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Transforming nursing care: The impact of information and communication technologies

Noura Abdullah Alkharji
KSA, National Guard Health Affairs

Nora Mohammed Aldosary
KSA, National Guard Health Affairs

Wejdan Amein Abdullah
KSA, National Guard Health Affairs

Jehan Khelaif Alanazi
KSA, National Guard Health Affairs

Maha Mosleh Albugami
KSA, National Guard Health Affairs

Amani Abdulmohsen Alshammari
KSA, National Guard Health Affairs

Lila Muteb Almutairi
KSA, National Guard Health Affairs

Mubarak Saud Alanazi
KSA, National Guard Health Affairs

Reham Mohammad Alsoulaimi
KSA, National Guard Health Affairs

Ghadeer Ghazi ALKhabbaz
KSA, National Guard Health Affairs

Nahid Ahmad Lamfon
KSA, National Guard Health Affairs

Wael Ibrahim AlGhanim
KSA, National Guard Health Affairs

Email Address: akk29337@gmail.com
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Anoud Saud Alanizi
KSA, National Guard Health Affairs

***Abstract*---Background:** The integration of Information and Communication Technologies (ICTs) in healthcare, termed eHealth, is transforming nursing practices. These technologies encompass electronic health records (EHRs), computerized decision support systems (CDSSs), and telehealth, among others, and promise to enhance the efficiency, accuracy, and communication in nursing care. **Aim:** This study aims to evaluate the impact of ICTs on nursing practices, focusing on their influence on nursing care performance indicators and patient outcomes. **Methods:** An overview of systematic reviews was conducted, adhering to the Cochrane Collaboration methodology and the PICOS framework. The study included qualitative, mixed-method, and quantitative reviews from 1995 onwards, focusing on the impact of ICTs on nursing care. Data extraction and quality assessment were performed using the AMSTAR tool, and a narrative synthesis approach was employed due to study heterogeneity. **Results:** Of 6187 titles screened, 22 reviews met the inclusion criteria. ICTs were found to impact time management, patient care, and documentation quality. Positive effects included improved access to patient information and enhanced communication. However, challenges such as increased documentation time and the need for adaptation to electronic systems were noted. **Conclusion:** ICTs have a significant impact on nursing care, offering opportunities to improve patient outcomes and streamline clinical processes. The Nursing Care Performance Framework (NCPF) provides a comprehensive model to understand these impacts, but further research is needed to optimize ICT use in nursing.

***Keywords*---** eHealth, Information and Communication Technologies, Nursing Care, Electronic Health Records, Computerized Decision Support Systems, Telehealth, Nursing Care Performance Framework

Introduction

eHealth, or the use of information and communication technologies (ICTs) in healthcare, provides a way to improve the delivery of healthcare [3, 2]. The way nurses organize, execute, record, and assess clinical care has been completely transformed by these tools, and this revolution is certain to continue as long as technological breakthroughs persist. The process of obtaining and evaluating diagnostic data, making clinical choices, interacting and communicating with patients and their families, and carrying out clinical interventions will all be profoundly changed by the incorporation of ICTs into nursing practice [4,5]. ICTs come in many forms and are used to assist and provide healthcare. Information systems, computerized decision support systems (CDSSs), management systems, and communication systems are the four primary domains of eHealth that Mair et al. [6] defined. Electronic health records (EHRs) and electronic medical records

(EMRs) are examples of patient-related administrative or clinical tasks that are made easier to obtain, store, transmit, and display with the use of management systems. Communication systems can help in the diagnosis, management, counseling, teaching, and support of healthcare professionals as well as between professionals and patients. These systems include telemedicine and telecare systems in addition to email and cell phones. Healthcare personnel can use CDSSs—automated decision-support systems—on their computers, smartphones, or personal digital assistants (PDAs) to help them make decisions and follow clinical guidelines and treatment pathways. Information systems that use Internet technology to give access to health-related information sources include web-based resources and eHealth portals.

