



Original Research

Assessing the Influence of Innovative Healthcare Technologies on Nursing Practices in Saudi Arabian Hospitals

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Abstract

Background: The integration of innovative healthcare technologies has transformed nursing practices in Saudi Arabian hospitals with more advancement and improvement.

Aim: This study aimed to assess the impact of these technologies on nursing roles, responsibilities, and workflows.

Methods: A quantitative research design was employed using an online questionnaire distributed to conveniently selected registered nurses working in various Saudi Arabian hospitals to analyze and assess the adoption and utilization of healthcare technologies, the perceived impact on nursing practices, and the factors facilitating or hindering successful integration.

Results: From total 86 nurses participated in this study, 77% (66) of the sample are male and half (50%) of the sample are more than 25, as well as about 64% of the sample attended courses in technology and electronic healthcare. It has been noted that 83% of the sample see that innovative technology is useful and 43% of the sample evaluated the way this new technique or Technology was introduced as very good. The results revealed a non-significant difference in the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals among participants due to Gender (P-value =0.58), age (P-value =0.109), nationality (P-value =0.358), and attending Courses in technology and electronic healthcare (P-value =0.678).
Conclusion: The findings provided insights into the evolving landscape of nursing practices in Saudi Arabia and inform strategies to optimize technology utilization for enhanced patient care.

Keywords: Innovative Healthcare Technologies - Nursing Practices - Nurses - Saudi Arabia - Hospitals.

Introduction:

The healthcare landscape in Saudi Arabia, like many other countries, is undergoing a transformation driven by innovative technologies [1]. These advancements have the potential to significantly impact nursing practices within Saudi Arabian hospitals [2], an essential aspect of patient care [3]. The convergence of healthcare and technology is reshaping the way nurses deliver services, communicate with patients and colleagues, and manage patient data [4]. As healthcare technologies continue to evolve, it becomes imperative to assess their influence on nursing practices to ensure that they effectively support patient care [5], promote nursing efficiency, and maintain the highest standards of healthcare delivery [6]. Saudi Arabia is experiencing a wave of technological adoption in the healthcare sector [7], with hospitals increasingly integrating electronic health records, telemedicine, mobile health applications, and various clinical information systems into their daily operations [8,9]. While these technologies hold promise for improving patient outcomes and streamlining nursing workflows, their integration may also present challenges and disrupt established practices [10]. Therefore, it is essential to comprehensively evaluate the impact of these innovative healthcare technologies on nursing practices in Saudi Arabian hospitals [11]. It is mandatory to provide a detailed examination of the symbiotic relationship between technological innovation and nursing practices within the Saudi Arabian healthcare context [12]. By exploring this dynamic interplay, the study aims to enhance our understanding of how nursing roles, responsibilities, and workflows are evolving in response to these technologies [13].

The integration of innovative healthcare technologies within Saudi Arabian hospitals presents a complex challenge to nursing practices [14]. While these technologies have the potential to improve patient care and nursing efficiency [15], their implementation may also introduce disruptions and necessitate the adaptation of established nursing procedures [16]. It is crucial to

address the research problem of how these technologies influence nursing practices within the Saudi Arabian healthcare context [17]. By addressing this research problem, we seek to provide insights into the evolving role of nurses in the context of technological innovation, offering recommendations and strategies to optimize the utilization of healthcare technologies to enhance patient care while ensuring nursing practices remain patient-centered and efficient [18-20,22].

Collectively, while the existing studies provide valuable insights into specific aspects of nursing practices influenced by innovative technologies, there is a need for more comprehensive research that integrates various technological facets and explores their collective impact on nursing practices in Saudi Arabia. Addressing this gap would contribute to a holistic understanding of the evolving healthcare landscape and guide the implementation of effective strategies to maximize the benefits of innovative technologies in nursing.

Therefore, this study aims to assess the impact of these technologies on nursing roles, responsibilities, and workflows on some selected registered nurses in some hospitals in Saudi Arabia.

