

Examining The Mechanisms Linking Technology Adaptation To Improve Quality Of Nursing Care: A Systematic Review

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Abstract

Background: The healthcare sector faces significant pressure to respond quickly to emergencies and adapt to new data-dependent technologies like electronic health records. However, stringent laws hinder effective data sharing, necessitating interoperability for intelligent, flexible healthcare. Healthcare has not fully embraced technology improvements due to potential hazards, and must successfully integrate new technology to ensure dependability. This article examines the mechanisms linking technology adoption to improve the quality of nursing care. **Method:** To classify necessary research published between 2019 and 2023, a comprehensive search of databases, including Scopus, PubMed, and Web of Science, was done.

The inclusion criteria for this study were studies written in English that specifically studied the impact and results of the mechanisms linking technology adaptation to improve the quality of nursing care. Furthermore, the studies chosen had to use well-established scales for measurement and provide valuable data on team dynamics. Eleven studies were included in the synthesis after initial screening and quality assessment.

Results: The result identified three themes, which are to evaluate service quality, explore the adoption of telemedicine and virtual software for outpatient care, and examine the link between electronic health record usability and nurse and patient outcomes.

Conclusion: It is concluded that the quality of e-health services in nursing is linked to their quality of care, emphasizing the need for innovative solutions like virtual software and telemedicine to reduce workload and improve patient care, while also requiring technology adaptation in documentation.

Keywords: Mechanisms Linking, Technology Adaptation, Improve Quality, Nursing Care, Systematic Review.

Introduction

The healthcare sector is under tremendous pressure to respond quickly to unanticipated emergencies and to be adaptable and flexible. Electronic health records, one of the new data-dependent technologies, can speed up procedures and support medical personnel in dire circumstances. However stringent laws impede effective data sharing, making interoperability necessary for intelligent, flexible, and effective healthcare. Healthcare has not completely embraced technology improvements, maybe because of worries about possible hazards. Healthcare must handle adoption issues and successfully integrate new technology to guarantee dependability (Atasoy et al., 2019; Oraibi et al., 2022; Alruwaili et al., 2023).

Healthcare has several areas, and as a result, there are differences in the ways that technology is used. Healthcare practice environments, companies, and nursing units all have different approaches to implementing technology. The application of tools, medications, treatments, and systems intended to address health issues and enhance quality of life has increased thanks to innovations in healthcare. It might be

challenging to introduce new technology in the healthcare industry (Amano et al., 2023). Numerous issues need to be taken into account, including the technology's safety, its intended usage, and its effects on patients and healthcare professionals. Because they are unfamiliar with the technology and have financial concerns, many hospitals are hesitant to accept new technologies. Recognize the causes of the low adoption of technology and address those issues (Min et al., 2019; Alruwaili et al., 2023).

Comprehending the usage of technology is essential for mitigating risks and enhancing patient care. Reducing obstacles and raising patient satisfaction is possible when solutions, like interim reimbursement and regulatory restrictions, are willingly adopted. Technology has proven to be a useful tool and a captive road. It has achieved a kind of victory over the disease itself and paves the way for a new approach to teaching (Kumar et al., 2020; Al Ali et al., 2022; Almutairi et al., 2022).

The use of blockchain in healthcare settings is growing, with potential applications in financial claims processing, patient data management, health supply chain management, and combating fake pharmaceuticals. Nonetheless, there are obstacles including the rate of project failure and cooperation. The influence adoption from organizational, financial, social, technical, regulatory, and legal perspectives. It also develops a scoring model to assess healthcare organizations' preparedness for blockchain adoption in the administration of electronic health records systems (Lee & Yoon, 2021; Alharthi et al., 2023).

In addition to facilitating seamless integration and remote communication, these technologies are enhancing patient care by enabling quick diagnosis, tailored medication, precision surgery, and targeted drug delivery. Within the healthcare among the nursing staff, the use of technology has emerged which is impacting patient dealing. Technology is being added to nursing curricula by healthcare professionals more often to improve patient experiences and efficiency (Awad et al., 2021). The use of technology in nursing education is impacted by both faculty- and student-centred methods. Healthcare customers need practitioners who are ethical, skilled, and empathetic to meet their demands. To support the beneficial effects of technology on clinical settings and patient care, additional data is nonetheless required (Smart et al., 2020; Matmi et al., 2023).