Adopting a wide range of ICTs is possible to assist the diverse and complicated practices and interventions in nursing, however not without difficulties. ICTs that help in planning and documenting nursing care, such as computerized nursing care plans and EHRs, also improve patient information access [7]. Nurses must switch from maintaining paper records to electronic ones in order to implement these technologies, and electronic documentation elements like copy and paste, drop-down menus, and electronic interfaces may affect accuracy and critical thinking [8]. Another example of a telehealth technology is videoconferencing, computer-mediated communications, and remote patient monitoring [9]. In order to respond effectively to each patient's condition, nurses participating in remote patient monitoring (telemonitoring) must evaluate huge amounts of data (e.g., vital signs, symptoms) and apply clinical decision skills [10]. When interacting through technology modalities, effective communication skills like questioning, redirecting, active listening, and verifying are still essential [11–13].

ICTs are enabling nurses to provide high-quality healthcare. As a result, it is crucial to look at how nurses use ICTs in the clinical setting [3] and how ICTs affect nursing practices [14]. The everyday practice of nurses can be revolutionized by the use of ICTs in direct or indirect patient care [3]. Various ICTs, including EHRs [15], CDSSs [16], and nursing computerized records systems [17], have been the subject of certain systematic evaluations. These assessments, however, frequently lacked a precise definition of nursing practice or nursing care as well as a conceptual framework for considering the potential effects of ICTs on nursing care indicators. In order to bridge this disparity, we utilized a comprehensive understanding of nursing care that is grounded in the Nursing Care Performance Framework (NCPF) [18], providing a multifaceted outlook on nursing care. The patient's condition, nursing services, and nursing resources are the three interrelated subsystems that make up the NCPF. In order to generate nursing services that effectively improve patients' circumstances, it is defined as "the capacity demonstrated by an organization or an organizational unit to acquire the needed nursing resources and use them in a sustainable manner" ([18], p. 6). However, because of the diversity of ICTs utilized in the literature and the inadequate conceptualization of nursing care, there is a dearth of comprehensive knowledge about the effects of ICTs on nursing care. To create a complete picture of the nursing care indicators that the use of ICTs could either enhance or limit, we performed an overview of systematic reviews. When comparing and contrasting the findings of different reviews [19] about the

beneficial, detrimental, and neutral effects of ICTs on nursing care, an overview is a useful place to start.

In conclusion, the integration of information and communication technologies (ICTs) in nursing care has the potential to significantly transform healthcare delivery. The adoption of eHealth tools, such as electronic health records (EHRs), computerized decision support systems (CDSSs), and telehealth technologies, enhances the efficiency and accuracy of nursing practices. These technologies facilitate better documentation, improved access to patient information, and more effective communication between healthcare providers and patients. However, the transition from traditional to electronic systems poses challenges, including the need for nurses to adapt their documentation methods and maintain critical thinking skills. Despite these challenges, the overall impact of ICTs on nursing care is promising, offering opportunities to improve patient outcomes and streamline clinical processes. Further research and systematic reviews are necessary to fully understand and optimize the role of ICTs in nursing practice, ensuring that these technologies are leveraged to their fullest potential for the benefit of patients and healthcare systems.

Nursing Care Performance Framework:

An organizational model called the Nursing Care Performance Framework (NCPF) was used to explain how ICT interventions affected nursing care and health outcomes [18]. The NCPF integrates the most recent developments in the field and is in line with the most important projects that try to conceptualize nursing care delivery. Drawing from system theory [20], Donabedian's seminal work on healthcare organization [21], and Parsons' theory of social action [22], this conception is grounded in a systems approach. 14 dimensions and 51 indicators make up the model.. It shows how three nursing subsystems—resources, processes or services, and patient outcomes—interact to fulfill three main functions: (1) obtaining, allocating, and maintaining nursing resources; (2) converting nursing resources into nursing services; and (3) producing improvements in patients' conditions as a result of the nursing services rendered ("nursing-sensitive outcomes"). The first function deals with the material and human resources—staffing levels, working conditions, staff retention, and economic sustainability—that are required for providing excellent nursing care. The nursing practice environment (such as nurse autonomy and collaboration), nursing processes (such as problem and symptom management, assessment, care planning, and evaluation), nurses' job satisfaction, and patient experiences are all included in the second function. The improvement of patients' situations is the intended result of these exchanges. "Nursing-sensitive outcomes," or the beneficial improvements seen in patients, are referred to as the third function.