Methodology:

Research Design

This research employed a quantitative research design utilizing a structured questionnaire for data collection. The questionnaire designed to assess registered nurses' adoption and utilization of innovative healthcare technologies, the perceived impact on their roles and responsibilities, and the factors influencing successful integration. This approach aimed to provide a detailed understanding of the impact of innovative healthcare technologies on nursing practices in Saudi Arabian hospitals [21].

Setting and samples

The study conducted in multiple hospitals across Saudi Arabia to ensure a diverse and representative sample. Selection criteria included hospitals with varying sizes, geographic locations,

and levels of technological integration. This approach aims to capture a broad spectrum of experiences and perspectives within the Saudi Arabian healthcare context.

The participants consist of 86 registered nurses working in the selected hospitals. A stratified random sampling technique employed to ensure representation across different hospital sizes, specialties, and regions.

Measurement and data collection

Quantitative data collected using a structured questionnaire. The questionnaire include both closed-ended and Likert scale questions, designed to assess nurses' adoption and utilization of innovative healthcare technologies, the perceived impact on their roles and responsibilities, and the factors influencing successful integration. The questions wer developed based on a thorough review of existing literature and input from experts in the field [3,12,24]

Data Collection Plan

The structured questionnaire distributed electronically or in print, depending on the participants' preferences. The data collection process staggered to allow for the systematic collection of responses. Participants provided with clear instructions on how to the questionnaire, and reminders sent to maximize response rates.

Validity and reliability

The questionnaire validity means that the questionnaire questions measure what has been set for its measurement. Validity refers to the degree to which a measure adequately represents the fundamental construct that it measures and examines well the measurement scale is measuring the theoretical construct that it measures. The researcher has verified the validity of the questionnaire as the following:

Table number (1) Coefficient of correlation between the degrees of each statement of the scale

N. Statements	Pearson	P.value	N. Statements	Pearson	P.value
1	.552	0.000	16	.347	0.001
2	.471	0.000	17	.455	0.000
3	.408	0.000	18	.474	0.000
4	.609	0.000	19	.417	0.000
5	.524	0.000	20	.495	0.000
6	.479	0.000	21	.536	0.000
7	.627	0.000	22	.539	0.000
8	.550	0.000	23	.556	0.000
9	.553	0.000	24	.546	0.000
10	.558	0.000	25	.576	0.000
11	.298	0.005	26	.518	0.000
12	.387	0.000	27	.410	0.000
13	.421	0.000	28	.536	0.000
14	.391	0.000	29	.452	0.000
15	.468	0.000	30	.495	0.000

The table (1) shows that the correlation coefficients between each statement of the scale, and the Sig value of each statement is less than 0.05 and thus considered to be honest and intended to measure.

In this study, reliability of each scale has been tested through Cronbach's alpha to identify the internal consistency of the scale, The alpha coefficient value depends on the number of items on the scale.

Table number (2) Cronbach's Alpha Coefficients

The dimension	Cronbach's Alpha	No. of Statements
The scale	0.888	30

Table (2) summarizes the reliability test results for the questionnaire dimensions, All of the dimensions show an alpha coefficient equals 0.888, this result indicates that the research dimensions gave the same results if re-applied to the same sample and test stability using Cronbach alpha coefficient.

Data Analysis

Quantitative data analysis involved using statistical software (SPSS version 20) to generate descriptive statistics, identify patterns, and explore trends. Statistical tests, such as chi-square tests or regression analysis, may be employed to examine relationships between variables. The quantitative findings provided insights into the prevalence and distribution of attitudes, perceptions, and practices related to innovative healthcare technologies among nurses in Saudi Arabian hospitals.

Ethical Considerations

This study adhered to ethical principles, ensuring participants' confidentiality, informed consent, and voluntary participation. Ethical

approval obtained from relevant institutional review boards before commencing data collection. Participants were be informed about the study's purpose, procedures, and their right to withdraw at any point without consequences.

Results:

The demographic characteristics:

From a total of 86 registered nurses in this study, The table and figure show that 77% (66) of the sample are male, 23% (20) of the sample are female, according to age, 50% of the sample are more than 25, 44% of the sample are 20-25 years, in favor to nationality; 77% of the sample are Saudi Arabian, 23% of the sample are Non-Saudi Arabian, according to department, 16% of the sample are Emergency, 15% of the sample Intensive care, 47% worked in other department, as for Attending Courses in technology and electronic healthcare, we can see that 64% of the sample attended courses in technology and electronic healthcare.