At the point of care, nurses use technology to obtain data, such as medical records and evidence. They are worried about its use, though. Key characteristics that make them more likely to employ digital technology are possessed by digitally knowledgeable nurses. These issues can be addressed by giving nurses priority when developing digital systems and by funding chances for professional growth. However, the technology adaptation helps nursing staff to provide care which is directly linked to patient satisfaction (Brown et al., 2020).

Method

Research Objective:

The present systematic review aims to examine the mechanisms linking technology adaptation to improve the quality of nursing care.

Research Questions :

In this systematic review, the research questions include the following;

- How does the mechanism linking technology adaptation improve the quality of nursing care?

Literature Search Strategy:

A detailed and methodical examination of academic databases identified relevant papers published in peer-reviewed journals. PubMed, Scopus and Web of Science were among the searchable databases to be searched. The search phrases were chosen with care to include relevant themes, such as "Technology Adaptation in Healthcare", "Quality of care" "Nursing Staff" and "Technology Adoption Improves the Nurses' Quality of Care."

Table 1 Syntax Search

Syntax 1	"Technology Adaptation in Healthcare"
Syntax 2	"Technology Adoption Improves the Nurses' Quality of Care,"

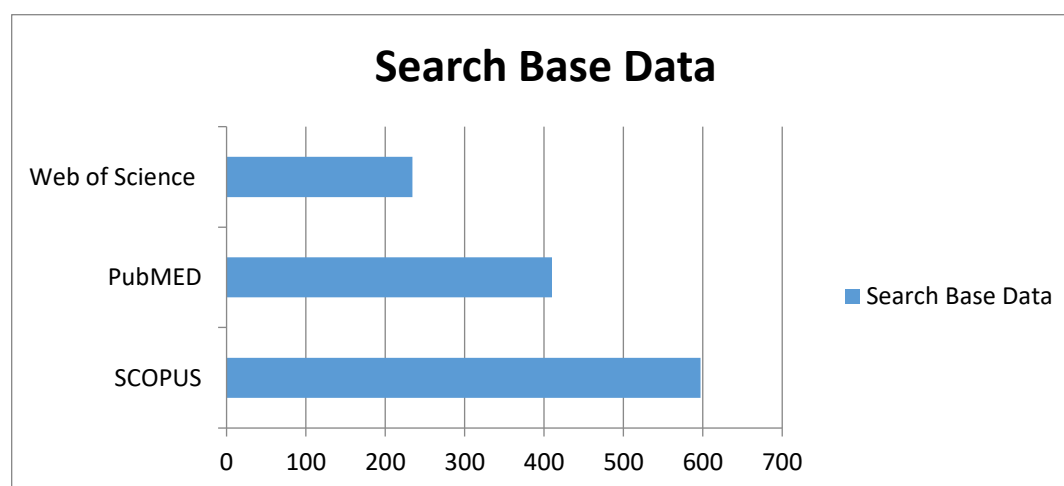
Table 2 Statistics from the Data Base

No	Database	Syntax	Year	No of Researches
1	PubMed	Syntax 1	2019	396
		Syntax 2		14

2	Scopus	Syntax 1	430
		Syntax 2	167
3	Web of Science	Syntax 1	189
		Syntax 2	45

To discover relevant research publications, three prominent databases were used: Scopus, PubMed, and Web of Science—the chosen search to assure validity and applicability focused on papers issued during 2019 and 2023. According to the statistics, Scopus produced the most significant research articles, totalling 597. PubMed contributed 410 pieces of research, while Web of Science contributed 234. These findings show the thoroughness of the scientific search and lay a solid foundation for the next steps of the systemic review.

