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IMPACT OF THE INTEGRATION AND USE OF INFORMATION TECHNOLOGIES BY NURSE MANAGERS IN THE MANAGEMENT OF NURSING SERVICES

Andreia Cristina Costa Magalhães

Specialist Nurse in Rehabilitation Nursing, São João Local Health Unit

Carina Alexandra Marques Ferreira

Nurse, Northeast Local Health Unit

Sandra Carla Vasconcelos Lopes Guimarães Neto

Specialist in Medical-Surgical Nursing, Paços de Ferreira Prison

Sónia Isabel Martins Gomes Pereira

Master's Degree in Child and Pediatric Health Nursing, Specialist in Child and Pediatric Health Nursing, Portuguese Institute of Oncology of Porto Francisco Gentil



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Abstract: Introduction: Information and communication technologies (ICT) are present in the practice of nurse managers. They are a vital tool for the performance of their duties and the definition of action strategies. **Objective:** To assess the impact of the integration and use of information technologies by nurse managers in the management of nursing services. **Methodology:** Systematic review of the literature, based on the *Joanna Briggs Institute* methodology. Search conducted in the *CINAHL®* and *MEDLINE Complete* databases. **Results:** ICTs allow easy access to information and correct decision-making. They promote improvement in continuity of care, increase user safety, and allow for maximization of service management. **Conclusion:** Nurse managers are aware of the importance of ICT and consider that the use of multiple information systems overloads their performance. In management, videoconferencing and email are the resources most used by nurse managers.

Keywords: Nurse Managers; Health Information Systems; Information and Communication Technologies; Nursing Services Management

INTRODUCTION

Information is of great importance in today's societies, with technological innovation being one of the main forces of economic, social, and human development. In the health sector, with a management model focused on budgetary, rational, and quantitative criteria, there is growing concern with the development of efficient information and communication technologies (ICT) that enable the maximization of service management and promote improvements in

the continuity of health care. ICT makes healthcare organizations more efficient and contributes to innovation in healthcare markets (Santos, 2019). It is considered one of the pillars of organizational success, enabling the operationalization of processes and easy access to various data sources, as well as proving to be extremely useful in the implementation of management activities (Vaz & Landeiro, 2022).

The nurse manager coordinates one of the largest professional groups in the health sector. In Portugal, they have management skills that ensure the professional and ethical practice of the team they lead. They work to implement continuous improvement and excellence in nursing care, ensuring the professional practice of evidence-based care (Martins et al., 2020). With the use of these types of tools, it is expected that nurse managers will be available to perform other functions, namely, to be with their employees and to take on the assessment and coordination of care. It should also be noted that the information generated by these applications can serve as a basis for the production of quality and efficiency indicators and thus optimize management processes. Through valid, reliable, and comparable information, it is possible to promote intelligent and capable management in nursing (Pereira, 2009).

Thus, this review aims to assess the impact of the integration and use of information technologies by nurse managers in the management of nursing services.

DEVELOPMENT

Currently, in modern societies, technology, computerization, and communication are of great importance. Information drives

human and organizational activities and is of great importance in decision-making and problem-solving (Zunkowski et al., 2021). Technological developments in recent years, which are increasingly present in everyday life, have enabled a change in the way healthcare organizations and their professionals work, particularly nurse managers.

Healthcare organizations face increasing pressure to improve their processes in order to provide evidence of the quality, efficiency, and effectiveness of their services. The implementation of ICT has enabled new forms of knowledge and communication that are fundamental to maximizing service management, as they enable better planning of action strategies at the operational, tactical, and top management levels for decision-making and change, for modernization and innovation, for the provision of effective, safe, and quality care, as well as for the improvement of the population's health standards (Vaz, 2020).

Portuguese healthcare institutions have undergone several reforms and restructuring processes and have made significant investments in ICT, particularly in clinical information systems (Directorate-General for Health, 2015). They currently offer a wide range of tools to professionals, such as telemedicine, clinical databases, email communication with users, virtual information libraries, medication prescriptions, test interpretation, work schedule distribution, and results reporting, among others (Vaz & Landeiro, 2022).

The instruments developed generate new challenges and opportunities, assist and support clinical practice, are strategic resources for the management of health organizations (Pereira, 2009), and are fundamental elements for optimizing the fi-

nancing of health organizations, taking into account their productivity. They enable the design of strategies to mitigate weaknesses and maximize the strengths of the organization (Gomes, 2018). They facilitate and transmit information quickly, easily, and securely (Farokhzadian, et al., 2020; Peltonen et al., 2018).

