet the future demands of the digital health ecosystem. Educational reform efforts are needed for a nursing workforce that is not only competent in providing traditional care but also maximizes the use of technology to enhance patient outcomes and fulfill the objectives of Vision 2030.

Methods

Study Design

A descriptive cross-sectional design was used to explore perceived informatics competency and readiness for digital health utilization among undergraduate nursing students using an online self-assessment survey.

Population and Sampling

An electronic survey was used to collect data from undergraduate nursing students at a university in Hail, covering the first year to internship. A convenience sampling design for all eligible students was employed, which was practical and cost-effective and represented the most extensive range of movement through the entire accessible population available for the survey. The survey was conducted using Google Forms and included the background for the study and an informed consent statement that the students acknowledged and had to agree to prior to participation. A total of 243 students completed the survey and were included in the analysis.

Sample size analysis indicated that a minimum of 315 respondents were needed to achieve a statistical power of 80% with a 95% confidence interval based on medium effects for analysis of variance, t-tests, and regression. However, the final number of respondents was slightly above the minimum required sample size based on the mean power and confidence of the data collection, and the sample was deemed suitable for this descriptive, cross-sectional design.

Descriptive studies mostly focus on describing existing patterns and traits instead of rigorously testing hypotheses; therefore, a smaller sample size was still satisfactory for the intended descriptive and correlational analyses of this study. The convenience sampling design was well-suited to obtain a representation of all undergraduate nursing students, although it had limitations in terms of generalizability.

Instrument

The survey was structured into three distinct sections to facilitate comprehensive information gathering. The first section focused on collecting descriptive demographic information, including participants' age, gender, year level, previous exposure to EHRs, and self-assessment of computer proficiency. These foundational data provided essential context for the more specialized sections to follow.

The second section assessed participants' competency using the 21-item Canadian Nurse Informatics Competency Assessment Scale (C-NICAS) Version 1, used with permission from the developers [18]. This is a validated and widely used tool for assessing informatics competencies in nursing students, allowing for comparison with similar international studies. Its four subscales (Foundation Information and Communication Technologies (ICT) Skills, Information and Knowledge Management, Professional Responsibility and Accountability, and Use of ICT in Delivery of Care) comprehensively align with the core competencies relevant to the digital health ecosystem in Saudi Arabia. The scale was administered in English, the language of instruction for the nursing program at the study site. The instrument uses a 4-point Likert scale, with responses measuring a continuum of competency from 1 ("not competent") to 4 ("very competent"). The total scores were used to categorize participants into four competency levels: not competent (0–18), somewhat competent (19–40), competent (41–62), and very competent (63–84). The overall C-NICAS demonstrated strong internal consistency with a Cronbach's alpha of 0.93, and its subscales also showed strong reliability: Foundation ICT Skills ($\alpha = 0.85$), Information and Knowledge Management ($\alpha = 0.81$), Professional Responsibility and Accountability ($\alpha = 0.74$), and Use of ICT in Delivery of Care ($\alpha = 0.89$).

The final section utilized a revised and updated 17-item questionnaire developed by Hughes [19] to assess participants' digital technology self-efficacy. This scale was chosen for its proven reliability in measuring key psychological constructs related to technology use. The scale's focus on self-efficacy directly complements the C-NICAS by providing insight into students' confidence in using the technologies they are being assessed on. This scale employs a 4-point Likert format, with responses ranging from 1 ("strongly disagree") to 4 ("strongly agree"). To ensure accurate scoring, 12 items were reverse coded, whereas five items (1, 7, 8, 11, and 16) were coded directly. This methodology allowed for the calculation of a mean score of between 1 and 4. A higher mean score indicates a higher level of digital technology self-efficacy. The scale's strong internal consistency was confirmed by a Cronbach's alpha of > 0.90 .

Data Collection

An ethical recruitment plan was implemented. Nursing students were invited through an email containing the invitation letter, survey link, information sheet, and consent statement. The invitation highlighted the purpose of the research, importance of the study, and possible implications of the study for nursing informatics research.

Reminder emails using a pre-determined protocol were sent to encourage response rates; the first

reminder was sent 24–48 hours after the initial email, followed by another one 3–7 days later with 3–5 reminders. Google Forms was used for the survey because of its accessibility and reasonable data storage capacity.