Figure 1



Graphic representation of search database according to different search engines

Inclusion and Exclusion Criteria

The research on the effect of technology adoption on the quality of nursing care must be conducted in English, with the exclusion of non-English, outdated, and grey publications. Full-text papers published between 2019 and 2023 are also required.

Quality Assessment

The methodological quality and bias risk of the included studies were assessed using appropriate quality assessment instruments tailored to different study designs. This procedure guaranteed that the research was a condensed and reliable source of information.

Table 3 Assessment of the literature quality matrix

Sr #	Author	Are the selection of studies described appropriately	Has the literature covered all relevant studies	Does the method section describe?	Were findings clearly described?	Quality rating
1	Ko & Chou. (2020)	Yes	Yes	Yes	Yes	High
2	Bokolo, (2021)	Yes	Yes	Yes	Yes	high
3	Haase et al. (2022)	Yes	Yes	Yes	Yes	High
4	Araya et al. (2021)	Yes	Yes	Yes	Yes	High
5	McCarthy et al. (2019)	Yes	Yes	Yes	Yes	High
6	Vest al. (2019)	Yes	Yes	Yes	Yes	High
7	Kutney-Lee et al. (2019)	Yes	Yes	Yes	Yes	High
8	Kutney-Lee et al. (2021)	Yes	Yes	Yes	Yes	High
9	Huang et al. (2022)	Yes	Yes	Yes	Yes	High
10	Han et al. (2020)	Yes	Yes	Yes	Yes	High
11	Ali & Li (2020)	Yes	Yes	Yes	Yes	High

The systematic review of studies provided clear descriptions, methods, selection processes, literature coverage, and clear conclusions, resulting in a "Good" rating for their quality.

Study Selection

Concept identification, tracking, upkeep, formulation, and synthesis are all included in the data search. Using inclusion and exclusion criteria, search engines are identified and studies are chosen first. There is utilization of databases, literature libraries, and search engines.

Table 4 Selected Studies for SR (Systematic Review)

No	Author	Research	Year
1	Ko, C. H., & Chou, C. M. (2020)	Apply the SERVQUAL instrument to measure service quality for the adaptation of ICT technologies: A case study of nursing homes in Taiwan	2020
2	Bokolo, A. J. (2021)	Exploring the adoption of telemedicine and virtual software for the care of outpatients during and after the COVID-19 pandemic	2021
3	Haase, J. E., et al. (2022)	Randomized Clinical Trial of a Self-Care and Communication Intervention for Parents of	2022