The support and cooperation of nurse managers in introducing new health technologies is essential (Laukka et al., 2020; Peltonen et al., 2018). Within a healthcare organization, nurse managers have the most contact with clinical practice and work closely with the constraints of healthcare services. Thus, their commitment and contribution are relevant to this new reality in healthcare (Vaz, 2020).

Nowadays, ICTs are present in most of the tasks performed by nurse managers and are a vital tool, used in real time, for performing management functions and defining action strategies. In the exercise of their activities, nurse managers participate in the identification and implementation of policies, ensure the integration and application of information systems, and promote the integration of information technologies into nursing processes as a strategy for the continuous improvement of the quality of nursing care (Regulation No.º 101/2015, 2015). Furthermore, nurse managers are expected to have skills that go beyond the aforementioned scope, as they are responsible for, among other things, promoting team empowerment and motivation, ensuring the quality of care, and monitoring indicators.

Based on the above, it is important to map knowledge about the impact of the integration and use of ICT by nurse managers in the management of nursing services, i.e.,

to know which, how, and in what ways ICT assists nurse managers in the management process, as well as the benefits, challenges, and implications associated with this technological integration.

Methodology

This article aims to map knowledge about the impact of the integration and use of information technologies by nurse managers on improving the management of nursing services. A systematic review of the literature was conducted and, for better organization of the information, the research was based on the guidelines and methodology of the *Joanna Briggs Institute Reviewer (JBI Manual for Evidence Synthesis, 2021)* and the PRISMA – *Flow Diagram* model (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (Page et al., 2021).

The research question was formulated as follows: “What is the impact of the integration and use of information technologies by nurse managers on the management of nursing services?” based on the PICo model, where the population refers to nurse managers, the intervention concerns the integration and use of information technologies by nurse managers, and the *outcome* refers to the impact of these resources on the management of nursing services.

An initial exploratory search was conducted to identify keywords and free terms. Subsequently, MeSH descriptors were defined, organized using the Boolean operators *AND* and *OR*, and the Boolean phrase was constructed (Table 1). The search was conducted using the scientific content aggregator *EBSCOhost web*. The databases used were: *CINAHL® Complete* and *MEDLINE Complete*. The inclusion criteria for

this search were: articles written in Portuguese or English, with full text and addressing nursing management. A total of 328 articles were found. After removing duplicates, the titles and abstracts were analyzed by two independent reviewers (peer review strategy). Sixteen articles were obtained. The articles were read in full. Five articles were included in the final sample. The process of identifying and including articles is outlined using the PRISMA *Diagram flow* (Figure 1) (Page, et al., 2021).

RESULTS AND DISCUSSION

The articles selected and analyzed are mostly descriptive longitudinal studies. A total of 328 articles emerged. After reading them in full, the final sample consisted of five articles, four of which were published in Europe and one in the United States. The samples consist of nurse managers from various work contexts, and all articles aim to reflect on the impact of the integration and use of information technologies by nurse managers in the management of nursing services. The selected articles and their respective results are presented in tables to facilitate the mapping and understanding of the extracted data (Table 2 attached).

Excellence in the quality of care is a constant concern in the health sector. It is therefore essential to evaluate and monitor the provision of health care, which makes it possible to identify weaknesses and opportunities for improvement. The production of health indicators that are sensitive to nursing care, allows data to be translated and organized in order to generate actions aimed at improving performance. It can provide guidance for innovative management and