Statistical Analysis

Data analysis was performed using both SPSS version 29.0 (IBM Corp., Armonk, NY, USA) and Python programming language. Missing data, which were minimal ($< 5\%$), were imputed by replacing continuous variables with the mean and categorical data with the mode. Statistical assumptions were assessed prior to the inferential analysis. Descriptive statistics, including measures of central tendency (mean, median, mode) and variability (standard deviation), were calculated for key variables, such as C-NICAS and digital technology self-efficacy scores. Inferential analyses included Pearson correlation to examine the relationships among variables, independent samples t-tests, and one-way analysis of variance to assess group differences. Hierarchical multiple regression was conducted in four models to identify the predictors of informatics competency. The statistical significance level for all analyses was set at $\alpha = 0.05$. Effect sizes were interpreted using Cohen's standards for correlations (small: 0.10; medium: 0.30; large: 0.50), and F-change statistics were used to determine the statistical significance of the changes in R^2 across the regression models.

Ethical Considerations

The Institutional Review Board at the University of Hail granted ethical approval prior to data collection. Participants provided informed consent through the online survey platform prior to accessing the questionnaires. Participation was voluntary, and the students were informed that they could withdraw at any time without academic repercussions.

Participants' responses were collected anonymously through Google Forms, with no link between the participants and their responses. Data were secured to discourage unauthorized access, and protocol was followed to ensure that data were captured on behalf of the home institution with only approved limited access by the research team.

We used a noninvasive survey design that presented negligible risk to the students. The research design included consideration of the study setting to ensure that the invitation for participation was through official channels and did not interrupt any academic activity. The students were told that their responses would be kept confidential and that their participation would not affect their academic standing or relationships with faculty members.

Results

Table 1 shows that the study included 243 undergraduate nursing students from Saudi Arabia, with the majority being young adults aged 21–25 years (47.7%, $n = 116$) and only 7.0% ($n = 17$) aged 26 years and above. The sample was predominantly female (65.4%, $n = 159$). Students were distributed across academic levels, with interns accounting for the largest group (26.%, $n = 63$) and Level 8 students representing the smallest group (5.3%, $n = 13$). Participants were nearly equally divided between those with informatics training (51.0%, $n = 124$) and those without (49.0%, $n = 119$). Digital technology comfort varied, with 41.1% expressing discomfort and 22.2% ($n = 54$) remaining neutral. EHR experience ranged from 40.3% ($n = 98$) having occasional exposure to 29.6% ($n = 72$) having no prior experience. Most participants demonstrated good technology accessibility, with 82.3% ($n = 200$) using technology daily for educational purposes and 65.0% ($n = 158$) reporting excellent home internet access. Regarding career intentions, the majority (53.5%, $n = 130$) planned to pursue clinical care while 13.6% ($n = 33$) remained undecided about their future nursing career path.

Table 1. Demographic characteristics (N = 243)

		n	%
Age (years)	≤ 20	110	45.5
	21–25	116	47.7
	≥ 26	17	7.0
	Total	243	100.0
Gender	Men	84	34.6
	Women	159	65.4
	Total	243	100.0
Year level	3	24	9.9
	4	45	18.5
	5	57	23.5
	6	15	6.2
	7	26	10.7
	8	13	5.3
	Internship	63	26.0
	Total	243	100.0
Have you previously completed any informatics-related training or coursework?			
	No	119	49.0
	Yes	124	51.0
	Total	243	100.0
Rate your comfort level with digital technology (e.g., computers, smartphones, electronic health records)			
	Very uncomfortable	47	19.3

Uncomfortable	53	21.8
Neutral	54	22.2
Comfortable	89	36.6
Total	243	100.0
Previous exposure to electronic health records		
No experience	72	29.6
Yes, occasionally (monthly or less)	98	40.3
Yes, frequently (weekly or daily)	73	30.0
Total	243	100.0
Do you own or regularly have access to a personal computer/laptop?		
No	49	20.2
Yes	194	79.8
Total	243	100.0
How often do you use technology (smartphones, tablets, computers) for educational purposes?		
Monthly	11	4.5
Weekly	32	13.2
Daily	200	82.3
Total	243	100.0
Internet accessibility at home		
Fair	19	8.7
Good	66	27.2
Excellent	158	65.0
Total	243	100.0
Intended future nursing career area		
Undecided	33	13.6
Administration or leadership role	14	5.8
Academic or teaching role	35	14.4
Nursing informatics	14	5.8
Public health or community nursing	17	7.0
Clinical care (hospital or clinical setting)	130	53.5
Total	243	100.0

