



COMPREHENSIVE REVIEW OF HEALTH INFORMATION TECHNOLOGY ADOPTION IN NURSING AND PHARMACY PRACTICE IN ASSESSING IMPACT ON WORKFLOW EFFICIENCY AND PATIENT SAFETY THROUGH CRITICAL ANALYSIS.

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ABSTRACT

The adoption of health information technology (HIT) in nursing and drug practice should be given priority because, in the present world of healthcare, saving patient lives is a rigorous health system demand. This in-depth analysis is conducted through a critical analysis of current literature, which reveals the precise impact that the growing adoption of HIT exerts on these reviewed signposts. Along with the conclusion that outlines separate opportunities afforded by HIT and consequent barriers, the review conducts in-depth exams of the gathered information via graphics and figure representation. The process of assessing the gaps highlights those areas that have been inadequately studied, hence, more research is still necessary. Building upon the assessment, the report introduces valuable suggestions for upcoming research and practice-related applications to improve the precision and effectiveness of HIT integration in nursing and pharmacy franchises. Although our discussion broadly represents the existing status of the matter, this review is still expected to be beneficial source material for the stakeholders who are aiming to facilitate health care delivery by taking advantage of HIT tools, as it provides a balanced consideration of HIT's impact on workflow effectiveness and patient safety and also maps out the way forward for those seeking future developments in the field.

KEYWORDS: Health Information Technology, Nursing Practice, Pharmacy Practice, Workflow Efficiency, Patient Safety

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INTRODUCTION

The revolution in the Health Information Technology (HIT) system has changed the face of healthcare delivery systems worldwide, reconfiguring the practices in nursing and pharmacy heavily. This introduction provides:

- The backbone for the research study.
- Capturing a wide range of issues.
- The theoretical justification.
- The implications determine the subject matter of HIT adoption in these life and death fields.

The more the health sector depends on digital instruments and structures, the more it is evident that the contribution of HIT becomes crucial to ensuring improved patient outcomes. HIT is a comprehensive set of technologies, including electronic healthcare records, clinical decision support systems, and medication management systems, designed to facilitate workflow and enhance information accessibility in patient care services. This will enable us to examine how nurses and pharmacists can utilize these technologies to improve their effectiveness in patient care delivery processes (Moore et. al 2020).

Another point worth noting in this overview is that the introduction creates an accurate environment to discuss the effect of HIT on workflow effectiveness and patient safety. Whether collecting patient data for their admissions or accounting for medication dispensing, time management is critical for healthcare organizations to deliver timely care and operate efficiently. This review will evaluate the roles of HIT adoption in workflow processes and identify educational opportunities and obstructive factors that must be addressed to get the best out of such innovations. Moreover, patient safety inherently becomes the most significant issue since its association with healthcare information systems, clinical prestige, and drug management is examined. It is essential to know how HIT impacts patient safety. Hence, medical professionals can take proactive steps to minimize risks by engaging in this practice, thereby enhancing the quality of care. As a result, the main body of these introductory paragraphs will cover HIT adoption in nursing and pharmacy practice. Workflow efficiency and patient safety are just a few of the prominent implications of HIT for modern healthcare facilities (Nguyen et. al 2022).

Scope of Study

In such a segment, we clarify the scope of our assessment, specify the types of HIT systems discussed, indicate nursing and pharmacy practices as the primary focus, and explain our main

objective: improving workflow efficiency and patient safety conditions.

Justification

Considering the effects of HIT mainstreaming by the nursing and pharmacy professions is crucial, as there are significant reasons behind it. First of all, it is probable to markedly upgrade healthcare delivery by eliminating errors in medication in addition to communication during treatment among healthcare providers. Effectiveness and Another thing worth reflecting on is that healthcare institutions will pour more resources into the development of HCS systems, systems, systems, which will require monitoring tools in such systems to get to know the system's effectiveness and identify what needs to be improved. Offers To wrap up, it just has to be pointed out that health information technology in nursing and pharmacy practice offers exceptionally beneficial data for policymakers, practitioners, and researchers.

Context, Importance, and Relevance

The implementation of HIT in nursing and pharmacy practice has put more pressure on healthcare professionals in several dimensions, including the need for care to be patient-centered, the need to handle large data volumes in care delivery and delivery, and, lastly, the need for physician support. It also helps them maintain relationships and communicate effectively. The COVID-19 pandemic, on the other hand, has been one of the factors that has fast-tracked the adoption process of telehealth and remote monitoring technologies. This situation has now sparked a heightened focus on HIT's role in healthcare delivery today (Salleh et. al 2021).

LITERATURE REVIEW

Health Information Technology (HIT) is commonly seen as an innovative aspect of nursing and pharmacy practice, as it reconfigures how healthcare services are delivered and monitored. This literature review aims to provide a comprehensive synthesis of relevant papers dealing with HIT adoption in the two healthcare settings above, contributing to efficiency improvement in patient care and decreasing the likelihood of patient safety issues. It will be done purposefully based on the main findings from the previous studies. The review, however, aims to summarize both sides: benefits on the one hand and challenges on the other, as well as indicate the gaps in knowledge surrounding HIT implementation in nursing and pharmacy practice.