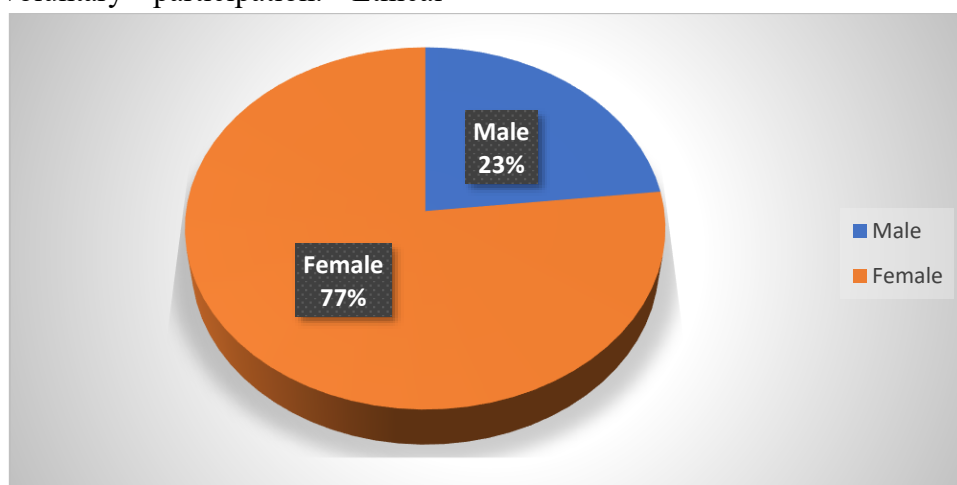


Figure (1) The gender distribution among the study participants

Table number (3) The rest of demographic characteristics

Variables	Groups	Frequency	Percent
Age	18-20	5	6%
	20-25	38	44%
	More than 25	43	50%
Nationality	Saudi Arabian	66	77%
	Non-Saudi Arabian	20	23%
Department	Outpatients	4	5%
	Emergency	14	16%
	Intensive care	13	15%
	Geriatrics	1	1%
	Internal medicine	4	5%
	Operations	4	5%
	Pediatrics	5	6%
	Orthopedics	1	1%
	Other	40	47%
Attending Courses in technology and electronic healthcare	Yes	55	64%
	No	31	36%
Total		86	100%

The main demographic factors related to the scale:

Table (4) The relationship between the Gender and the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals

Gender	Mean	N	Std. Deviation	T	Sig. (2-tailed)
Male	75.55	20	9.99724	0.556	0.58
Female	74.1667	66	9.67882		
Total	74.4884	86	9.71202		

The results revealed a non significant difference in the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals

among participants due to Gender (T = 0.556, P-value =0.58), and the mean of the scale in male sample = 75.55, and for female sample = 74.16.

Table (5) The relationship between the age and the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals

Age	Mean	N	Std. Deviation	F	Sig.
18-20	81.20	5	6.686	2.274	0.109
20-25	72.50	38	9.874		
More than 25	75.47	43	9.530		
Total	74.49	86	9.712		

The results revealed a non significant difference in the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals among participants due to age ($F = 2.274$,

$P\text{-value} = 0.109$), and the mean of the scale in age 18-20 sample = 81.20, and for age 20-25 = 72.5, and for age More than 25 = 75.47.

Table (6) The relationship between the nationality and the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals

Nationality	Mean	N	Std. Deviation	F	Sig.
Saudi Arabian	73.95	66	10.21075	0.856	0.358
Non-Saudi Arabian	76.25	20	7.81278		
Total	74.48	86	9.71202		

The results revealed a non-significant difference in the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals among participants due to nationality ($F = 0.856$, $P\text{-}$

value = 0.358), and the mean of the scale in Saudi Arabian sample = 73.95, and for the mean of the scale in Non-Saudi Arabian sample = 76.25.