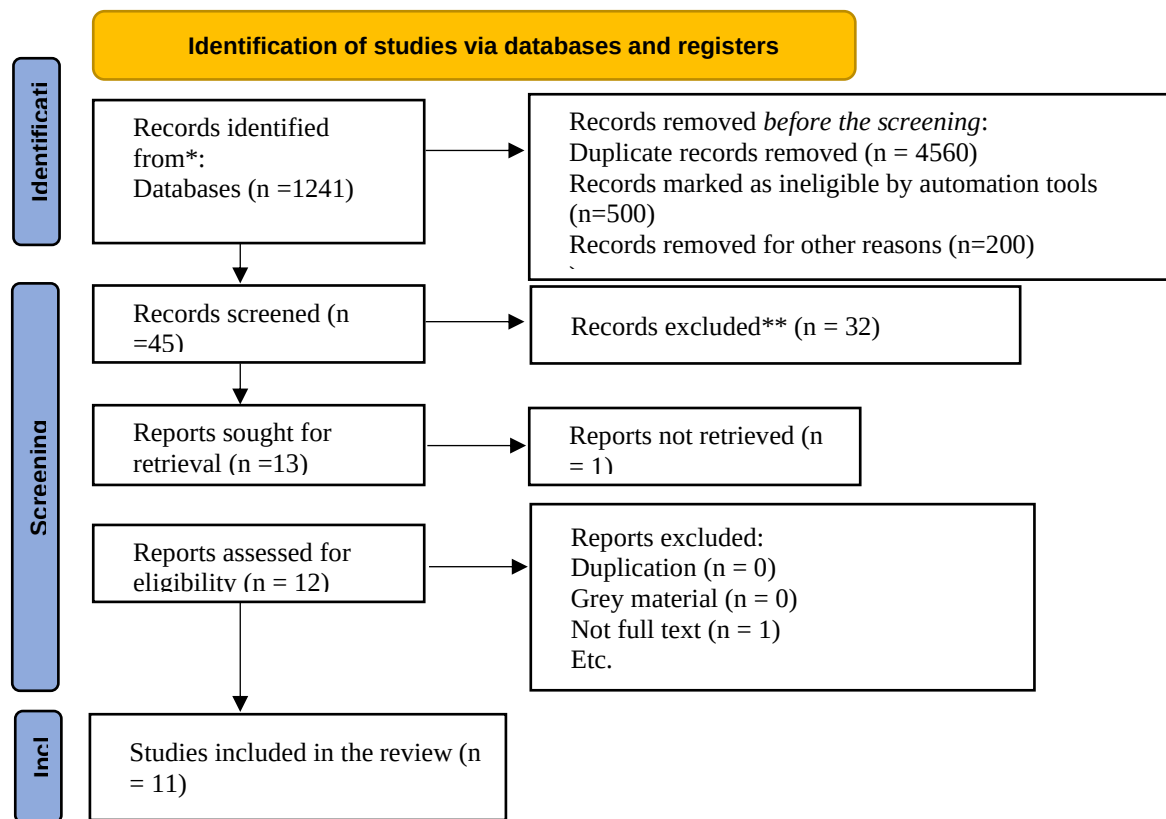
		Adolescent/Young Adults Undergoing High-Risk Cancer Treatment: A Report From the Children's Oncology Group	
4	Araya, R., et al. (2021)	Effect of a digital intervention on depressive symptoms in patients with comorbid hypertension or diabetes in Brazil and Peru: two randomized clinical trials	2021
5	McCarthy, B., et al. (2019)	Electronic nursing documentation interventions to promote or improve patient safety and quality care: A systematic review	2019
6	Vest, J. R., et al. (2019)	Adoption of health information technology among US nursing facilities	2019
7	Kutney-Lee, A., et al. (2019)	Electronic health record adoption and nurse reports of usability and quality of care: the role of work environment	2019
8	Kutney-Lee, A., et al. (2021)	Electronic health record usability: associations with nurse and patient outcomes in hospitals	2021
9	Huang, T. L., et al. (2022)	How robots impact nurses' time pressure and turnover intention: A two-wave study	2022
10	Han, J., et al. (2020)	Impact of Intelligent Healthscape quality on Nurse Job Outcomes and Job Satisfaction: A Test of the Moderating Effect of innovativeness	2020
11	Ali, H., & Li, H. (2020)	Use of notification and communication technology (call light systems) in nursing homes: Observational study	2020

Result

Identification of studies via databases and registers

To provide useful information about research methods and their application, quality evaluation is a systematic procedure that includes assessing a study's quality utilizing data from peer-reviewed publications, overall assessment, and quality management.

Table 5 Identification of Studies via Database



Data Extraction

The data was extracted using PRISMA, a method to investigate how mental health laws and policies affect psychiatric nurse practice in Saudi Arabia. Measurements, participant profiles, and study parameters served as the inclusion and exclusion criteria.

Table 6 Research Matrix

Author, Year	Aim of study	Methodology	Sample	Setting	Result
Ko, C. H., & Chou, C. M. (2020)	Measure service quality for the adaptation of ICT technologies in nursing homes in Taiwan	Applied SERVQUAL instrument to measure service quality.	200 nursing home residents in Taiwan	Nursing homes in Taiwan	Assessed service quality for the adaptation of ICT technologies in nursing homes, with a sample of 200 residents providing insights into their experiences.
Bokolo, A. J. (2021)	Explore the adoption of	Systematic review	Not specified	Norway	Explored the adoption of