The 51 indicators cover all significant aspects of nursing care performance and include the information that is currently supported by the scientific literature. The NCPF offers an integrative and systemic framework that goes beyond a simple list of indicators. This framework has been used in recent research to examine several aspects of nursing care [23, 24]. For example, in order to find indicators relevant to ambulatory nursing, the NCPF organized a scoping review [23]. The assessment resulted to the creation of five new indicators and showed how

flexible the framework was for mobile nursing care. Additional study is advised by the NCPF authors in order to assess the framework's use in various nursing care scenarios [18]. This overview is an attempt to use the NCPF for the first time in organizing and interpreting the nursing care indicators that are impacted by ICTs. Using the NCPF is expected to validate present indicators, create new indicators tailored to ICT contexts, and maybe update existing indicators. Our goal in compiling this summary was to extract pertinent facts for nurses. A systematic review was excluded, for instance, if it described nursing resources, services, or procedures alone and did not assess patient outcomes. Patient outcomes, or nursing-sensitive outcomes, were considered only if they had to do with how nurses used ICTs.

Methodology

The protocol for this overview has been registered on PROSPERO (CRD42014014762) and published previously [25]. Following the Cochrane Collaboration methodology [26] and other relevant works in this field [19,27], the overview was developed using the PICOS framework (participants, interventions, comparisons, outcomes, study design) [28,29]. The study included all qualitative, mixed-method, and quantitative reviews published in French, English, or Spanish from January 1, 1995, that aimed to evaluate the impact of ICTs (across four eHealth domains) used by nurses on nursing care. Including multiple methodological approaches aimed to broaden the understanding of ICTs' influence on nursing care. The target populations included registered nurses (RNs), nurses in training, nursing students, and patients receiving care from RNs through ICTs. The interventions focused on ICTs within the four eHealth domains identified by Mair et al. [6]: management systems, communication systems, computerized decision support systems (CDSSs), and information systems. Excluded ICTs were purely administrative nurse management systems, educational systems unless applied to direct patient care, and telephone systems, as they are not considered digital technologies by most definitions [30,31].

A medical librarian crafted and conducted the search strategies, drawing from similar reviews and using well-established search filters where appropriate. Searches were conducted in English, French, or Spanish within several electronic databases, including the Cochrane Database of Systematic Reviews, Epistemonikos, PubMed, Embase, Web of Science, and CINAHL, covering publications from January 1, 1995, to the specified end dates for each database. Structured search strategies utilized thesaurus terms (e.g., Medical Subject Heading (MeSH) for PubMed) and free text targeting the "title" and "abstract" fields. Adaptations were made for each database, and results were consolidated into a single reference database with duplicates removed. Two reviewers (GR, JPG) independently screened titles and abstracts to determine eligibility. Publications not meeting inclusion criteria were excluded. Full-text copies were retrieved and assessed by the same reviewers, with discrepancies resolved through discussion. A third reviewer was available for arbitration when consensus was not reached.

Three reviewers (GR, JPG, EH) were responsible for data extraction and management. Information from each review was independently extracted by two reviewers, with disagreements discussed and resolved among them. The third

reviewer was involved in case of unresolved disagreements. Extracted data included objectives, review type, number of included studies, search dates, population, setting, eHealth domain, types of ICTs, intervention examples, comparisons, primary and secondary outcomes, review limitations, and authors' conclusions. A data extraction form was developed based on the NCPF [18] and the scope of nursing practice [32], with modifications made during the extraction process to include additional dimensions or result categories. Google Sheets facilitated teamwork and communication among reviewers. The final data extraction grid was reviewed to eliminate discrepancies and errors. The methodological quality of eligible reviews was assessed using the AMSTAR tool [33,34] by the three reviewers. Each review was independently assessed by two reviewers, with disagreements discussed and the third reviewer available for arbitration if needed. AMSTAR's 11-item checklist evaluates methodological criteria, such as the comprehensiveness of the search strategy and quality assessment of included studies. AMSTAR rates quality on three levels: high (8-11 points), medium (4-7 points), and low (0-3 points) [36]. Although AMSTAR is primarily for quantitative reviews using randomized controlled trial designs, it was applied to all reviews for consistency, despite its limitations for mixed-method and qualitative reviews.

