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EFFECT OF HEALTH INFORMATION TECHNOLOGY ON REDUCING NURSES WORKLOAD IN EMERGENCY DEPARTMENT

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Abstract

Introduction: The escalating demands on emergency department (ED) staff, particularly nurses, necessitate innovative solutions to reduce workload and enhance patient care. Health Information Technology (HIT) has emerged as a promising avenue to achieve these goals. This systematic review aimed to assess the impact of HIT on reducing nurses' workload in EDS, focusing on interventional studies and clinical trials conducted in the last few years up to 2022.

Methods: A comprehensive search was conducted across PubMed, CINAHL, EMBASE, and the Cochrane Library, focusing on interventional studies and clinical trials from the last five years to 2022. Studies were included if they evaluated the impact Of HIT interventions (e.g., EHRs, CDSS, BCMA systems, and integrated monitoring systems) on nurses' workload in ED settings. The primary outcomes considered were reductions in documentation time, medication administration errors, and adverse drug events. Quality assessment and data extraction were performed systematically.

Results: Eight studies met the inclusion criteria, encompassing a variety of HIT interventions. Key findings included a reduction in documentation time by up to 25%, medication administration errors by 45%, and potential adverse drug events by 50%. These results demonstrate the significant potential of HIT to enhance operational efficiency and patient safety in emergency care. However, the effectiveness varied based on the type of technology and implementation strategy, underscoring the need for tailored HIT solutions.

Conclusions: HIT interventions significantly reduce nurses' workload and improve patient safety in EDS. The adoption of HIT, particularly EHRs, CDSS, BCMA systems, and integrated monitoring technologies, offers a viable strategy to address the Challenges faced by nursing staff in emergency settings. Future research should focus on overcoming implementation barriers and exploring the long-term benefits of HIT in diverse healthcare environments.

Keywords: Health Information Technology, Emergency Department, Electronic Health Records, Clinical Decision .

Introduction

The integration of Health Information Technology (HIT) into the emergency department (ED) has been a pivotal shift in modern healthcare, aiming to enhance patient care While optimizing nursing workflows. Studies have shown that the implementation of electronic health records (EHRs) and other HIT systems can significantly reduce the administrative burden on nurses, with some reports indicating a reduction in documentation time by up to 30% Furthermore, the automation of routine tasks, such as medication reconciliation and patient monitoring, has been credited with decreasing the time nurses spend on non-patient-facing activities by approximately 25% [2]. This shift not only improves efficiency but also allows nurses to dedicate more time to direct patient care, potentially increasing patient satisfaction scores by upto 15% [31.

The impact of HIT on patient safety and error reduction is equally noteworthy. The use of clinical decision support systems (CDSS) within the ED has been associated with a 20% reduction in medication errors [4], and barcode medication administration (BCMA) systems have further contributed to a 50% decrease in potential adverse drug events [5]. These technologies have been instrumental in enhancing the accuracy of patient care delivery, highlighting the critical role of HIT in mitigating risks associated with fast-paced emergency care environments. Additionally, HIT's role in facilitating real-time communication and information exchange has improved the coordination of care, with studies reporting a 40% enhancement in the timeliness of interventions However, the adoption of HIT is not without Challenges. The initial implementation phase can lead to temporary increases in workload and stress among nursing staff, with some studies noting

a 10-20% increase in perceived workload during the first few months post-implementation [7]. Despite these initial hurdles, the long-term benefits of HIT in reducing manual documentation and streamlining in workflows are undeniable. A survey among nurses reported a 35% decrease in overall stress levels and a 40% improvement in job satisfaction after adapting to new HIT systems [8]. The financial implications of HIT for healthcare institutions are also significant. While the upfront costs of HIT implementation can be substantial, the long-term savings associated with reduced paperwork, decreased medication errors, and improved patient outcomes are considerable. Research has estimated that the adoption of comprehensive HIT systems could save the healthcare industry between $30 billion to $40 billion annually through increased efficiency and reduced errors [9]. These savings underscore the economic viability and sustainability of integrating HIT into emergency departments.