	telemedicine and virtual software for the care of outpatients during and after the COVID-19 pandemic				telemedicine and virtual software for outpatient care during and after the COVID-19 pandemic.
Haase, J. E., et al. (2022)	Evaluate a self-care and communication intervention for parents of adolescents/young adults undergoing high-risk cancer treatment	A randomized clinical trial of a self-care and communication intervention.	325 parents of adolescents/young adults	Cancer treatment centres	The intervention showed positive effects on parents' self-care and communication during high-risk cancer treatment, with a sample of 325 parents participating in the trial.
Araya, R., et al. (2021)	Assess the effect of a digital intervention on depressive symptoms in patients with comorbid hypertension or diabetes in Brazil and Peru	Two randomized clinical trials of a digital intervention.	Patients with comorbid conditions	Brazil and Peru	The digital intervention had a positive effect on reducing depressive symptoms in patients with comorbid hypertension or diabetes. The sample included patients with these conditions participating in two randomized clinical trials.
McCarthy, B., et al. (2019)	Evaluate electronic nursing documentation interventions to promote or improve patient safety and quality care	A systematic review of electronic nursing documentation interventions.	6 articles	Ireland	Identified the impact of electronic nursing documentation interventions on patient safety and quality of care through a systematic review. The sample included studies encompassing

					electronic nursing documentation interventions.
Vest, J. R., et al. (2019)	Examine the adoption of health information technology among US nursing facilities	Examined the adoption of health information technology.	635 nursing facilities in the US	Nursing facilities in the United States	Explored the level of adoption of health information technology in 635 nursing facilities across the United States.
Kutney-Lee, A., et al. (2019)	Investigate the association between electronic health record adoption and nurse reports of usability and quality of care	Explored the relationship between EHR adoption and nurse-reported outcomes.	535 hospitals	Hospitals	Found associations between EHR adoption and nurse reports of usability and quality of care, influenced by the work environment. The sample included data from 535 hospitals, with nurses providing reports on EHR adoption and its impact.
Kutney-Lee, A., et al. (2021)	Examine the associations between electronic health record usability and nurse and patient outcomes in hospitals	Studied associations between EHR usability and nurse and patient outcomes.	535 hospitals	Hospitals	Found associations between EHR usability and nurse and patient outcomes in hospital settings. The sample included data from 535 hospitals, with a focus on the relationship between EHR usability and various outcomes for both nurses and patients.
Huang, T. L., et al. (2022)	Investigate how robots impact nurses' time pressure and turnover intention	Conducted a two-wave study to explore the impact of	442 nurses in Taiwan	Hospitals in Taiwan	Robots were found to impact nurses' time pressure and turnover intention. The sample included 442 nurses from

		robots on nurses.			hospitals in Taiwan, providing insights into the effects of robots on nursing work-related outcomes.
Han, J., et al. (2020)	Assess the impact of intelligent healthcare quality on nurse job outcomes and job satisfaction	Examined the impact of intelligent healthscape quality on nurse outcomes.	433 nurses in South Korea	Hospitals in South Korea	Found that intelligent healthscape quality influenced nurse job outcomes and satisfaction, with innovativeness moderating the effect. The sample included 433 nurses working in hospitals in South Korea, contributing to understanding the impact of healthcare environments on nursing outcomes.
Ali, H., & Li, H. (2020)	Study the use of notification and communication technology (call light systems) in nursing homes	Observational study on the use of notification and communication technology.	10 nursing homes	Nursing homes in an unspecified location	Examined the use of call light systems in nursing homes and their impact on communication technology. The sample included 10 nursing homes, providing insights into the implementation and use of these systems in a healthcare setting.

Table 7 The following sub-themes have been observed among the studies, including in the systematic review

No	Theme
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- 1 Measure Service Quality for the Adaptation of Information and Communication Technologies
 - 2 Explore the Adoption of Telemedicine and Virtual Software for Care of Outpatients
 - 3 Examine the Associations between Electronic Health Record Usability and Nurse and Patient Outcomes
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Discussion

An instrument for assessing the quality of e-health services in nursing homes was created using the SERVQUAL model. The tool, which integrates electronic health care informatics, may help resolve problems such as inappropriate room conditions and inadequate staff communication. According to the results this technology identified as effective to improving nursing care and dealing the patients (Ko & Chou,2020). Moreover, a study also finds that due to usability problems including damaged parts and a lack of feedback, nursing facilities with antiquated call light systems have high alarm rates, overexpectative staff, and slow response times. More than eight per cent of residents leave them alone after waiting, which emphasizes the necessity for nursing home administration to take feedback into account to enhance service quality and resolve issues with notification and communication technologies (Ali & Li,2020).