A statistical meta-analysis was not feasible due to the heterogeneity of included studies. Instead, a narrative synthesis approach was used, summarizing and explaining outcomes using words and text [39]. This approach categorizes reviews into subgroups based on intervention type and their effects (positive, negative, or no effect) on specific dimensions of nursing care (e.g., practice environment, nursing processes, professional satisfaction, and nursing-sensitive outcomes). This synthesis aims to “tell the story” of the outcomes from the included studies, providing a comprehensive understanding of ICTs' impacts on nursing care.

Results

In the beginning, 6187 titles or abstracts were found. After duplicate references were eliminated, the eligibility of 5515 titles or abstracts was assessed. A thorough assessment required obtaining 72 articles' full-text publications. Of these, 22 reviews that were published between the years 2002 and 2015 met the requirements for qualifying. The Multimedia Appendix 2 contains a list of these reviews. Nine reviews used a quantitative technique, twelve used a mixed-method synthesis approach, and one used a qualitative approach (meta-ethnography). The main reasons fifty reviews were rejected were because their primary outcomes (n = 24) were not relevant to nursing care, or their outcomes (n = 13) were identical to those of other groups. Details on the main grounds for exclusion as well as the complete references of the excluded publications are included in Multimedia Appendix 3. Multimedia Appendix 4 provides specifics on the general attributes (such as review type, search dates, target population, and healthcare settings) of the included reviews. Multimedia Appendix 5 summarizes the review's goals, constraints, and key findings. The eHealth domains that were covered were CDSSs (n=10), management systems (n=14), and communication systems (n=7). Not a single information systems-focused evaluation. Five reviews [3, 41–44] covered more than one eHealth domain. ICTs including computer-based nursing records, computerized nursing care planning, electronic medical/health/patient

records, and regional healthcare information systems were reviewed in articles about management systems. ICTs such as email and mobile phones, bedside communication aids, iPod technology for educational seminars, and videophones or videoconferencing for telemedicine and telehealth were examples of communication systems. Medication management technologies, e-prescribing, computerized provider order entry (CPOE), bar-code medication administration (BCMA), electronic medication administration record systems, and PDAs were all covered by CDSSs. Depending on their constituent parts, these eHealth services frequently cover several domains [6]. Multimedia Appendix 6 contains further information regarding eHealth domains, examples of included interventions, and comparisons.

Quality Assessment of Reviews:

The methodological quality of each review was assessed using the AMSTAR technique. Nine reviews were assessed as medium quality (scores: 4-7), nine as low quality (scores: 0-3), and four, mostly quantitative reviews, were classified as high quality (scores: 8-9). Two of the AMSTAR tool's criteria (#7 and #9) were modified in order to evaluate the caliber of mixed-method and qualitative evaluations. "Yes" was indicated for criterion 7—reporting and assessment of the scientific quality of included reviews—if authors recognized the challenges in evaluating qualitative or mixed-methods reviews as well as evaluated and documented the quality of quantitative reviews. The review authors made a statement regarding the inappropriateness of pooling data (e.g., highlighted issues about heterogeneity or variability between the studies), summarized and synthesized the available evidence narratively according to a defined analysis plan and/or using appropriate qualitative methods and techniques (e.g., construction of common rubrics, content analysis, tabulation, groupings, and clustering)." For criterion 9, which concerns the inappropriateness of methods used to combine findings, "yes" was indicated based on decision rules developed by Kitsiou et al. [45]: There is a dearth of empirical data in qualitative research on the evaluation of publishing bias, which is criteria 10 [46]. It is presumed that mixed-method reviews follow the same rules.

Information and Communication Technologies Affect Nursing Care Dimensions
The function, dimension, and theme of the results are displayed in relation to the NCPF and may or may not correlate to a particular indicator in the framework. Eleven reviews [15, 16, 43, 44, 47, 48, 51, 53, 56, 58, 60] in total contained information about time management, including time saved or consumed by using ICT, time spent on patient care, and time spent documenting.