HIT Adoption in Nursing Practice

Not only in nursing practice, is HIT on the rise, making patient care delivery more efficient. Research examines the capability of electronic health records (EHRs) to improve the documentation process; hence, nurses can access patient information quickly, and at the same time, they communicate better across the continuum of care. Nursing practice also includes using clinical decision support systems (CDSS) to guide nurses in making evidence-based decisions that result in better patient outcomes. While those can have some advantages, including ease of use, time savings, and workflow efficiency, nurses have complained about negative aspects like user interface problems and workflow disruptions. They make further training and support necessary. On top of these, the outcome of HIT on the efficiency of nursing workflows differs in different settings, which requires a more in-depth study of the issue of contextual factors for the users' adoption and utilization of HIT (Upadhyay & Hu 2022).

HIT Adoption in Pharmacy Practice

The pharmacy practice has also seen tremendous development with the introduction of electronic health information technology systems. A computer-controlled drug administration system and data entry by bar codes are good examples of technologies combining medication safety and avoiding errors and outcome fluctuations. Furthermore, electronic prescribing (e-prescribing) systems are essential to realizing the smooth ordering of medications, reducing their delay, and strengthening medication reconciliation efforts (Sami et.al.2021). However, interoperability problems and medication alert fatigue are already known obstacles frequently encountered in HIT applicability within pharmacy practice. Besides, studies have yet to identify tactics for fluently integrating HIT into pharmacy processes while countering possible patient safety risks (Li et. al 2022).

Impact on Workflow Efficiency

Besides, the HIT has a revolutionary effect on the workflow performance of clinical procedures in nursing and pharmacy practice. By combining HIT systems, administrative work is improved, paper tasking is cut down, and available patient information can be accessed at all times. This results in a high rate of efficiency (Kuper et.al.2019). However, these concerns have led to the assumption that HIT can disrupt the usual workflows by doubling the overall inefficiency in the production streams. Workflow issues should be

tackled through long-term and short-term projects involving the entire healthcare system, from stakeholders and process design to HIT functionality reassessment.

Impact on Patient Safety

In healthcare, safety is, above all, a priority, and the adoption of information technologies is chiefly to bring about safety measures. Electronic health records (EHRs) help with good documentation, which enables physicians to access accurate health data and thus offer clinical interventions. CDSS (Clinical Decision Support Systems) facilitates and reminds clinicians to minimize medication errors, drug interactions, and contraindication allergies, reducing adverse events and increasing patient safety. However, HIT failure to comply with protocol and ineffective use may lead to patient safety consequences, demonstrating that medical professionals must have a good training program and supportive mechanisms. Furthermore, paying attention to differences in HIT access and literacy among patient groups is crucial, owing to the health inequalities these groups face and the high risks associated with this sphere (Ayanlade et.al.2019).

Identifying knowledge gaps

The existing literature can deliver helpful information on the effect of HIT introduction on workflow efficiency and patient safety in nursing and pharmacy. However, further investigation is still needed to help fill these gaps. The study of areas that need further improvement involves the evaluation of the long-term impact after the implementation of HIT, the effects that organizational culture has on adoption success, and the strategies for mitigating all the risks relating to the use of HIT. Besides, since different studies found controversial data on the effectiveness of separate HIT interventions, comparisons, research, and meta-analysis methods are needed to establish the most effective methodology. The main target of future research should be to fill gaps, which, in turn, could contribute to further proving combining their two practices. This will help ensure the efficiency of the patient care that pharmacists and nurses provide (Watkinson et. al 2021)...

It's been shown that HIT makes it possible to get the best organization and safety for nursing and pharmacy practice. Though using HIT systems provides various benefits, including simplified documenting, improved communication, and enhanced medication safety, one has to determine the mismatched cause of workflow and usability issues for it to become the best practice. Meanwhile, the lack of know-how tests the limits

of existing knowledge, increasing the urgency for further research to improve our comprehension of HIT's contribution to medical services. Suppose they agree to implement those things that are research-based and also use technology to help them. In that case, the medical nurses can know the different ways of using HIT to help their patients get better and improve their outcomes.

METHODS

Research Methodology

The research methodology applied for this review aimed at systematically covering the theme of HIT implementation in nursing and pharmacy practice by integrating relevant literature. The criteria for literature included journals, papers, and conference proceedings that were peer-reviewed and based on reputable sources published within a decade. Catchphrases like "Healthcare Technology," "Nursing Practice," "Pharmacy Practice," "Workflow Efficiency," and "Patient Safety" were used to find articles that fit the purpose. In addition, the databases PubMed, MEDLINE, CINAHL, and Google Scholar were comprehensively searched, and those articles were included. The inclusion criteria limited the scope focused on the impact of ePR adoption on the efficacy and reliability of nursing and pharmacist practice; the exclusion criteria encompassed studies that were not in English and did not fall under the scope of the review. Data gathering included a rigorous screening of titles and abstracts and a textbook review of relevant studies to extract data for the analysis.