Given the compelling evidence supporting the benefits of Health Information Technology in reducing nurses' workload and improving patient care in the emergency department, this review was conducted to systematically evaluate the existing literature on the topic. The aim was to assess the extent to which HIT interventions can alleviate the workload of nursing staff in ED settings, thereby enhancing both patient and staff outcomes. The review found that HIT not only significantly reduces the time nurses spend on administrative tasks but also improves the quality of patient care through enhanced safety measures and better communication [101.

Methods

The systematic review was meticulously designed to encompass a comprehensive search strategy, focusing on identifying interventional studies that evaluated the effect of Health Information Technology (HIT) on reducing nurses' workload in emergency departments. The search terms used were carefully selected to capture the broad spectrum Of HIT applications, including "Health Information Technology "Electronic Health Records," "Clinical Decision

Support Systems," "Barcode Medication Administration," "Nursing Workload," and "Emergency Department. " These terms were combined using Boolean operators to ensure a wideranging search. The search was conducted across several electronic databases, including PubMed, CINAHL, EMBASE, and the Cochrane Library, to ensure a thorough retrieval of relevant literature. The inclusion criteria were strictly defined to ensure the selection of studies that provided the most relevant and high-quality evidence. Only interventional studies conducted in the last five years up to 2022 were considered, to reflect the most current practices and technologies. Studies were required to focus specifically on the emergency department setting and report quantifiable outcomes related to nurses' workload, such as time spent on documentation, medication administration errors, or overall efficiency in patient care. Additionally, studies needed to be published in peer-reviewed journals and available in English.

Conversely, the exclusion criteria were designed to omit studies that did not meet the rigorous standards set for this review. Studies were excluded if they were observational or qualitative in nature, focused on settings outside the emergency department, or did not explicitly measure the impact of HIT on nursing workload. Literature reviews, editorials, and opinion pieces were also excluded, as the goal was to analyze primary research findings. Studies not available in full text or

published in languages other than English were additionally excluded to ensure the comprehensibility and applicability of the findings. The study selection process involved several steps to ensure the meticulous screening and evaluation of identified records. Initially, all search results were imported into a reference management software, where duplicates were removed. The titles and abstracts of the remaining studies were then screened against the inclusion and exclusion criteria by two independent reviewers. Discrepancies between reviewers were resolved through discussion or, if necessary, consultation with a third reviewer.

Studies that passed the initial screening were subjected to a full-text review, where the same inclusion and exclusion criteria were applied in detail to determine their eligibility for inclusion in the review. This step further narrowed down the selection to only those studies that directly addressed the research question and met all specified criteria. Finally, data extraction and quality assessment were performed on the included studies. Relevant information such as study design, setting, sample size, intervention details, and key outcomes related to nurses' workload was systematically extracted using a standardized form. The quality of each study was assessed using an appropriate appraisal tool, considering factors such as bias, validity, and reliability of findings. This rigorous methodology ensured that the systematic review was based on high-quality evidence, providing reliable insights into the impact of Health Information Technology on reducing nurses' workload in emergency departments.

Results and discussion

The results section of this systematic review synthesizes findings from eight interventional studies and clinical trials that assessed the impact of Health Information Technology (HIT) interventions on reducing nurses' workload in emergency departments. The included studies, conducted between the last few years and 2022, varied considerably in design, sample size, and types ofHIT interventions examined. Sample sizes across these studies ranged from as few as 30 participants to over 200, reflecting diverse research contexts and scales of implementation.

Several types of HIT interventions were explored across the included studies. These ranged from the implementation of comprehensive Electronic Health Records (EHR) systems [11], advanced Clinical Decision Support Systems (CDSS) [12], to Barcode Medication Administration (BCMA) systems [13], and integrated patient monitoring systems [14]. Each study aimed to evaluate how these technologies could alleviate the workload Of nursing staff in emergency departments.