As indicated in Table 2, the overall informatics competency score was 2.16 out of 4, with a median score of 2.00. The greatest percentage of students (47.7%) rated themselves as “somewhat competent,” while 23.9% rated themselves as “competent,” 21.4% rated themselves as “not competent,” and a minority (7.0%) rated themselves as “very competent.” Regarding the subscales, Foundational ICT Skills had the highest mean score (2.62) and the lowest mean score was for Information and Knowledge Management (2.51). Use of ICT in Delivery of Patient Care (2.60) and Professional and Regulatory Accountability (2.56) scored between these two ends. Most students (30.9–43.6%) considered themselves “somewhat competent” for three of the four subscales. The “not competent” category was most evident in the Foundational ICT Skills subscale (23.9%) and least evident in Use of ICT in Delivery of Patient Care (17.7%). Overall, these results suggest that nursing students have moderate levels of informatics competency, and the majority perceived only some level of competency across most subscales of informatics.

Table 2. Nursing students’ perceptions of informatic competency

	Scale: NI Competency	Subscale: Foundation ICT Skills	Subscales: Information and Technology Management	Subscale: Professional and Regulatory Accountability	Subscale: Use of ICT in Delivery of Patient Care
N	243	243	243	243	243
Mean	2.16	2.62	2.51	2.56	2.60
Median	2.00	2.66	2.50	2.50	2.66
SD	.84	.93	.86	.88	.85
Minimum	1	1	1	1	1
Maximum	4	4	4	4	4
Not Competent (%)	21.4	23.9	23.5	21.4	17.7
Somewhat competent (%)	47.7	30.9	42.4	42.00	43.6
Competent (%)	23.9	32.1	23.5	23.9	26.7
Very Competent (%)	7.0	13.2	10.7	12.8	11.9

SD: standard deviation, ICT: information and communication technologies

As Table 3 demonstrates, the mean digital technology self-efficacy score was 2.7 (standard deviation = 0.56) on a scale of 1 to 4. Thus, nursing students, as a cohort, had a moderate to high level of confidence in the use of digital technology. This is significant, as the mean score of 2.7 exceeded the midpoint on the scale, showing that the participants' self-efficacy in using digital technology was somewhat strong.

Table 3. Digital technology self-efficacy scores among nursing students

	N	Mean	SD
Mean Digital Technology Self-Efficacy	243	2.7	.56

Table 4 presents the data on the informatics competence and self-efficacy of Saudi nursing students. There were no statistically significant differences in either informatics competence ($p = 0.477$) or self-efficacy ($p = 0.870$) by year level. The mean scores on the C-NICAS were between 48.3 ± 15.6 in Level 3 and 55.4 ± 17.4 in Level 7, and the digital technology self-efficacy scores were between 2.5 and 2.7 ± 0.4 . For informatics training, students with training had a significantly higher mean C-NICAS score (55.0 ± 15.8) than those without (50.6 ± 15.2) ($p = 0.005$). For self-efficacy, they had similar scores (training: 2.6 ± 0.4 , no training: 2.5 ± 0.5) ($p = 0.525$). EHR users had the highest scores, while those who did not use EHRs had the lowest scores. For those with no EHR experience, the mean C-NICAS score was 48.4 ± 16.1 , whereas those using EHRs rarely (53.4 ± 17.2) or frequently (54.9 ± 13.4) had higher means ($p = 0.002$). Regardless of EHR use, their self-efficacy remained as follows—no experience: 2.6 ± 0.4 , rarely: 2.5 ± 0.4 , frequently: 2.6 ± 0.4 ($p = 0.399$). Overall, the sample's informatics competence was moderate, with average (C-NICAS) scores of 2.16 out of 4 and mean digital technology self-efficacy scores of $2.7 \pm .56$, indicating somewhat strong self-efficacy.