Descriptors	<p>“nurs* administrators” or “nurs* administrator” or “nurs* managers” or “nurs* manager” or “nurs* executives” or “nurs* executive”</p> <p>“healthcare evaluation mechanisms” or “health information systems” or “nursing information systems” or “management information systems” or “clinical information systems” or “clinical decision support systems” or “clinical decision supports” or “clinical decision support” or “hospital information systems” or “multi-hospital information systems” or “nursing informatics” or “health care technology” or “health technology” or “clinical informatics” or “health informatics” or “health information technology”</p> <p>“charge nurs*” or “management improvement” or “health management” or “administration of health services” or “nurs* administration improvement” or “nurs* leaders” or “head nurs*” or</p> <p>“supervisory nurs*” or “nurs* administration” or “nurs* care management”</p>
Boolean phrase	((“nursing administrators”) OR (“nursing administrator”) OR (“nursing managers”) OR (“nursing manager”) OR (“nursing executives”) OR (“nursing executive”)) AND ((“healthcare evaluation mechanisms”) OR (“health information systems”) OR (“nursing information systems”) OR (“management information systems”) OR (“clinical information systems”) OR (“clinical decision support systems”) OR (“clinical decision supports”) OR (“clinical decision support”) OR (“hospital information systems”) OR (“multi-hospital information systems”) OR (“nursing informatics”) OR (“health care technology”) OR (“health technology”) OR (“clinical informatics”) OR (“health informatics”) OR (“health information technology”)) AND ((“charge nurs*”) OR (“management improvement”) OR (“health management”) OR (“administration of health services”) OR (“nurs* administration improvement”) OR (“nurs* leaders”) OR (“head nurs*”) OR (“supervisory nurs*”) OR (“nurs* administration”) OR (“nurs* care management”)))

Table 1 – Table showing MeSH descriptors, free terms, and Boolean phrases

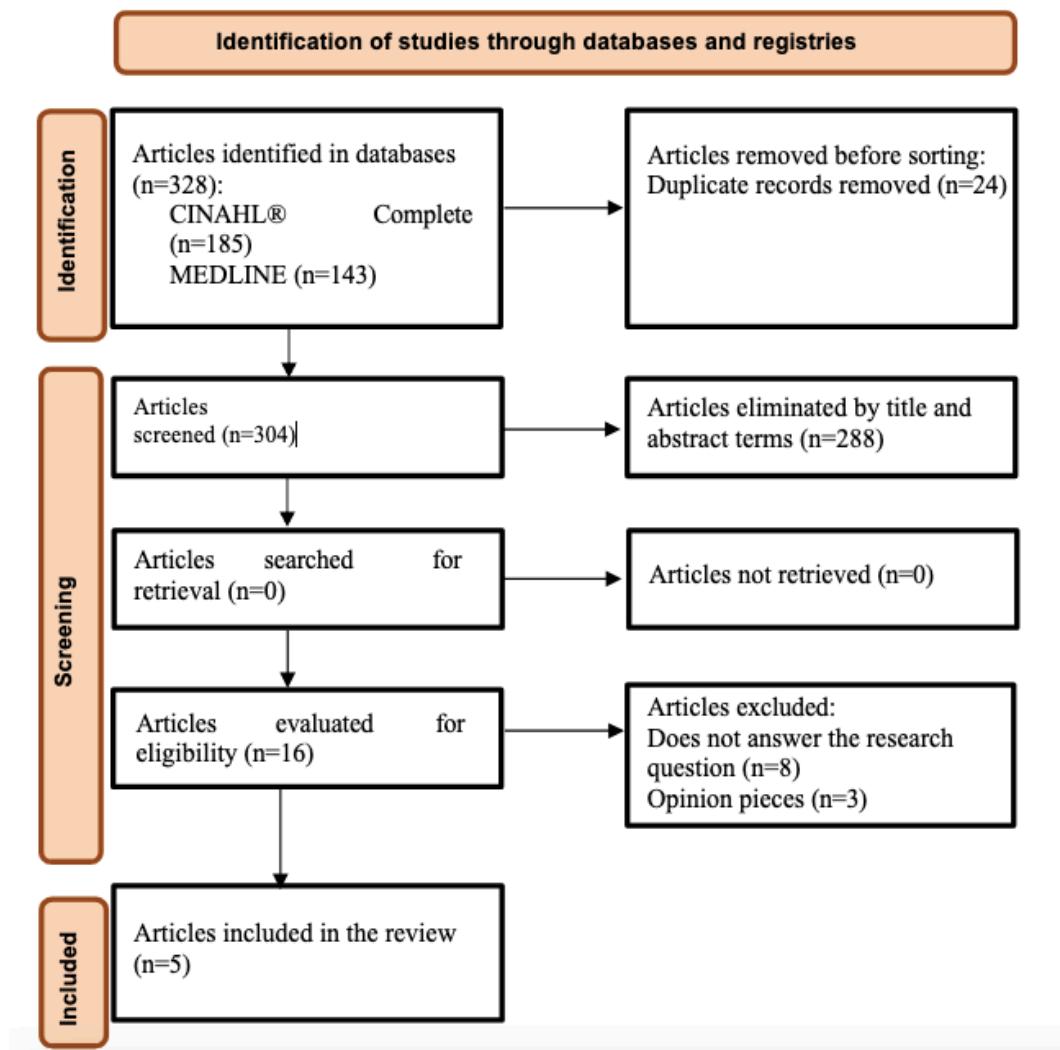


Figure 1 – Process of identification and inclusion of articles – PRISMA Diagram flow (Page, *et al.*, 2021)

contribute to nursing as a science, as it facilitates research and decision-making (Lobo, 2015).