The effectiveness of these interventions varied, with all studies reporting a reduction in nurses' workload to varying degrees. One study [l l] demonstrated that the implementation of an EHR system significantly reduced the time nurses spent on documentation, with a reported decrease of 25% (95% CI: 15-35%). Another study [12] on CDSS reported a reduction in medication administration errors by 45% (RR: 0.55, 95% CI: 0.33-0.77), indicating a substantial improvement in patient safety alongside workload reduction. The introduction of BCMA systems [13] was associated with a 50% decrease in potential adverse drug events (RR: 0.50, 95% Cl: 0.28-0.89). Comparatively, studies exploring the integration of patient monitoring systems [14] highlighted a significant improvement in the efficiency of patient care, reducing the time nurses spent on manual patient observations by approximately 30% (95% CI: 2040%). This not only reduced the workload

but also allowed nurses more time for direct patient care activities. Across the board, the studies exhibited a trend towards significant improvements in operational efficiency and patient care quality due to HIT interventions. However, the magnitude of these benefits varied based on the specific technology implemented and the context of the emergency department. Some studies, such as those focusing on EHRs [l Il and BCMA systems [13], presented more pronounced benefits in terms of workload reduction and error mitigation, respectively. In contrast, interventions like CDSS [12] and integrated monitoring systems [14] showed a broader range of impacts, including enhanced clinical decision-making and patient monitoring efficiency.

This comparative analysis of the included studies reveals a promising outlook for the role of HIT in emergency departments. Despite the variation in outcomes, the collective evidence underscores the potential of HIT interventions to significantly alleviate the workload of nursing staff, improve patient safety, and enhance the overall efficiency of emergency care. These findings support the continued exploration and adoption of HIT solutions in emergency care settings to address the challenges of nursing workload and patient care delivery. In the discussion of the systematic review, the findings from the eight included interventional studies and clinical trials underscore the significant impact of Health Information Technology (HIT) on reducing nurses' workload in emergency departments. These results reveal a compelling narrative when juxtaposed with outcomes from other interventions in the medical literature aimed at similar objectives. The reduction in documentation time reported by one of the included studies [11], approximately 25%, aligns closely with findings from other literature, where interventions like workflow optimization and staffing adjustments have yielded reductions ranging from 15% to 30% [19, 201. However, the HIT interventions seem to offer a more sustainable and long-term solution by integrating technology into daily operations, as opposed to temporary or fluctuating adjustments in staffing or manual processes.

Similarly, the decrease in medication administration errors by 45% [12] in our review surpasses results from studies focusing on traditional educational or policy-driven interventions, which report reductions of around 20-35% [21, 221. This highlights the effectiveness of HIT, specifically CDSS and BCMA systems, in providing a more reliable and consistent means of reducing errors compared to more conventional approaches. The risk reduction associated with adverse drug events, detailed in the included studies [131, showing a 50% decrease, also outperforms many non-technological interventions reported in the literature, where the average risk reduction hovers around 30-40% [23, 241. This discrepancy underscores the potential of HIT to significantly enhance patient safety in emergency care settings.

The efficiency improvements in patient monitoring, with a time reduction of about 30% [14], are particularly notable when compared to improvements reported in the literature for interventions like manual patient observation enhancements, which typically see time savings of 10-20% [25, 26]. This further supports the argument that integrating advanced monitoring technologies can free up significant amounts of nursing time for direct patient care, beyond what is achievable through more traditional methods. Moreover, the variance in the effectiveness of different HIT interventions observed in the included studies reflects a nuanced landscape where the choice of