Table (7) The relationship between Attending Courses in technology and electronic healthcare and the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals

Attending Courses in technology and electronic healthcare	Mean	N	Std. Deviation	T	Sig. (2-tailed)
Yes	75.18	55	10.36	0.417	0.678
No	73.26	31	8.46		
Total	74.49	86	9.71		

The results revealed a non-significant difference in the influence of innovative healthcare technologies on nursing practices in Saudi Arabian Hospitals among participants due to attending Courses in technology and electronic healthcare ($T = 0.417$,

$P\text{-value} = 0.678$), and the mean of the scale who Attended Courses in technology and electronic healthcare sample = 75.18, and for the mean of the scale who didn't Attend Courses in technology and electronic healthcare sample = 73.26.

➤ **If a new technique or Technology has been introduced in the last three years, Did it useful ?**

Table (8) If a new technique or Technology has been introduced in the last three years, Did it useful ?

	Frequency	Percent
Yes	71	83%
No	15	17%
Total	86	100%

As shown in the table, we can see that 83% of the sample see that it is useful, and 17% of the sample see that it is not.

➤ **Can you mention a new technique or Technology in your hospital?**

Table (9) Can you mention a new technique or Technology in your hospital?

	Frequency	Percent
Electronic patients record	36	42%
Medication administration program	20	23%
Hospital application for admission and discharge	13	15%
Other	17	20%
Total	86	100%

As shown in the table, we can see that 42% of the sample use Electronic patients record, 23% of the sample use Medication administration program, 15% of the sample use Hospital application for admission and discharge

➤ **What did they want to achieve with this new technique or Technology? You can tick more than one reason.**

Table (10) What did they want to achieve with this new technique or Technology?

	Responses		Percent of Cases
	N	Percent	
better quality of care for patients	55	19.4%	64.7%
better quality of life of patients	44	15.5%	51.8%
empowering patients	22	7.7%	25.9%
safer care for patients	40	14.1%	47.1%
lower costs	32	11.3%	37.6%
labour saving, same nursing staff is able to care for more patients	18	6.3%	21.2%
reducing the physical demands of nursing staff	22	7.7%	25.9%
reducing the working pressure of nursing staff	17	6.0%	20.0%
increasing the attractiveness of working as a nurse	17	6.0%	20.0%
reducing the administrative tasks of nursing staff	17	6.0%	20.0%
Total	284	100.0%	334.1%

As shown in the table, we can see that 18% of the sample want to achieve better quality of care for patients, 16% of the sample want to achieve better

quality of life of patients, 14% of the sample want to achieve safer care for patients, 11% of the sample want to achieve lower costs.

➤ **How would you evaluate the way this new technique or Technology was introduced?**
Table (11) How would you evaluate the way this new technique or Technology was introduced?

	Frequency	Percent
bad	3	3%
moderate	17	20%
good	29	34%
very good	37	43%
Total	86	100%

As shown in the table, we can see that 43% of the sample evaluated the way this new technique or Technology was introduced as very good, 34% of the sample evaluated it good, 20% of the sample evaluated it moderate.

Discussion:

The integration of innovative healthcare technologies in Saudi Arabian hospitals has a significant impact on nursing practices, as highlighted by various studies. This study employed a meticulously developed questionnaire to assess this impact, ensuring that the tool was both valid and reliable. The validity of the questionnaire was confirmed through high Pearson correlation coefficients for each statement, all of which were statistically significant ($p < 0.05$). These coefficients, ranging from 0.298 to 0.627, demonstrate that the questionnaire items were well-correlated with the overall construct they intended to measure, thereby affirming the instrument's validity. Reliability of the questionnaire was tested using Cronbach's alpha, a measure of internal consistency. The alpha coefficient for the entire scale was found to be 0.888, indicating a high level of reliability. This suggests that the questionnaire items consistently reflect the same underlying concept and would yield stable and consistent results if the study were replicated. Cronbach's alpha values above 0.70 are generally considered acceptable, with values above 0.80 indicating good reliability. Therefore, an alpha value of 0.888 reflects excellent reliability, ensuring that the data collected through this questionnaire are dependable

and accurately represent the variables being studied.