ICT should provide concrete, authentic, transparent, and comparable information to promote structured and capable management (Pereira, 2009). It is the responsibility of nurse managers to extract information provided by ICT that is relevant for the production and analysis of quality and efficiency indicators that contribute to the optimization of the management process (Vaz & Lumini, 2022), particularly with regard to the organization and management of work processes, the reorganization of care models, the adjustment of nurse ratios, and the determination of training needs (Lobo, 2015). Consequently, nurse managers spend less time on administrative tasks and have more time available to be close to the team and to coordinate and evaluate care. They improve strategic planning, reporting, and project development (Peltonen et al., 2018; Vaz & Landeiro, 2022).

Farokhazadian, et al., (2020), in a study on nurses' experiences and opinions regarding the benefits of adopting ICT, concluded that information technologies play an important role in providing necessary and valid information for the decision-making process. They facilitate team performance evaluation by providing nurse managers with valid information to control, monitor, and evaluate the tasks of professionals. They promote quality improvement actions through audits and accreditation through inter-organizational communication. They simplify the production of statistics, which are beneficial for decision-making and allow for the adoption of timely, logical, and specialized policies. They also enable the timely detection of gaps through quick access to fi-

nancial and organizational reports. Thus, it is important for nurse managers to be aware that the successful applicability of ICT is directly dependent on its correct use (Laukka et al., 2020; Peltonen et al., 2018). Vaz & Landeiro, 2022, consider that nurse managers must be equipped with skills that allow them to fully and correctly take advantage of ICT in their management activities. They must have an open mind to digitization in the age of information and communication.

Laukka et al. (2020) identified that managers in the health sector perform functions that contribute to the implementation of and adherence to ICT by providing training time and technical support. They reported the following functions: 1) support, which is understood as motivating the use of ICT and manager-employee partnerships; 2) agent of change, in which leaders, through the implementation of and motivation for ICT adoption, are able to develop new routines, functions, and responsibilities, as well as organize workflow. This saves time, improves the quality of nursing care, and improves communication between professionals. It is their role to list the advantages of using ICT and mitigate identified resistance. The commitment and knowledge of the nurse manager in the use of ICT acts as a motivational and success factor in its implementation; 3) project managers and decision-makers, who are responsible not only for the decision to implement ICT, but also for planning its implementation. They are agents of change in that they possess the knowledge and skills that enable successful implementation in the pursuit of better health outcomes; 4) advocate role, as the use of ICT promotes user safety. Nurse managers seek to ensure the best use of the resources at their disposal and play a decisive

role in encouraging the adoption and use of ICT (Vaz, 2020). A proactive approach to the use of technologies ensures significant improvements in multidisciplinary and organizational communication, as well as in work processes, excellence in care, quality of life, and user safety.

However, numerous ICTs are needed to support decision-making. Nurse managers are aware of the importance of ICT in leadership, regardless of the leadership styles adopted. However, they consider that the use of multiple information systems (various applications, websites, and other tools) to perform management tasks and support decision-making overloads their performance and sometimes leads to duplication of information. It would be important to review information systems, reduce sources for obtaining important information, and centralize all information on a single platform in order to improve access to information and effectively support the regular operations of nurse managers (Sharpp et al., 2020; Peltonen, et al., 2018). Despite technological developments, the management of nursing services is complex. The large number of technological tools available and existing deficiencies in interoperability can compromise support for strategic planning and lead to inadequate resources.

In relation to the ICT available to support nurse managers, email, intranet, and S-Clínico were mentioned. Email was identified as the technological resource most used by nurse managers. It is important for clinical practice and information management. This was followed by the intranet, discussion groups, and video conferencing. The latter is useful for information management and training. Email and the intranet

facilitate human resource management (Vaz & Lumini, 2022).