The COVID-19 pandemic has brought attention to the need for creative solutions to enhance patient care and control the virus's spread. Physicians can receive health-related information from software-based systems, such as medical software apps, which can enhance the quality of life for outpatients. Virtual software and telemedicine present encouraging possibilities for eradicating the infection. This study examines the benefits, uses, and difficulties associated with virtual software and telemedicine, emphasizing the variables that influence its uptake. According to the research, receiving therapy remotely may reduce ER visits while safeguarding healthcare resources (Bokolo,2021). Another research explored how technologies have positive impact on the patient's outcomes. A 6-week digital intervention significantly improved depressive symptoms in patients with hypertension or diabetes in Brazil and Peru, but the effects did not last for six months and were minimal (Araya et al., 2021).

Nursing professional workplaces may suffer if robotics reduces the workload of nurses but also necessitates their efforts to ensure smooth functioning. The favourable correlation between EERSO and time pressure is weakened by good robot performance, underscoring the importance of cautious analysis (McCarthy et al., 2019). Compared to nurses at hospitals with better EHR usability, those in lower usability hospitals had higher odds of exhaustion, job dissatisfaction, and desire to leave. Inpatient mortality and 30-day readmission rates were greater for surgical patients treated in these facilities. Adoption of a comprehensive EHR was also linked to an increased risk of nurse burnout. According to the study, complete EHR adoption may not be as crucial for nurse jobs and patient outcomes as EHR usability (Kutney-Lee et al., 2021). later it was also explored that nurses are less likely to report bad usability outcomes, such as system dissatisfaction, when they use complete EHRs. The way that nurses assess the usefulness of EHRs and if they are having the desired impact on raising the standard and safety of care is also heavily influenced by their work environment. Better work conditions also reduced the likelihood of unfavourable reports from nurses, and low patient safety ratings were linked to the workplace environment but not the degree of EHR use (Kutney-Lee et al., 2019).

Limitation & Implication

This systematic review, a five-year study, aimed to examine the link between technology adoption and improving nursing care quality. However, the risk of publication bias was deemed high as only published studies were included, potentially removing unreported or grey material. The review followed methodology norms, but resource limitations prevented it from organizing all relevant technologies. The review produced fewer neutral or negative results, potentially indicating a bias in favour of promising technology.

Recommendations

Future studies could use unpublished information and research from government-run and nonprofit groups and engage subject-matter experts to reduce this limitation. It is suggested to examine the link between technology adoption and improving nursing care quality within the Saudi context which would be helpful for the healthcare setting to introduce the technologies which are helpful for the nursing staff so their quality of care is improved. Exploring the impact of different

technology in KSA. As the themes identified the technology, by adoption may improve not only the quality of service but also reduce the workload as well as the burnout among the nursing staff.

What this article is adding to existing literature?

This article adds to existing as it identified the different technology-based approaches which enhance nursing performance and positively impact on the quality of care.

What is its impact and contribution to the Saudi context?

As the systematic review suggested the different technologies which have positive link with the nurses' quality of care and enhance their performance. It contributes to the healthcare institutes developing the technology which are necessary for nursing staff so that their time pressure and workload get reduced by keeping the reports and record in the form of softcopy so by a click they get the required documents.

Conclusion

It is concluded that the quality of e-health services in nursing has linked with their quality of care. It also has highlighted the need for innovative solutions like virtual software and telemedicine which reduce their workload and positively impact their dealing with the patients. It is also concluded that technology adaptation is needed in the documentation process as it holds back their time which they utilize in other duties.

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