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ARTIGO DE INVESTIGAÇÃO (ORIGINAL)

Electronic health records kept by nurses in perioperative care

Registos eletrónicos de saúde realizados pelos enfermeiros no cuidado à pessoa em situação perioperatória

Registros electrónicos de salud realizados por los enfermeros cuando atienden a personas en situaciones perioperatorias

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Abstract
Background: Electronic health records kept by nurses when caring for perioperative patients are essential for ensuring the quality and safety of care.
Objective: To identify the nursing focuses and interventions reported by nurses in electronic health records when caring for perioperative patients.
Methodology: A retrospective observational study was conducted in the Central Operating Room and the Ambulatory Surgery Unit. The nursing documentation in the electronic health records kept from December 2016 to December 2022 were analyzed, in a total of 50,732 nursing focuses and 451,003 interventions.
Results: The most frequently identified nursing diagnoses in nursing records were hypothermia (35.5%) and surgical wound (34.7%). Nursing interventions with referential integrity were of the *observing* type.
Conclusion: Th nursing records about perioperative patients in the health information system focus on surveillance parameters related to safety and infection during the intraoperative period.

Keywords: perioperative nursing; perioperative care; health information systems; electronic health records

Resumo
Enquadramento: Os registos eletrónicos de saúde realizados pelos enfermeiros no cuidado à pessoa em situação perioperatória são fundamentais para a garantia da qualidade e segurança dos cuidados.
Objetivo: Identificar os focos e intervenções identificados pelos enfermeiros nos registos eletrónicos de saúde no cuidado à pessoa em situação perioperatória.
Metodologia: Estudo observacional retrospetivo, realizado no serviço de Bloco Operatório Central e na Unidade de Cirurgia Ambulatória, com recurso à análise da documentação de enfermagem nos registos eletrónicos de saúde no período de dezembro de 2016 a dezembro de 2022. Foram analisadas 50.732 focos de enfermagem e 45.1003 intervenções no sistema de informação eletrónico.
Resultados: Nos registos de enfermagem os diagnósticos de enfermagem mais frequentemente identificados são a hipotermia (35,5%) e ferida cirúrgica (34,7%). As intervenções de enfermagem com integridade referencial centram-se no âmbito do observar.
Conclusão: Os registos de enfermagem no cuidado à pessoa em situação perioperatória no sistema de informação de saúde em uso centram-se em parâmetros de vigilância relacionados com a segurança e infeção durante o período intraoperatório.

Palavras-chave: enfermagem perioperatória; cuidados perioperatórios; sistemas de informação de saúde; registos eletrónicos de saúde

Resumen
Marco contextual: Los registros electrónicos de salud que utilizan los enfermeros para atender a las personas que reciben cuidados perioperatorios son fundamentales para garantizar la calidad y la seguridad de los cuidados.
Objetivo: Identificar los focos y las intervenciones identificadas por los enfermeros en los registros de salud electrónicos cuando atienden a personas en situaciones perioperatorias.
Metodología: Estudio observacional retrospectivo realizado en la Unidad de Quirófano Central y en la Unidad de Cirugía Ambulatoria, analizando la documentación de enfermería en los registros electrónicos de salud desde diciembre de 2016 hasta diciembre de 2022. Se analizaron un total de 50.732 focos de enfermería y 451.003 intervenciones en el sistema electrónico de información.
Resultados: En los registros de enfermería, los diagnósticos de enfermería más frecuentemente identificados son la hipotermia (35,5%) y las heridas quirúrgicas (34,7%). Las intervenciones de enfermería con integridad referencial se centran en observar.
Conclusión: Los registros de enfermería para cuidados perioperatorios en el sistema de información sanitaria en uso se centran en parámetros de vigilancia relacionados con la seguridad y la infección durante el periodo intraoperatorio.

Palabras clave: enfermería perioperatoria; cuidados perioperatorios; sistemas de información sanitaria; registros clínicos electrónicos

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Introduction

The use of electronic health records by perioperative nurses has become routine over the years as a result of technological advances in healthcare.
As documentation systems, information systems should facilitate the sharing of information, decision-making, and the continuity and quality of care. Health information systems should be optimized to facilitate documentation practices and support nurses (Usselman et al., 2015).
Nursing documentation gives visibility to the care provided to perioperative patients and, consequently, demonstrates nurses' professional performance.
As perioperative electronic health record databases continue to evolve and expand, nurses require standardized documentation to ensure data integrity and reliability. Improving the understanding of the perioperative environment through the electronic records is an excellent contribution to ensuring the quality of care (Colquhoun et al., 2020). Perioperative nurses have specialized knowledge and skills to care for patients in the operating room and maintain their stability, safety, and comfort before, during, and after surgery. Health records are an integral part of their responsibilities (Qualey, 2023).
The electronic health records kept by nurses include the identification of health aspects relevant to nursing practice (focuses), nursing diagnoses, and interventions. This research project aims to contribute to the identification of nursing focuses and interventions that meet the real needs of perioperative patients, thus contributing to the continuous improvement of the quality of care, with a significant impact on health gains.
Therefore, based on the research question, the following objective was defined: to identify the nursing focuses and interventions identified by nurses in electronic records when caring for perioperative patients.
The results of this study will provide insight into the value of electronic nursing records and information systems (IS) in enhancing the quality of nursing care and optimizing service management.