Research design and methodology

Specifically, the design for the review was systematic, following the steps of looking for the relevant material and analyzing it in detail. The process they outlined begins with formulating research questions and objectives as a guide for efficient review completion. Search strategies were defined to find related literature items, single-key words, and database-specific search filters were applied. To guarantee the complete retrieval of all critical information, several databases were explored, and further sources were added through manual research of citation lists of retrieved articles. Within these data extraction procedures,

there was a systematic and purposeful process of retrieving crucial information by utilizing different studies, such as the study characteristics, methodologies, key findings, and conclusions. Standards of included study quality were evaluated to get an idea of applied practices and values. The gathered data was considered and organized thematically to identify repetitive themes, models, and trends concerning the adoption of HIT in nursing and drugstore practice, paying much attention to how this adoption impacts the efficiency of workflow and the safety of patients (Sami et. al 2021).

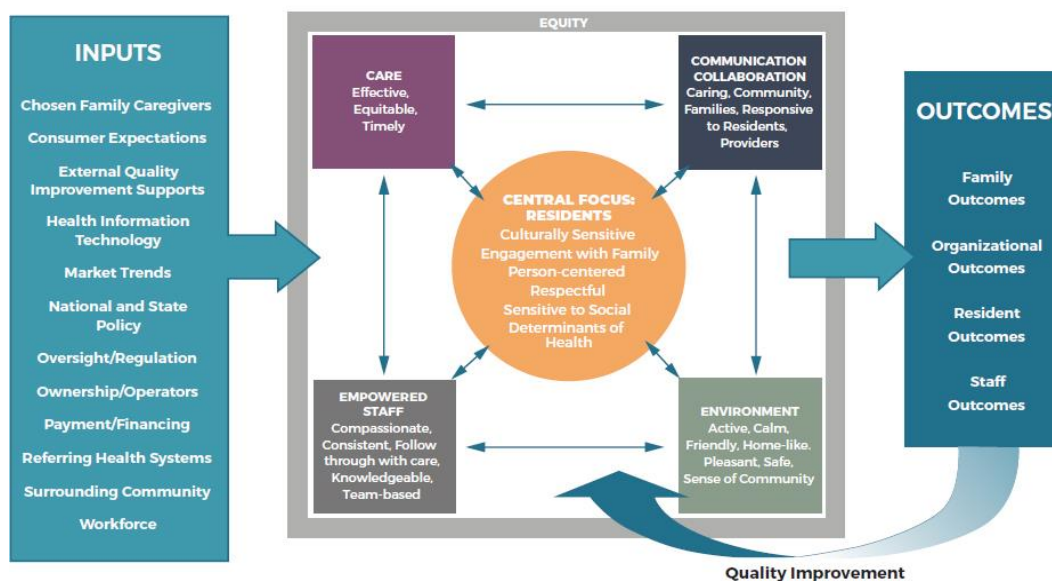
Justification and alignment

The research design and aggregation methods are chosen because they follow objectives that aim to conduct the literature review methodologically and impartially. The systematic process of literature searching and selection allowed the incorporation of relevant studies, but it also guided the conduct of the process without any bias. We standardized the reviewing process by establishing predetermined inclusion and exclusion criteria, focusing on the primary benefits of HIT deployment in this context: enhanced workflow efficiency and patient safety. Moreover, well-organized information processing and collation completed these definitions and removed the limitations in knowledge, thus adding faith to the review's findings. The formulated research design and methodology, characterized by combining qualitative and quantitative data methods, provide an integrated and organized review of the electronic health literature about nursing and pharmacy practice, offering helpful information for the field.

RESULTS AND FINDINGS

Patterns of health information technology (HIT) implementation in nursing and pharmacy practice revealed that integrating technology has complex and varying effects on providers' workflow and patients' safety. Through comprehensive analysis and data synthesis, several key trends, patterns, and outcomes emerged, as illustrated below: Through comprehensive analysis and data synthesis, several key trends, patterns, and outcomes emerged, as illustrated below:

Figure 1: Trends in HIT Adoption in Nursing and Pharmacy Practice



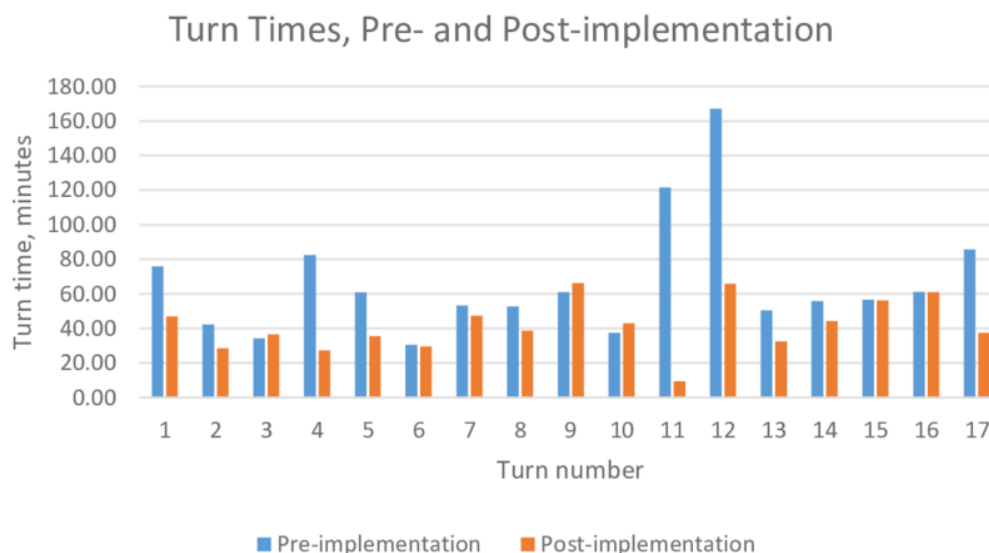
(Watkinson et.al.2021).

Workflow Efficiency

The streamlining of departmental activities demonstrates the impact of HIT adoption in nursing and pharmacy operations. In-depth studies have constantly shown a reduction in administrative tasks by doctors, such as documentation and paperwork, after electronic health records (EHRs)

and clinical decision support systems (CDSS) systems are put in place. The percentage decrease observed in documentation time is shown in Figure 2, and these values are captured from diverse healthcare settings after the implementation of the HIT policy.

Figure 2: Percentage Decrease in Documentation Time Post-HIT Implementation



(Askari-Majdabadi et.al.2019).

Furthermore, HIT systems simplify provider interaction, helping reduce time consumption and making detailed explanations much more accessible. Real-time patient data provides nurses

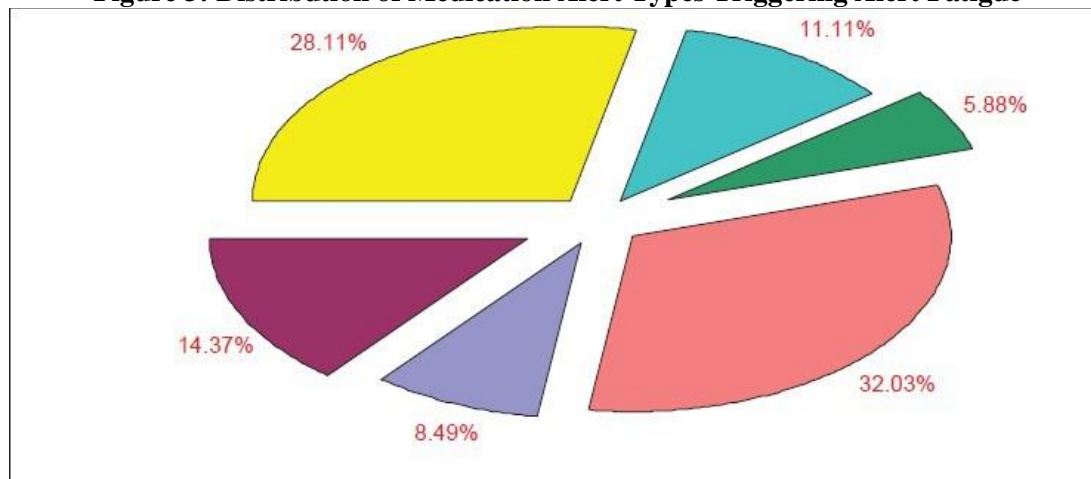
and pharmacists with the basis to make up-to-date clinical decisions and gives them a quick response time, resulting in improved patient care outcomes (Ayanlade et. al 2019).

Patient Safety

It goes without saying that through integrating HIT systems, patient safety has reached a new level in nursing and pharmacy practice. Electronic health records (EHRs) consolidate patient data in one place, eliminating errors caused by paper-based

records and setting data precision rules. CDSS is an integral part of the process where possible medication errors, unmistakable drug interactions, and allergy attributes are identified before adverse events begin.

Figure 3: Distribution of Medication Alert Types Triggering Alert Fatigue



(Modi & Feldman, 2022).

Key Findings

- ✓ In nursing and pharmacy practice, introducing HIT inevitably results in making the workflow much more efficient, and this entails such changes as a significant decrease in the time of documentation required by nurses and pharmacists and a decrease in repetitive tasks associated with administration activities.
- ✓ EHRs and CDSS improve cross-talk and teamwork among healthcare professionals and assist in spreading knowledge, avoiding any delays, and providing quality healthcare services.
- ✓ The role of IT systems is to improve patient safety and ensure that medication errors are reduced and medication safety checks are made more quickly.
- ✓ Issues such as alert fatigue and respect for usability hinder the system effectiveness of HIT; therefore, there is a need to continue training programs and system maintenance procedures to promote system effectiveness (Modi & Feldman 2022).