It was found that the articles analyzed make no mention of human resource management platforms, such as those related to schedule production. This type of ICT allows nurse managers to distribute the necessary human resources in an appropriate and rational manner, as well as to comply with legal requirements. They enable the creation of a work schedule that complies with the maximum permitted working hours and alerts managers to any irregularities in its implementation. The use of this type of technology allows for the creation of a work schedule that promotes quality and safety for users, satisfaction for nurses, and prevents absenteeism and work overload. These applications are available at any time, anywhere, with access for both nurse managers and nurses, as long as there is computer equipment (computer, tablet, cell phone).

With regard to platforms that assist in the management and procurement of medicines, clinical consumables, hotel supplies, foodstuffs, and maintenance and conservation materials, there was also no evidence of their contribution to nurse managers. These types of goods and resources must be scaled based on the consumption of clinical services, and if they are not well managed, they can interfere with or even block the action of services and interfere with the quality of care provided. Nurse managers can directly influence efficiency, as they have the ability to rationalize spending and organize the use of materials, identify where resources are being spent most, and try to optimize their use. It is the nurse manager's responsibility to ensure the availability of all these materials.

So that there are no obstacles to the provision of nursing care. We believe that this type of application reduces costs and guarantees the quality of the services and care provided. Effective management of these materials contributes to economic benefits for healthcare institutions and reduces healthcare costs.

No evidence was found in the articles analyzed regarding performance evaluation and ICT. The evaluation of nurses is an individual performance evaluation model for a given period. There are platforms to support nurse managers, in which objectives and behaviors are mentioned in an orderly and clear manner. These platforms are accessible to nurse managers and employees. Monitoring employee *performance* allows nurse managers to take various actions: making informed decisions regarding the allocation of incentives, identifying training needs, promoting research, promoting the profession, and affirming its social value.

The use of ICT is essential for nurse managers, but it cannot replace the importance of leadership, relationships, and critical-reflective thinking (Sharpp, et al., 2019).

FINAL CONSIDERATIONS

Advances in the profession require informed and innovative nursing leaders who value data collection and use it to improve sustainable healthcare services.

In practice, we realize that the operationalization of ICT is challenging for nurse managers and has several advantages, starting with the fact that it allows immediate access to up-to-date and accurate information. Easy and quick access to different content enables adequate management planning

and the consequent optimization of work processes and decision-making support; it fosters continuity, organization, and adequacy of quality care; it contributes to time management; it enables the improvement of workflows; it enables the applicability of algorithms, standards, and guidelines; it reduces costs. Problems and errors are identified in real time, allowing for quick and appropriate action in selecting strategies to correct identified gaps, bring about change, and act in areas that need improvement.

For nurse managers, they are a useful tool that allows them to identify human resource needs, produce useful indicators for performance evaluation, define health policies (Vaz & Lumini, 2022), and represent the profession socially. They aggregate authentic databases that guide research and knowledge production, which brings visibility and value to nursing.

The current systematic review of the literature provides a comprehensive overview of the impact of the integration and use of ICT by nurse managers in the management of nursing services. Based on the literature reviewed and our critical reflection, we can conclude that the existence of ICT has advantages and disadvantages for nurse managers. The use of ICT allows easy access to information, enables continuity of care, supports correct decision-making, increases user safety, provides sensitive indicators for nursing care, reduces costs and waiting times, and allows real-time interaction between the user and healthcare professionals. It also promotes communication and involvement. On the downside, we consider that ICT is slow to navigate, with limited parameterization, and nurse managers have to resort to different platforms to make as-

sertive decisions, which can sometimes condition decision-making.

Regarding the reference to specific management platforms, namely in human resources management, specifically performance evaluation or materials management, there was no evidence of their use by nurse managers.

It is also important to mention the limitations of this study. The use of only freely accessible databases may have excluded relevant publications. On the other hand, there is also the possibility that articles were excluded due to the selection of indexing terms and keywords defined in the search strategy implemented.

Furthermore, the fact that there is only one Portuguese study included in this systematic review of the literature, due to the methodology defined, and the lack of evidence regarding ICTs that assist Portuguese nurse managers, motivates opportunities for subsequent research. More Portuguese studies should be promoted on this topic, especially on the specification of ICTs that assist nurse managers, their advantages and disadvantages, and how they promote the effective management of their work processes, as well as their contribution to the area of research/training.

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