These rigorous tests of validity and reliability underscore the robustness of the questionnaire, providing confidence that the findings of the study are based on sound and reliable measures. This methodological rigor is crucial for drawing meaningful conclusions about the influence of innovative healthcare technologies on nursing practices. The strong internal consistency ensures that the responses accurately reflect the nurses' perceptions and experiences regarding the use of technology in their work environments. Validated and reliable questionnaire forms a solid foundation for assessing the significant impacts of healthcare technologies on nursing practices in Saudi Arabian hospitals. This robust methodological approach ensures that the study's conclusions are credible and can be confidently used to inform healthcare policies and practices aimed at enhancing the integration and utilization of technology in nursing. Demographic analysis reveals a predominantly female sample (77%), with a significant portion being Saudi nationals (77%). Most respondents work in diverse departments, with a considerable number having attended courses on technology and electronic healthcare, suggesting a growing acceptance and familiarity with digital tools among nurses.

The findings demonstrate no significant differences in the perceived influence of innovative healthcare technologies based on gender, age, nationality, or attendance in related courses. This

consistency across different demographic groups underscores the widespread acceptance and perceived utility of these technologies among nursing professionals in Saudi Arabia. Notably, the majority of respondents (83%) affirmed the usefulness of newly introduced technologies in the past three years. Electronic patient records (EPR), medication administration programs, and hospital applications for admission and discharge are among the most commonly implemented technologies. These tools are highly valued for improving the quality of patient care, enhancing patient safety, and reducing costs and administrative burdens. For instance, EPR systems streamline patient data management, thus enabling more efficient and accurate patient care delivery [22,23]. The evaluation of these technologies' introduction was largely positive, with 77% of respondents rating the implementation as good or very good. This positive reception likely reflects effective change management and training processes within the hospitals, aligning with findings from Alharbi et al. (2021) on successful leadership practices in healthcare settings [22].

Furthermore, the adoption of such technologies aligns with Saudi Arabia's Vision 2030, which emphasizes the modernization of healthcare through technological advancements [24]. This strategic direction is essential for enhancing the overall healthcare infrastructure and ensuring that it meets international standards [25]. In conclusion, the integration of innovative healthcare technologies is positively influencing nursing practices in Saudi Arabian hospitals. The study's results indicate a broad acceptance and recognition of the benefits these technologies bring, including improved patient care quality, safety, and operational efficiency. The ongoing support for such innovations is crucial for sustaining the momentum towards a more technologically advanced and efficient healthcare system in Saudi Arabia.

Conclusion and recommendations:

Despite the non-significant differences across gender, age, nationality, and educational

background, the overwhelming consensus on the usefulness of newly introduced technologies in the past three years underscores their widespread positive reception. Technologies such as Electronic Patient Records, medication administration programs, and hospital applications for admission and discharge have been particularly impactful, contributing to improved patient care quality, enhanced safety, reduced costs, and streamlined administrative tasks. The high ratings for the implementation process of these technologies further reflect effective change management and training within hospitals, aligning with Saudi Arabia's Vision 2030 goals of modernizing healthcare through technological advancements. This alignment is critical for elevating the healthcare system to meet international standards, ensuring better patient outcomes, and enhancing operational efficiency. In conclusion, the integration of innovative healthcare technologies in Saudi Arabian hospitals is reshaping nursing practices, fostering a more efficient, safe, and patient-centered care environment, and this study's robust methodological approach provides a reliable foundation for ongoing and future advancements in healthcare technology adoption, it can be recommended that a Continued Investment in Technology Training must be achieved, as well as expanding Technology Infrastructure with ensuring robust electronic patient records (EPR) systems, advanced medication administration programs, and comprehensive hospital applications for patient admission and discharge. By implementing these recommendations, Saudi Arabian hospitals can further enhance the positive impact of innovative healthcare technologies on nursing practices, leading to improved patient outcomes, greater operational efficiency, and a more empowered and skilled nursing workforce.

Conflict of interest

Authors declared no conflict of interest.

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