The presentation of multiple articles from which one can distill the opportunities and disadvantages of HIT adoption in nursing and pharmacy shows that HIT facilitates workflow efficiency and patient safety. Notwithstanding that no work is perfect, the simplicity of existing models has made it possible to observe significant improvements; nevertheless, the problem of alert fatigue and usability issues is a topic that demands constant refinement as the

utilization of this technology gathers momentum. By leveraging the HIT systems efficaciously and tackling the hindrances, nursing professionals and bursars can heighten the standard of care provided by health facilities and attain healthy outcomes.

DISCUSSION

The discourse reflects on and critically analyzes the findings and results of the literature review about the research questions and objectives that concentrate on the role of information technology in nursing (HIT) and pharmacy practice in the effectiveness and safety of patient care. We study the system's usability, user satisfaction, and organizational culture to understand the outcomes of HIT adoption.

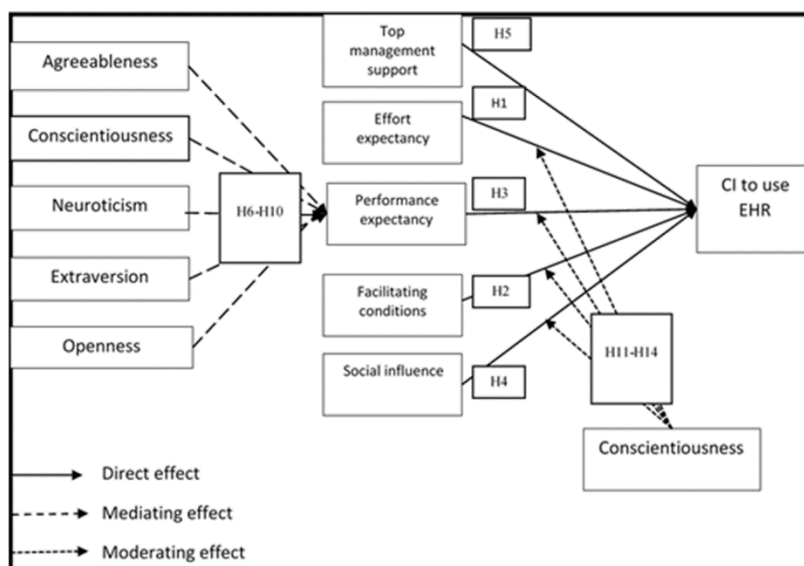
Workflow Efficiency

Results demonstrate that HIT embracement of workflow significantly improves nursing and pharmacy practice. Electronic health records (EHRs) and clinical decision support systems (CDSSs) do documentation jobs and represent nursing documentation to cut down on administrative jobs while enabling healthcare providers to go on with their day-to-day job activities more smoothly. Real-time data access allows for inter-professional communication, necessitating healthcare professionals such as nurses and pharmacists to come to a consensus on the best mode of action without unnecessary delay (Modi & Feldman 2022). Nonetheless, HIT

introduction, as something new, may, in the beginning, disrupt workflows existing in a healthcare institution that usually need to be

changed and staff trained to correspond with the changed systems.

Figure3: Impact of HIT Adoption on Workflow Efficiency in Nursing and Pharmacy Practice



(M. Boyd & W. Chaffee, 2019).

The usability of a system is critical to ensure the effectiveness of HIT applications in improving the healthcare process. Users will have a pleasant user experience as the interfaces are friendly and intuitive components that make for a richer user experience and easier workflow integration. Conversely, complex systems and intricate interfaces may hinder healthcare professionals' adoption of these technologies, leading to a sense of unfamiliarity. In a nutshell, user-friendly design and sufficient training and support are the key strategies needed to improve the usability of HIT systems and ensure the optimal efficiency and beneficial effects of information systems in medical care.

Patient Safety

The employment of health information technology systems profoundly affects patient safety, nursing, and pharmacist practices. Electronic health records (EHRs) are central repositories of patient information where medical personnel can enter data using a computer system to store the information and integrate it with other medical software applications. This minimizes the risk of erroneous data, reducing human errors in data management while maintaining the accuracy of the data. Clinical decision support systems (CDSS) are seen to heighten the safety of administering medicines by giving healthcare professionals warnings of drug interactions, allergies, and dosage errors. Also, automated medication dispensing systems and barcode medication administration