Background

Perioperative nursing is increasingly faced with challenges resulting from the complexity of surgical procedures, the perioperative care associated with these procedures, the successive technological advances in this area, and the increase in the comorbidities of perioperative patients.
Perioperative nursing, with its current competencies, is the result of advances in health technologies and in nursing as a discipline and profession (Cabrita, 2021). Therefore, perioperative nurses must have specialized knowledge and skills to care for patients in the operating room and maintain their stability, safety, and comfort before, during, and after surgery (Regulamento n.º 429/2018, de 16 de julho).
In the Quality Standards for Specialized Care in Medical-Surgical Nursing, the Portuguese nursing regulator (Ordem dos Enfermeiros [OE], 2017) defines a perioperative patient as any individual who, throughout their life cycle, requires, chooses, or agrees to undergo surgical and anesthetic procedures.
Perioperative nurses should have critical-reflective thinking, specific skills, and differentiated practices to care for perioperative patients, promote patient safety throughout the surgical process, and carry out their work as part of a multidisciplinary team with the capacity and competence to provide interdependent and autonomous perioperative care while ensuring their quality (Vogelsang et al., 2020).
The health/illness transition experienced by perioperative patients has a significant impact on their recovery, so nurses play a leading and facilitating role in this transition by accompanying them throughout this process (Mota et al., 2018). Therefore, it is essential to enable patients to gain more knowledge about their surgical process and promote their autonomy in their postoperative recovery.
Among the basic concepts of this theory are nursing therapies, which include interventions and their purposes (Meleis, 2007). "Nursing therapies allow nurses to identify the best action to maintain and promote health, in response to the health aspects relevant to nursing practice" (Mota et al., 2018, p. 20). The same authors also state that it is essential to identify the nursing diagnoses and interventions carried out by nurses in order to understand their purpose (Mota et al., 2018).
The documentation kept by nurses in the nursing records gives visibility to the care provided and the nurse's performance as a professional, making it an essential tool in ensuring the provision of excellent nursing care. Therefore, nursing documentation also contributes to research studies that support evidence-based practice.
Information sharing is essential to ensure quality and continuity of nursing care. The purpose of health records is to share all relevant information about the care provided and to be provided to the patient, thereby ensuring continuity and quality of care.
According to the Quality Standards for Nursing Care, "the existence of a nursing record system that systematically incorporates, among other data, the client's nursing care needs, the nursing interventions, and the nursing-sensitive outcomes obtained by the client" is fundamental (Ordem dos Enfermeiros, 2012, p. 18).
The use of computer systems to manage information has optimized and increased the efficiency of health professionals' practices, not only because of access to information, but also because data is not duplicated and information is more accurately recorded. The correct use of information makes it possible to achieve health gains for the patients through better diagnoses/interventions resulting from the better information available.
Electronic health records offer an opportunity to reflect on clinical nursing judgment and give visibility to nursing care (Rossi et al., 2022). Thus, it is essential to develop tools to support perioperative management and quality assurance in all actions to plan, perform, maintain, and promote the safety of patients and the surgical environment (Wu et al., 2017).
This study emerges from a need felt by the researcher, as a perioperative nurse, to understand the concept of perioperative nursing care, given that health/nursing information

systems do not yet specifically cover this environment.
Thus, this research study aims to contribute to the identification of nursing care, namely the nursing focuses and interventions recorded, in comparison to the real needs of surgical patients. This will contribute to the continuous improvement of the quality of care, with a significant impact on health gains.
Identifying nursing focuses and interventions in perioperative settings is an opportunity to document nursing care and contribute to a more unified nursing profession. This process facilitates the standardization of care documentation, which can be studied and transferred into scientific and generic nursing knowledge (Lopes, 2020).
According to Lopes (2020, p. 96):

> improving nursing records not only gives visibility to the nursing profession but also facilitates the systematization and standardization of the documentation of information, while respecting the individuality of each patient. No less importantly, it highlights the value of nursing care and its importance in disease prevention, health promotion, and restoration of patients' health.

Therefore, it is imperative to consolidate knowledge and highlight the specialized practice of perioperative nursing through research studies such as this one, contributing to the provision of safe and quality care and the making of appropriate and conscious decisions (Moura, 2023).

Research question

What are the focuses and interventions identified by nurses in electronic health records when caring for perioperative patients?