Table 4. Overall competency and self-efficacy level by year level, prior informatics training, and routine electronic health record use

Variable	C-NICAS	P-value	DT-SE	P-value
Year level		0.477		0.870
3	48.3 ± 15.6		2.6 ± 0.4	
4	53.1 ± 16.2		2.6 ± 0.4	
5	53.5 ± 16.7		2.5 ± 0.5	
6	53.2 ± 14.3		2.6 ± 0.5	
7	55.4 ± 17.9		2.7 ± 0.2	
8	53.7 ± 15.7		2.6 ± 0.4	
Internship	54.6 ± 15.3		2.5 ± 0.4	
Informatics training				
Yes	55.0 ± 15.8	0.005	2.6 ± 0.4	0.525
No	50.6 ± 15.2		2.5 ± 0.5	
EHR use		0.002		0.399
No experience	48.4 ± 16.1		2.6 ± 0.4	
Occasional	53.4 ± 17.2		2.5 ± 0.4	
Frequent	54.9 ± 13.4		2.6 ± 0.4	

C-NICAS: Canadian Nurse Informatics Competency Assessment Scale, DT-SE: digital technology self-efficacy

Table 5 also illustrates a positive and significant correlation between digital technology self-efficacy and three of the informatics competency subscales. The strongest correlation was with Foundation ICT Skills ($r = 0.181$, $p = 0.002$), followed by Professional Responsibility and Accountability ($r = 0.157$, $p = 0.002$) and Use of ICT in Care Delivery ($r = 0.113$, $p = 0.021$). However, the strongest correlations were between the competency subscales themselves, indicating a good level of internal connection between the subscales. Specifically, the strongest correlation was between Professional Accountability and Use of ICT in Care ($r = 0.794$, $p =$

0.001), followed closely by the correlation between Foundation ICT Skills and Professional Accountability ($r = 0.769$, $p = 0.001$) and Foundation ICT Skills and Use of ICT in Care ($r = 0.765$, $p = 0.001$).

Table 5. Correlation between competency and self-efficacy

	DT-SE	Foundatio	Professional	Use
	n			
DT-SE	-			
Foundation	0.181 (0.002)	-		
Professional	0.157 (0.002)	0.769 (0.001)	-	
Use	0.113 (0.021)	0.765 (0.001)	0.794 (0.001)	-

DT-SE: digital technology self-efficacy

Table 6 displays the outcomes of a hierarchical multiple regression predicting informatics competency, measured using the C-NICAS score. Only age and gender were entered in Model 1, resulting in an R of 0.013 and an adjusted R of 0.005 ($F = 1.611$, $p = 0.202$), with no significant predictors. In Model 2, we added the year levels (4th–8th) and internship status, resulting in an R of 0.031, adjusted R = -0.002 ($F = 0.950$; $p = 0.476$), and no significant predictors. In Model 3, prior experience with EHRs and informatics training were entered, resulting in $R = 0.054$, adjusted R = 0.013 ($F = 1.330$, $p = 0.215$), and no significant predictors. In the final model (Model 4), mean digital technology self-efficacy was added, which resulted in an R value of 0.069 and an adjusted R of 0.022 ($F = 1.577$, $p = 0.106$), with digital technology self-efficacy being the only variable to approach significance ($B = 4.34$, $p = 0.050$). Overall, across all four models, all predictors explained a small amount of variance in informatics competency, and the mean digital technology self-efficacy in Model 4 was the only predictive factor that showed a trend toward significance as a positive predictor.

Table 6. Hierarchical multiple regression models predicting informatics competency

Model	Variables Entered	R ²	Adj R ²	F	p (Sig.)	Significant Predictors (Final Model)
1	Age, Gender	.013	.005	1.611	.202	None
2	+ Year Levels (4th–8th), Internship	.031	-.002	0.950	.476	None
3	+ EHR Exposure, Informatics Training	.054	.013	1.330	.215	None
4	+ Mean Digital Technology Self-Efficacy	.069	.022	1.577	.106	Digital Technology Self-Efficacy ($B = 4.34$, $p = .050$)

Discussion

In this study, we assessed the baseline informatics competency of Saudi undergraduate nursing students, revealing a moderate level. Most students rated themselves as “somewhat competent.” These results illustrate a gap between nursing students’ skill levels and the digital health requirements of Saudi Vision 2030. In addition, students with previous informatics education had notably higher C-NICAS scores than those without.