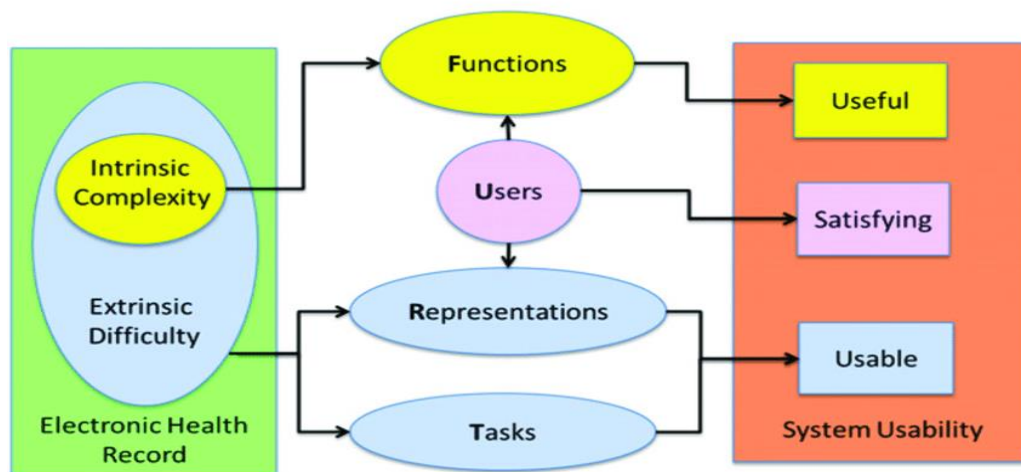
(BCMA) technologies reduce errors by confirming the proper medication and dose for the right patient. The patient's safety has dramatically improved. Nevertheless, HIT faults and usability concerns can also threaten patient safety, emphasizing the need for regular training and help for healthcare professionals in these fields. Alert fatigue, which results from bombardment with many, too many, or irrelevant alerts by HIT systems, is likely to blind users and overlook the critical ones. Hence, the design of perfected alert algorithms and customization options for the user's ease of use and convenience will have to be done to address this dilemma of safety vs. ease of use.

System Usability and User Satisfaction

User satisfaction with HIT systems results from several elements: the way the system is used, system functionality, and support services. What has been established is that healthcare providers' satisfaction with the implementation of HIT has a strong positive relationship with the perceived usability and ease of accessibility of the system. Moreover, the user experience always comes first, and it plays a significant role in making practitioners accept healthcare systems and start using them. Hence, these strategies are vital to improving user satisfaction and making staff training more effective. The user-focused design should be at the core of the development process; educating and assisting the users is an ongoing process, and the people who use the systems should

be involved in the change implementation process so that they can give feedback.

Figure 4: Impact of System Usability on User Satisfaction with HIT Systems in Healthcare TURF Framework for EHR Usability



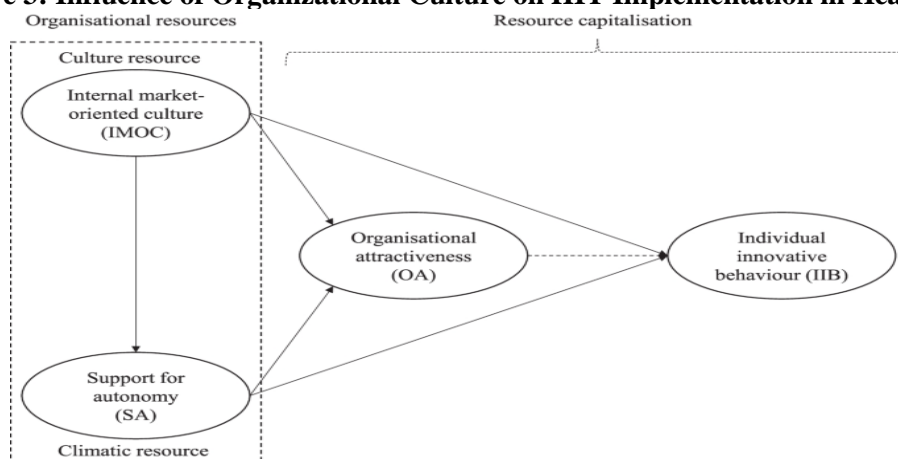
(Lshayib & Pawola, 2020).

Organizational Culture

The ability of the HIT implementation project to harness the correct type of organizational culture is one of the critical factors that influence the outcome of such initiatives. An innovation culture, networking, and constant improvement provide a fitting backdrop for HIT implementation. Leadership backing, good change management tactics, and straightforward communication outlets are the main factors that help overcome the hurdles of change and prepare the organization for HIT embracement. In addition, a data-driven culture that aims to improve quality also plays a crucial role in educating the implementation of HIT systems for optimizing personnel workflow and patient safety.

The paper also explains how HIT adoption can change workflow management and safety standards in nursing and pharmacy functions. Identifying these key factors, like system usability, user satisfaction, and organizational culture, will help healthcare institutions optimize the ADOHIT benefits and remove the probable challenges. The utilization of user-focused design, thorough training, maintenance of support, and the creation and maintenance of a silicon-valley-like culture of innovation and collaboration are significant techniques for the successful implementation and optimization of HIT in the healthcare sector. Nursing and pharmacy professionals can utilize continuous improvement initiatives and customer engagement to enhance HIT, improving patient care outcomes and health system performance.

Figure 3: Influence of Organizational Culture on HIT Implementation in Healthcare



(Moore et.al.2020).