Time Administration

"Time management" was covered in general in four evaluations [43,44,48,53] that focused on CDSSs, communication, and management systems: two reviews [44,53] indicated good impacts, one found no effect [48], and one review identified negative effects [43]. According to Nieuwlaat et al. [48], nurses thought both CDSSs and traditional care took the same amount of time (no effect). Reminder systems were deemed to be "time-consuming" in another evaluation [43]. According to Poissant et al. [53], electronic health records (EHRs) changed

workflow and encouraged nurses to become proficient system users by cutting down on time spent verbally exchanging information at the end of a shift. According to Bowles and Baugh [44], telehomecare has a favorable effect on "saving time."

Timing Dedicated to Patient Care:

A third of the reviews (7/23) [16,43,47,51,56,58,60] talked about the effects of CDSSs, management systems, and communication systems on the amount of time spent on patient care—both favorable [16,47,56,58] and negative [43,51,56,60], as well as no effect [43,51,58]. Concerns about BCMA or electronic nursing documentation potentially cutting down on patient care time were raised in several reviews [43, 56]. On the other hand, other reviews discovered that time spent on patient care was greatly increased by communication systems (like telehomecare) and management systems (like EHRs) [16,47,56,58], with nurses utilizing EHRs devoting more time to patient assessment, education, and communication [58].

Time for Documentation:

Seven reviews [15, 16, 43, 47, 53, 56, 60] that involved management systems including EHRs, e-prescribing systems, and CCIS addressed nurse documentation time. These ICTs had a varied impact on documentation time; six reviews [15,16,47,53,56,60], six reviews [15,16,43,47,53,60], and three reviews [43,47,60] had no effect at all. Positive results revealed that documentation time decreased with ICTs, however negative results showed that management systems increased documentation time. Sometimes, the time saved on paperwork was put to better use helping patients, leading to better health results [15]. On the other hand, longer documentation times meant less time could be spent on patient care [60].

Function 2: Creating Services Out of Resources:
Practice Environment for Nurses:
Updating and Utilizing Knowledge:

While one review found no effect [17], three indicated favorable effects [17, 44, 54] of CDSSs and communication systems on knowledge updating and use. By enhancing adherence to recommendations, CDSSs have been shown to improve knowledge utilization and the practical application of research findings [17]. Effective nursing knowledge transfer has also been documented to occur through communication systems (telehomecare, for example) [44, 54].

Quality and Access of Information:

After CDSSs in two evaluations [17,43], management systems were the most covered eHealth domain in terms of information quality and access, having been covered in four reviews [43,57,58,60]. Following the deployment of EHRs, an evaluation revealed improvements in the information quality as reported by physicians and nurses [58]. Improved information availability was noted in five evaluations [17, 43, 57, 58, 60], and three reviews [43, 57, 60] noted the benefits

of management systems and CDSSs in relation to patient issues, clinical data, and other information. Negative effects, however, were observed in two investigations [58,60], wherein computerized nursing recording systems made it difficult to obtain crucial patient care information.

Autonomy of the Nurse :

Positive mention of nurse autonomy was found in just one review. According to this analysis [59], nurses who used a tele-triage system for patients with chronic heart failure managed the majority of cases on their own and only referred patients to doctors in dire circumstances.

Collaboration Across and Within Professions:

With regard to CDSSs [17], communication systems [42,59], and management systems [43,52,60], four reviews indicated favorable effects on intra- and interprofessional collaboration, one revealed a negative effect [43], and one found no effect [60]. Interprofessional teams' communication was boosted by CDSSs [17], doctor-nurse interactions were strengthened by telehomecare systems [59], and more frequent collaboration was made possible by management systems [52]. However, one analysis found that electronic nursing documentation systems had a negative effect on the cooperative working relationships between nurses and doctors [60].

Medical Procedures:
Skills and Competencies of Nurse:

Decision support, observational skills, clinical judgment, and critical thinking were among the competences and skills that four reviews found that CDSSs and management systems favorably benefited [17,43,56, 60]. Clinical judgment and decision-making were enhanced by features including data readability, remote data access, improved patient record quality, reminders, and automated alerts [43, 56]. On the other hand, some ICT elements limited nurses' ability to think critically [60]. According to one analysis, CDSSs had little bearing on clinical judgment or knowledge related to pressure ulcer prevention [17].