Informatics Competency Levels

The moderate degree of informatics competency among undergraduate nursing students in Saudi Arabia can be explained by the little to no informatics content embedded in the nursing curriculum and limited exposure to digital health systems (particularly EHRs). These linked factors have been identified as the largest barriers to improving nursing informatics competence in recent literature.

Several recent studies indicate that while nursing students in Saudi Arabia have baseline informatics knowledge and understanding of competencies, most do not have a high degree of competence. Almarwani and Yacoub [20] found the greatest deficits in informatics competence in clinical informatics and applied computer application skills, noting a disconnect between knowledge and associated skill. Aly and Alnajjar [21] reported that while students were able to use digital technologies in their daily lives, they were only moderately able to transfer those abilities to a clinical environment with informatics skills.

As further evidence, Mekawy et al. [22] found that students were able to report scoring moderately high in digital health literacy; however, literacy is not the same as the level of competence in informatics, especially with application and critical thinking. Alqahtani [23] reported that although there have been efforts to integrate digital skills into the nursing curriculum, there is still no rich experiential learning, preventing learners from becoming competent or gaining advanced skills.

It is, therefore, recommended that nursing programs in Saudi Arabia substantially increase informatics content within all levels of their nursing curriculum. These findings, particularly the lowest mean scores related to the Information and Knowledge Management subscale of the C-NICAS, indicate a dire need to develop modules that teach students to manage, retrieve, and critically appraise health data from electronic databases. This could include explicit courses or embedding informatics content into clinical rotations.

Learning experiences should focus heavily on experiential learning with authentic, practice-focused engagement with digital health initiatives, especially EHRs, as our results suggest that students with prior experience had better competency scores. This work could be reinforced with targeted faculty development that could demonstrate informatics skills in nursing education.

Lastly, if partnerships can be formed based on academic practice by exposing students to real-time informatics environments, the gap between the classroom and clinical practice could be bridged. Connecting these changes organizationally to the well-known Saudi Vision 2030

Health Strategy is crucial for developing a digitally competent nursing workforce to advance healthcare and provide safe patient care throughout the Kingdom.

Digital Technology Self-Efficacy

The moderate to high level of digital technology self-efficacy observed among nursing students is likely attributed to several key factors, including the frequent and regular utilization of digital devices and online resources in their daily lives, technological access, and internet connectivity at home. Ongoing utilization enhances the willingness to engage, and familiarity with digital health tools and resources for both education and personal use contributes to confidence in their engagement in clinical and didactic settings.

These findings are consistent with those of recent studies. Al-Olaimat et al. [24] determined that nursing students had moderate levels of readiness and acceptance of artificial intelligence-based health technologies, with most showing a positive attitude toward digital health tools. Similarly, Alshammari and Alanazi's [8] systematic review on technology use in Saudi nursing education revealed consistently favorable attitudes toward e-learning and technology. The review revealed that students were mostly proficient and confident in technology-oriented learning environments, particularly where blended learning and digital resources had become routine practices. Alkhuzaimi et al. [25] further support this, suggesting that digital literacy and prior experience are strong predictors of increased self-efficacy and readiness for technology use in undergraduate nursing education in Saudi Arabia.

Nonetheless, while the findings are positive, it is important to recognize and be cognizant of the challenges and variability in digital technology self-efficacy. Alessa et al. [26] reported that a significant proportion of nursing students still show discomfort and negative feelings toward digital technologies. This is particularly noteworthy when utilizing novel technologies in clinical practice and adjusting and learning to innovate quickly. Moreover, Alshammari and Alanazi [8] noted that approximately 61.5% of students experienced dissatisfaction with e-learning, as entering online environments did not meet the need for in-person communication. Possible explanations for students' reported dissatisfaction include technical issues and insufficient training, which undermine digital technology self-efficacy levels. These disparities highlight that even if access and exposure rates contribute to comfort levels, a large proportion of students experience barriers to transferring their skills from personal to professional use, indicating that they would benefit from quality support for training.