CONCLUSION

Finally, reviewing HIT implementation reveals that changes are taking place in nursing and pharmacy practice, making them much more efficient and secure. The main contribution of HIT is enabling workflow effectiveness and patient safety. Integration of science into the literature showed that the HIT system, such as electronic health records (EHR), clinical decision support (CDS), and medication management technologies, facilitate the documentation process, communicate the interdenominational, and encourage the correct protocols for the utilization of the medications.

Significant findings point out that HIT usage is associated with distinct improvements in workflow insights; this is demonstrated by the fact that documentation time and administrative tasks have decreased significantly. However, superior human interface technology systems improve patient safety by centralizing patient information, reducing medication errors, and introducing pharmaceutical safety check-up measures. Even though problems like reminder fatigue and usability problems affect efficient EHR utilization, it is always a worthless effort for healthcare providers to keep training and supporting themselves to mitigate the adverse consequences of the challenges.

These results are crucial not only for conducting research but also for making policies in this field. Further studies should be directed towards utilizing such gaps that exist in existing literature, for example, the long-term effects of HIT implementation, and the influence of the organizational culture during the success of the adoption, and the strategies of risk mitigation for HIT risks. In addition, healthcare institutions should invest in user-oriented design involving stakeholders like providers and patients, comprehensive training conductions, and an effective change management strategy to achieve tremendous success in HIT adoption and benefits. Nursing staff and pharmacists can capitalize on HIT systems for the betterment of patient care, better-informed decisions related to clinical management, and increased medication safety. Along with incorporating evidence-based models, expanding a culture of innovation and engagement will make it possible for healthcare providers to benefit from all the potential HIT can give them when it comes to resolving clinical, patient procedure, and service quality matters.

RECOMMENDATIONS

Healthcare Organizations

- Invest in users, include them in the design process, and adjust nursing and pharmacy systems to align with their practice workflows.
- Train and support healthcare experts and other staff, such as nurses, to ensure proper use of HIT and reduce the probability of usability issues.
- Cultivate a microclimate of creativity and continuous updating to allow for intelligent adaptation and maximum use of HIT facilities.
- Develop basic change management frameworks, like clear communication and stakeholder engagement, to overcome hesitance to HIT implementation.

Policymakers

- Design and put policies and incentives in place to improve the adoption and optimization of healthcare organizations' healthcare technology systems to shore up hospital workflow efficiency and patient safety.
- Advocate for research-driven programs that target the existing gaps and offer objective assessments on the outcomes of health information technology (HIT) implantation in nursing and pharmacy practices.
- Promote the implementation of interoperability and data exchange protocols to facilitate the smooth Integration of HIT systems throughout healthcare settings. Interoperability assists in multi-organization care coordination.

Researchers

- Undertake longitudinal studies to evaluate whether workflow efficiency, patient safety, and clinical outcomes in nursing and pharmacy practice can remain steady during and after the improvement with HITs.
- Analyze how organizational culture, leadership buy-in, and user satisfaction among all people using the HIT systems may be dynamic factors in making them functional.
- Investigate methods for idealizing the usability of HIT, avoiding alert overload, and mitigating HIT safety to accomplish more effective system functioning.

AREAS FOR FUTURE RESEARCH

- Assessing the future impact of electronic health record health information technology (EHIH) on nursing and pharmacy practice.
- The role of the company's culture and managers' attitudes in successfully implementing IT technology.
- Strategies for usability and minimizing alert fatigue.
- Results of integrating HIT on clinical outcomes and patient reports.

- The last item will be checking the cost-efficiency of adopting HIT in healthcare facilities.

Through this holistic evaluation, the contribution of this literacy in the area of nursing and pharmacy's adoption of technology is very beneficial. With specified suggestions for actors involved and calls for more research on where efficiency can be improved, the review helps drive evidence-based decision-making and the whole process of improving healthcare systems through HIT integration and optimization.