Documentation Quality:

Positive effects on the quality of the documentation were noted in six reviews [3,15,43,56,58,60], the majority of which involved management systems. Three reviews [15, 56, 60] reported negative impacts, and one review [41] found no effect. By giving a thorough picture of the patient's condition, positive documentation quality enhanced patient care and safety [56]. EHRs were criticized, meanwhile, for failing to record important facets of psychological support and nursing care [15, 56].

Patient-Nurse Relationship:

According to three reviews, communication technologies (such videophones and telehomecare) have a favorable effect on Nurse-patient relationships have been

documented in [44, 59, 61], but a review [60] brought attention to the detrimental effects of electronic nursing documentation systems on these relationships and communication.

Discussion

In reference to the NCPF's principal duty, which is to obtain, allocate, and preserve nursing resources, a number of evaluations have emphasized results about "time." Time management, the amount of time spent on patient care, and documentation time were all impacted by the integration of ICTs. This element is also related to the NCPF's "maintenance and economic sustainability of the nursing workforce" component [18]. Economic sustainability places a strong emphasis on productivity and the optimization of outputs from a given set of inputs by highlighting the importance of preserving high-quality resources at a minimal cost. This means cutting back on the amount of nursing duties, supplies, and tools without sacrificing the standard of nursing care. Thus, the "time" dimension concerns the ways in which ICTs might influence resource use, staff productivity, and time management. While time is an interesting consequence of the nursing system as a whole, it does not immediately illustrate how ICTs might change or assist nursing activities in their professional practice. We do not advise concentrating future study on "time" to comprehend the impact of ICTs on nursing care, particularly on nursing procedures, in light of our findings.

Additional dimensions and indicators pertaining to the first function of the NCPF, such as nursing staff supply, which encompasses both quantity and quality indicators, were not examined in this analysis. It would be instructive, for example, to look into whether the number of nurses needed to provide nursing services is impacted by the availability of ICTs in particular healthcare settings. Investigating whether ICTs act as barriers that prevent nurses from improving their working circumstances or as facilitators or motivators to do so would be another important topic of research. How much can ICTs help establish welcoming environments that draw in and keep nurses? ICT use had a positive, if frequently indirect, impact on recruitment and retention in 9 out of 13 studies, according to a systematic review [62] looking at the impact of ICTs on healthcare professionals' recruitment and retention. ICTs' effects on nurse retention were also investigated in a qualitative study [63], which revealed a range of outcomes, including minimal, ambiguous, or indirect beneficial consequences.

The practice environment, nursing procedures, and the professional satisfaction of nurses are all included in the second function of the NCPF, which is the conversion of nursing resources into nursing services. The "actual scope of nursing practice" instrument was the source from which themes like "communication and care coordination" and "knowledge updating and utilization" were taken, rather than being directly stated in the NCPF [32]. Explicit subindicators are absent from the NCPF nursing processes, although the indicator "scope of practice" is there. ICTs can enhance nursing work by easing access to a variety of information sources and clinical data, according to an analysis of the issue of "information quality and access" as it relates to nurses' practice environments. On the other hand, the subject of "quality of documentation" relates more to nursing activities than the practice setting. The

organizational procedures that establish the nursing practice context and moderate its results are closely related to the treatments that nurses can provide [64, 65]. These procedures, which fall under the category of interventions, sustain a professional atmosphere and assist nursing work [66]. Our hypothesis is that having access to thorough patient data could improve nursing procedures including assessment, planning, evaluation, and documentation quality. This would improve coordination of care and communication, leading to better patient outcomes. A noteworthy observation was that nurse autonomy with regard to ICT use was only highlighted in one evaluation [59]. To fully grasp how ICTs might define and support nurse autonomy, more research is required. These technologies may also prove to be crucial teaching resources in practice settings.