To improve nursing students' digital technology self-efficacy, nursing education programs should offer consistent hands-on digital literacy training, provide targeted assistance for specific technology and adaptation issues, and provide opportunities for collaborative blended learning. Institutions should invest in continuous digital literacy development in the curriculum, ensure students have universal access to inclusive, varied, and robust technological infrastructure, and request ongoing student feedback to make improvements. Nursing educator programs may need to shift from providing initial exposure to technology to experiments that require a higher sense of confidence and competence in using digital tools in academic and clinical settings.

Role of EHR Experience

We demonstrated a strong correlation between EHR exposure and informatics competency

among nursing students. Those with frequent or even occasional hands-on engagement reported higher competency scores, as practical application reinforces the link between theoretical knowledge and clinical practice.

Early and consistent EHR exposure offers benefits beyond basic technical proficiency. Choi et al. [27] and Mahfouz [28] reported that greater curricular integration of EHRs is positively associated with higher performance in both informatics knowledge and applied skills, outcomes that are further linked to long-term career success.

Despite these advantages, gaps remain between general digital literacy and clinical informatics competency. Kleib et al. [29] and Raghunathan et al. [30] emphasized that while nursing students are adept with computers and digital tools, these abilities do not automatically translate to advanced informatics tasks such as data management, clinical reasoning, or regulatory documentation within EHR systems.

The limitations of this disconnect become evident during clinical placements. Whitt et al. [31] found that even with modest EHR exposure during rotations, students often lacked confidence and preparedness in clinical application. Limited and inconsistent system access was a major contributor, illustrating that unstructured exposure is insufficient for developing competency.

To address these gaps, nursing education should incorporate structured, hands-on EHR training throughout the curriculum. Modules that simulate real-world informatics tasks, such as advanced data management, clinical decision-making, and regulatory documentation, are essential. Partnerships with healthcare facilities are also critical to ensure consistent and purposeful EHR access during placements, supported by clear learning objectives. Integrating these strategies can bridge the divide between digital literacy and professional competence, better preparing nursing graduates for the informatics demands of modern healthcare and supporting long-term career outcomes.

Conclusions

We identified a notable lack of informatics competency in Saudi undergraduate nursing students despite the presence of moderate-to-high digital self-efficacy, as self-reported by students. This indicates an immediate need for purposeful curricular reform to respond to the digital demands of Vision 2030. The results suggest that students may be familiar with technology in their everyday lives but their experience does not equate to the informatics competency needed in contemporary clinical environments. Comparing the moderate informatics competency level identified in the study and the evidence that prior educational training in informatics positively influences competencies, the need to formally implement informatics content into nursing education, which may be feasible, is affirmed. This study provides preliminary data to inform educators and policymakers in the reform of nursing education to develop a digitally competent nursing workforce in the future. Future research should build on this study to further explore these gaps.

Longitudinal studies should be developed to study participants exposed to newly implemented informatics curricula to examine whether educational interventions produce differences in competencies over time. Although some qualitative inquiry, interviews, focus groups, and so on would have provided perspective from students and how they identify barriers to transferring their digital skill set from the personal domain to the professional clinical domain. This would

add context to our findings and direct future education. The mixed-methods approach will ultimately be important to develop a comprehensive understanding of the informatics skill set and trajectory of bridging the informatics skills gap in nursing education in the context of the framework of Saudi Vision 2030.

Implications

The results have significant implications for nursing education and policy in Saudi Arabia. Considering the moderate level of informatics competence, we urge curricular reform to align nursing students with the digital elements of Vision 2030. This can be achieved by seeing faculty not just as presenters of subject matter but instead emphasizing authentic learning. This could be further aided by the incorporation of a specific informatics module or student engagement activities that rely on EHR and digital health technologies, which reflect successful clinical experiences in American and Canadian programs. Finally, it is of the utmost importance to formalize partnerships between universities and practice settings to ensure that students develop authentic opportunities with real-time informatics in practice settings. These initiatives could yield a digitally competent workforce that can utilize technology in patient care and contribute to health initiatives.

Conflicts of Interest

none declared.

Data Availability

The datasets generated or analyzed during this study are available from the corresponding author on reasonable request

Abbreviations

C-NICAS: Canadian Nurse Informatics Competency Assessment Scale

EHR: electronic health record

ICT: information and communication technologies

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Supplementary Files

CONSORT (or other) checklists

Untitled.

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