technology and its implementation context can greatly influence outcomes. While the literature corroborates the general effectiveness of HIT [27 , 28], it also suggests that not all technologies are equally beneficial in all settings, emphasizing the importance of tailored solutions. In synthesizing these comparisons, it becomes evident that HIT interventions not only hold their ground but often surpass traditional methods in reducing nurses' workload and improving patient safety. The risk differences observed between the included studies and those from broader literature reinforce the critical role of technology in transforming emergency department operations. However, it also prompts a discussion on the need for careful selection, implementation, and adaptation of HIT solutions to specific emergency care environments to maximize benefits. This review, therefore, contributes to the growing body of evidence advocating for the adoption of HIT as a cornerstone in the strategy to alleviate nursing workload and enhance patient care in emergency departments. The comparative advantage of HIT interventions, as demonstrated through this analysis, offers a compelling case for their prioritization in healthcare planning and investment [25, 28].

The strengths of this systematic review lie in its comprehensive and rigorous methodology, which strictly included interventional studies and clinical trials conducted in emergency departments focusing on the impact of Health Information Technology (HIT) on nurses' workload. By concentrating solely on recent studies from the last few years up to 2022, the review ensures relevance and applicability to current clinical practice. Additionally, the diversity of HIT interventions examined, including Electronic Health Records (EHR), Clinical Decision Support Systems (CDSS), Barcode Medication Administration (BCMA) systems, and integrated patient monitoring systems, provides a broad perspective on the potential benefits of technology in emergency care settings. This wide-ranging analysis offers valuable insights for healthcare providers considering the adoption of HIT solutions, highlighting specific areas where technology can significantly reduce workload and improve patient safety.

However, the review is not without limitations. The exclusive focus on interventional studies and clinical trials, while ensuring high-quality evidence, may also exclude valuable insights from observational or qualitative studies that could offer a deeper understanding of the practical challenges and user experiences associated with implementing HIT in emergency departments. Additionally, the variation in study designs, settings, and outcome measures across the included studies introduces heterogeneity, making it challenging to generalize findings across different healthcare contexts. The review's geographical scope, primarily limited to studies published in English, may also omit relevant research conducted in non-English speaking regions, potentially skewing the applicability of conclusions to a global audience.

Conclusions

This systematic review highlights the significant potential of Health Information Technology interventions to reduce nurses' workload in emergency departments, with documented reductions in documentation time by up to 25%, medication administration errors by 45%, and potential adverse drug events by 50%. These findings underscore the effectiveness of HIT in enhancing

operational efficiency and patient safety, offering a compelling argument for its broader adoption in emergency care.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of the studies assessed the impact of HIT on reducing nurses' workload in EDS,

study ID	Sample	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	123	Nurses in a tertiary care ED	EHR system implementation	Documentation time reduced by 25% (95% Cl; 1535%)	EHR significantly reduced documentation workload.
[12]	75	ED nursing staff at a community hospital	CDSS for medication safety	Medication administration errors reduced by 45% (RR: 0.55, 95% Cl: 0.33-0.77)	CDSS effectively minimized medication errors.
[13]	201	Nursing team in a high-volume urban	BCMA system deployment	Adverse drug events decreased by 50% (RR: 0.50, 95% Cl: 0.28-0.89)	BCMA system significantly reduced adverse drug events.
[14]	89	ED nurses at a pediatric hospital	Integrated patient monitoring system	Time spent on patient monitoring reduced by 30% (95% Cl: 20-40%)	Integrated monitoring improved patient care efficiency.
[15]	157	Nursing staff in a mixed	EHR with enhanced user interface	Documentation accuracy	Enhanced EHR interface improved documentation

		adult and pediatric ED		improved by 40% (95% Cl: 30-50%)	accuracy and efficiency.
[16]	63	Emergency nursing team in a rural hospital	Mobile health technology for patient triage	Patient triage time decreased by 20% (95% Cl: 10-30%)	Mobile technology expedited patient triage processes.
[171	111	Nurses in a specialized trauma center ED	Automated alert system for lab results	Response time to Critical lab results improved by 35% (95% Cl: 25-45%)	Automated alerts for lab results enhanced timely clinical decisions.