The entire range of nursing practice is encompassed by the NCPF model, including care coordination, discharge planning, problem and symptom management, assessment, planning, and evaluation. The model's actions and procedures serve to conceive these components. When viewed through the lens of a healthcare practitioner, these procedures document the technical aspects of patient care and demonstrate the ability of nurses to address patient requirements by demonstrating how far they can mobilize their competences within the parameters of their practice [18]. According to our research, not many studies provided a detailed description of NCPF processes. The themes that were mentioned the most, however, were assessment, care planning, and evaluation; these were followed by patient and family education, communication, and care coordination. To investigate how ICTs might affect or assist other nursing procedures like symptom and issue management, health promotion and sickness prevention, and discharge planning, primary studies are required. It was discovered that nurses' viewpoint on the quality of treatment and their level of satisfaction or unhappiness with ICT use are the two aspects that make up their professional satisfaction as a result of nursing procedures. Other characteristics of professional satisfaction that are not covered in the reviews are included in the NCPF, such as getting enough time done on assignments and enjoying what they do for a living.

Because our inclusion criteria focused on the effects of ICT on nursing resources and services, patient outcomes—which are considered nursing-sensitive outcomes—were underrepresented in our overview. Therefore, only when nurse outcomes were reported were patient outcomes taken into account. As a result, in cases where patient outcomes were connected to nurses' use of ICT and the NCPF's secondary purpose (nursing services and procedures), they were included as primary outcomes. Systematic study was done by Dubois et al. [67] to determine priority indicators for assessing the contributions of nurses to the quality of care. According to their findings, pressure ulcers, medication administration errors, catheter-associated urine infections, and falls—all of which fall under the NCPF's "risk outcomes and safety" dimension—are the nursing-sensitive outcomes that are most commonly studied. Although there have been a number of systematic reviews on the effects of ICTs on patient outcomes (68–71), these evaluations may not have looked at how ICTs affect nurse services and procedures (the NCPF's second purpose) in relation to patient outcomes.

Opportunities and Limitations:

There are various advantages to this summary. First of all, a medical librarian created and implemented a thorough search strategy. Secondly, three reviewers carried out the data extraction and quality assessment independently. Thirdly, the NCPF served as a guide for the data extraction process, which made it easier to organize and analyze the findings and to think critically about how ICTs can affect different facets of nursing care. Time management, time spent on patient care and documentation, information quality and access, documentation quality, knowledge updating and utilization, communication and care coordination, and nurse and patient satisfaction or dissatisfaction with ICTs were among the new, redefined, or modified dimensions and indicators proposed by the framework. Fourthly, debriefing meetings were organized to address theme presentation inside the NCPF structure after one of the NCPF authors (CAD) closely examined the analysis and interpretation of the results.

There are restrictions, though. Other writers have pointed out that the review authors' level of depth reduced the amount of information that was available [27, 72]. Significant inferences on specific ICT influences on nursing care indicators were hampered by insufficient information about ICTs (features, components, contexts of use, and practice areas) and their impact on nursing care dimensions. As a result, it was difficult to classify the findings within the NCPF. To comprehend how distinct ICTs in particular practice areas affect different nursing care dimensions and indicators, more study is needed.

Thirdly, it was difficult to distill the essence of the subject from data from systematic reviews. It was challenging to ascertain whether nurses' usage of ICTs changed their practices or if they only thought that technology will transform their surroundings and way of working. Certain results associated with ICTs are labeled as "barriers," however it's not clear if these refer to consequences of ICT usage or barriers to ICT use. Despite the fact that numerous systematic studies address factors that influence nurses' use and acceptance of ICTs [31,73–75], they don't go into detail about how ICTs actually affect nursing practice.

Fourthly, although though AMSTAR was initially created for quantitative reviews employing RCT designs, we used it to evaluate the methodological quality of qualitative and mixed-method reviews. As such, care should be taken while interpreting the results. A review of a systematic review can yield biased results because of its constraints, which include population, intervention (ICT types), review types, and outcome heterogeneity, even though it offers a broad perspective. We suggest creating a unified instrument to assess all review kinds using an identical metric for next studies and methodological advancements. The methodological quality rating of AMSTAR must be interpreted cautiously, given its limits for qualitative and mixed-method studies. It is important to recognize that there are no set gold standards or criteria for this kind of work. Because of this, mixed-method and qualitative evaluations begin with lower scores by design, which makes it more difficult to assess bias and methodological constraints [76].