REFERENCE

1. Moore, E. C., Tolley, C. L., Bates, D. W., & Slight, S. P. (2020). A systematic review of the impact of health information technology on nurses' time. *Journal of the American Medical Informatics Association*, 27(5), 798-807. <https://academic.oup.com/jamia/article-abstract/27/5/798/5803111>
2. Elshayib, M., & Pawola, L. (2020). Computerized provider order entry-related medication errors among hospitalized patients: An integrative review. *Health Informatics Journal*, 26(4), 2834-2859. <https://journals.sagepub.com/doi/abs/10.1177/1460458220941750>
3. Sittig, D. F., Wright, A., Coiera, E., Magrabi, F., Ratwani, R., Bates, D. W., & Singh, H. (2020). Current challenges in health information technology-related patient safety. *Health informatics journal*, 26(1), 181-189. <https://journals.sagepub.com/doi/abs/10.1177/1460458218814893>
4. Galt, K. A., Fuji, K. T., Kaufman, T. K., & Shah, S. R. (2019). Health information technology use and patient safety: study of pharmacists in Nebraska. *Pharmacy*, 7(1), 7. <https://www.mdpi.com/2226-4787/7/1/7>
5. Keenan, R., Borycki, E. M., & Kushniruk, A. W. (2021). Computerized provider order entry and patient safety: A scoping review. *Knowledge Management & E-Learning*, 13(4), 452. <https://search.proquest.com/openview/9fd56c8909589745d104b09e3be7c965/1?pq-origsite=gscholar&cbl=2046212>
6. Nguyen, Q., Wybrow, M., Burstein, F., Taylor, D., & Enticott, J. (2022). Understanding the impacts of health information systems on patient flow management: A systematic review across several decades of research. *PloS one*, 17(9), e0274493. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0274493>
7. Devin, J., Cleary, B. J., & Cullinan, S. (2020). The impact of health information technology on prescribing errors in hospitals: a systematic review and behaviour change technique analysis. *Systematic reviews*, 9, 1-17. <https://link.springer.com/article/10.1186/s13643-020-01510-7>
8. M. Boyd, A., & W. Chaffee, B. (2019). Critical evaluation of pharmacy automation and robotic systems: a call to action. *Hospital pharmacy*, 54(1), 4-11. <https://journals.sagepub.com/doi/abs/10.1177/0018578718786942>
9. Atasoy, H., Greenwood, B. N., & McCullough, J. S. (2019). The digitization of patient care: a review of the effects of electronic health records on health care quality and utilization. *Annual review of public health*, 40, 487-500. <https://www.annualreviews.org/doi/abs/10.1146/annurev-publhealth-040218-044206>
10. Salleh, M. I. M., Abdullah, R., & Zakaria, N. (2021). Evaluating the effects of electronic health records system adoption on the performance of Malaysian health care providers. *BMC medical informatics and decision making*, 21, 1-13. <https://link.springer.com/article/10.1186/s12911-021-01447-4>
11. Upadhyay, S., & Hu, H. F. (2022). A qualitative analysis of the impact of electronic health records (EHR) on healthcare quality and safety: Clinicians' lived experiences. *Health Services Insights*, 15, 11786329211070722. <https://journals.sagepub.com/doi/abs/10.1177/11786329211070722>
12. Darby, A. B., Su, Y., Reynolds, R. B., & Madlock-Brown, C. (2019). A survey-based study of pharmacist acceptance and resistance to health information technology. *Perspectives in health information management*, 16(Spring). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6462883/>
13. Modi, S., & Feldman, S. S. (2022). The value of electronic health records since the health information technology for economic and clinical health act: systematic review. *JMIR Medical Informatics*, 10(9), e37283. <https://medinform.jmir.org/2022/9/e37283/>
14. Aguirre, R. R., Suarez, O., Fuentes, M., & Sanchez-Gonzalez, M. A. (2019). Electronic health record implementation: a review of

- resources and tools. *Cureus*, 11(9).
<https://www.cureus.com/articles/21899-electronic-health-record-implementation-a-review-of-resources-and-tools.pdf>
15. Sami, S. A., Marma, K. K. S., Chakraborty, A., Singha, T., Rakib, A., Uddin, M. G., ... & Uddin, S. N. (2021). A comprehensive review on global contributions and recognition of pharmacy professionals amidst COVID-19 pandemic: moving from present to future. *Future journal of pharmaceutical sciences*, 7(1), 119.
<https://link.springer.com/article/10.1186/s43094-021-00273-9>
16. Li, E., Clarke, J., Ashrafian, H., Darzi, A., & Neves, A. L. (2022). The impact of electronic health record interoperability on safety and quality of care in high-income countries: systematic review. *Journal of medical Internet research*, 24(9), e38144.
<https://www.jmir.org/2022/9/e38144/>
17. Askari-Majdabadi, H., Valinejadi, A., Mohammadpour, A., Bouraghi, H., Abbasy, Z., & Alaei, S. (2019). Use of health information technology in patients care management: A mixed methods study in Iran. *Acta Informatica Medica*, 27(5), 311.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7085310/>
18. Kuper, K. M., Nagel, J. L., Kile, J. W., May, L. S., & Lee, F. M. (2019). The role of electronic health record and “add-on” clinical decision support systems to enhance antimicrobial stewardship programs. *Infection Control & Hospital Epidemiology*, 40(5), 501-511.
<https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/role-of-electronic-health-record-and-addon-clinical-decision-support-systems-to-enhance-antimicrobial-stewardship-programs/26B108ECAE506230B56236F30940F3E2>
19. Ayanlade, O. S., Oyebisi, T. O., & Kolawole, B. A. (2019). Health information technology acceptance framework for diabetes management. *Heliyon*, 5(5).
[https://www.cell.com/heliyon/pdf/S2405-8440\(18\)37101-9.pdf](https://www.cell.com/heliyon/pdf/S2405-8440(18)37101-9.pdf)
20. Watkinson, F., Dharmayat, K. I., & Mastellos, N. (2021). A mixed-method service evaluation of health information exchange in England: technology acceptance and barriers and facilitators to adoption. *BMC health services research*, 21, 1-13.
<https://link.springer.com/article/10.1186/s12913-021-06771-z>