Conclusion

The integration of Information and Communication Technologies (ICTs) into nursing practice has substantially transformed healthcare delivery, enhancing the efficiency and accuracy of nursing care. Technologies such as Electronic Health Records (EHRs), Computerized Decision Support Systems (CDSSs), and telehealth tools have facilitated better documentation, improved access to patient information, and more effective communication among healthcare providers and patients. These advancements support the delivery of high-quality healthcare by enabling nurses to make informed clinical decisions, thereby improving patient outcomes. However, the transition from traditional paper-based systems to electronic ones presents challenges, including the need for nurses to adapt to new documentation methods while maintaining critical thinking skills. The time required for documentation can increase, potentially reducing the time available for direct patient care. The Nursing Care Performance Framework (NCPF) offers a structured approach to understanding the impacts of ICTs on nursing care, highlighting the interconnections between nursing resources, services, and patient outcomes. While ICTs generally have a positive impact on nursing practices, the complexity and variety of these technologies necessitate ongoing research to fully understand and optimize their use. Systematic reviews indicate that ICTs can enhance collaboration within and across professional boundaries, improve the quality and accessibility of information, and support the autonomy and decision-making skills of nurses. Nevertheless, the effective implementation of ICTs requires addressing issues related to user interface design, integration into existing workflows, and adequate training for healthcare professionals. In conclusion, ICTs hold great promise for transforming nursing care by improving clinical processes and patient outcomes. However, to leverage these technologies to their fullest potential, healthcare systems must address the challenges associated with their implementation and use. Future research should focus on identifying best practices for ICT integration in nursing, ensuring that these tools enhance rather than hinder the delivery of patient-centered care.

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تحويل رعاية التمريض: تأثير تقنيات المعلومات والاتصالات

الملخص

الخلفية: إن دمج تقنيات المعلومات والاتصالات (ICTs) في الرعاية الصحية، الذي يعرف بـeHealth ، يُحدث تحوّلاً في ممارسات التمريض. تشمل هذه التقنيات السجلات الصحية الإلكترونية(EHRs) ، وأنظمة دعم القرار المحوسبة(CDSSs) ، والرعاية الصحية عن بُعد، وغيرها، وتعد بتحسين الكفاءة والدقة والاتصال في رعاية التمريض

الهدف: تهدف هذه الدراسة إلى تقييم تأثير تقنيات المعلومات والاتصالات على ممارسات التمريض، مع التركيز على تأثيرها على مؤشرات أداء رعاية التمريض ونتائج المرضى

الطرق: تم إجراء مراجعة شاملة للنقد المنهجي، مع الالتزام بمنهجية تعاون كوكرين وإطار .PICOS تضمنت الدراسة مراجعات نوعية ومختلطة وكميّة منذ عام 1995، تركز على تأثير تقنيات المعلومات والاتصالات على رعاية التمريض. تم استخراج البيانات وتقييم الجودة باستخدام أداةAMSTAR ، وتم استخدام نهج التركيب السردي نظراً لتباين الدراسات .

النتائج: من بين 6187 عنوانًا تم فحصها، استوفت 22 مراجعة معايير الإدراج. وُجد أن تقنيات المعلومات والاتصالات تؤثر على إدارة الوقت، ورعاية المرضى، وجودة التوثيق. تشمل الآثار الإيجابية تحسين الوصول إلى معلومات المرضى وتعزيز التواصل. ومع ذلك، تم ملاحظة تحديات مثل زيادة وقت التوثيق والحاجة إلى التكيف مع الأنظمة الإلكترونية .

الاستنتاج: لتقنيات المعلومات والاتصالات تأثير كبير على رعاية التمريض، حيث توفر فرصًا لتحسين نتائج المرضى وتبسيط العمليات السريرية. يوفر إطار رعاية التمريض (NCPF) نموذجًا شاملاً لفهم هذه التأثيرات، لكن هناك حاجة إلى المزيد من البحوث لتحسين استخدام تقنيات المعلومات والاتصالات في التمريض .

الكلمات المفتاحية: الصحة الإلكترونية، تقنيات المعلومات والاتصالات، رعاية التمريض، السجلات الصحية الإلكترونية، أنظمة دعم القرار المحوسبة، الرعاية الصحية عن بُعد، إطار أداء رعاية التمريض