Methodology

A retrospective observational study was conducted to analyze the nursing documentation from SClinico®, a software based on the International Classification for Nursing Practice® (ICNP), beta version 2, which already incorporates terms from the most recent versions (International Council of Nurses, 2016).
This was an exploratory study. Data were collected in a hospital in the north of Portugal, in the Central Operating Room and Ambulatory Surgery Unit, from December 2016 to December 2022. A retrospective analysis was conducted on the information collected, processed, and documented by the nurses of these departments in a perioperative context. Data were collected from the electronic records of patients who underwent surgery during the period under analysis.
Data were processed and analyzed rigorously in an aggregated form and with computer-based tools. Data analysis was based on the conceptual principles of the ICNP regarding the identification of nursing focuses, diagnoses, and interventions for surgical patients, where "nursing actions and areas of action considered for the development of interventions correspond directly to the nursing diagnoses identified in the production of health gains sensitive to nursing care" (Mota et al., 2018, p. 22). Data were exported from the electronic information system to a nursing focus and intervention database by the hospital's IT department. Data were analyzed using descriptive statistics in Microsoft Office Excel, 2019 version. Anonymity was ensured by not revealing the patient's medical record number or personal identification and by not identifying the nurse who completed the documentation. This study was approved by the hospital's Board of Directors and received a favorable opinion from the Health Ethics Committee, with reference no. 137/2022.

Results

The analysis identified 104 different nursing focuses out of a total of 50,732 focuses identified during the period under analysis (Table 1).

Table 1

Nursing focuses identified

Focuses	*N*	%
Hypothermia	18135	35.75%
Surgical wound	17283	34.07%
Falling	1954	3.85%
Pain	1786	3.52%
Pressure ulcer	1707	3.36%
Infection	1283	2.53%
Knowledge	1162	2.29%
Self-care	1034	2.04%
Function	822	1.62%
Others	5566	10.97%
Total	50732	100.00%

Note. N = Number; *%* = Percentage.

In Table 1, the item "others" corresponds to focuses with a frequency of less than 1.41%, such as breastfeeding, blood loss, elimination, and parental role.
The table shows that the most frequent focuses identified by intraoperative nurses were hypothermia (35.5%) and surgical wound (34.7%).
Regarding the hypothermia focus, which is a phenomenon characterized by impaired thermoregulation when the patient is in an intraoperative settings, the interventions identified were *observing* and *organizing* (Table 2).

Table 2

Interventions with referential integrity for the hypothermia focus

Interventions	*N*
Monitoring body temperature	30436
Increasing body temperature using devices	14736
Assessing risk for hypothermia	4381
Assessing tissue perfusion	76
Assessing mother's and/or father's knowledge of hypothermia prevention	26
Managing body temperature using devices	6
Assessing knowledge of hypothermia prevention	3

Note. N = Number

The three most common interventions identified by the nurses were *monitoring body temperature*, *increasing body temperature using devices*, and *assessing risk for hypothermia* in perioperative patients. All the interventions identified were related to controlling and regulating body temperature.

The other most frequent nursing focus is surgical wound, which results from a cut of tissue produced by a sharp surgical instrument to create an opening into a space in the body. The nursing interventions with referential integrity for this focus were related to performing, observing, and informing actions (Table 3).

Table 3

Interventions with referential integrity for the surgical wound focus

Interventions	*N*
Performing surgical wound care	16582
Monitoring surgical wound dressing	11828
Assessing surgical wound	2725
Assessing knowledge of prevention of surgical wound complications	1159
Teaching about prevention of surgical wound complications	605
Assessing mother's and/or father's knowledge of prevention of surgical wound complications	136

Note. N = Number.

The most frequent nursing intervention identified was *performing surgical wound care*, followed by *monitoring surgical wound dressing* and *assessing surgical wound*.
Among the nursing interventions (718 different interventions out of a total of 404.763) implemented by nurses in perioperative settings, Table 4 shows their distribution according to the type of action.

Table 4

Interventions performed by the nurses in intraoperative settings by type of action

Action	*N*	%	Interventions	*N*	%
Observing	301496	74.14%	Monitoring	210528	69.83%
			Surveillance	48212	15.99%
			Assessing	42756	14.18%
Performing	70684	17.38%	Preparing	29230	41.35%
			Implementing	28068	39.71%
			Applying	6829	9.66%
			Administering	143	0.20%
Organizing	18615	4.58%	Optimizing	16205	87.05%
			Maintaining	911	4.89%
			Providing	849	4.56%
			Managing	650	3.49%
Informing	10179	2.54%	Teaching	7982	50.39%
			Instructing	2197	13.87%
			Training	125	0.79%
			Guiding	15	0.09%
Attending	5521	1.36%	Assisting	3381	21.34%
			Removing	6414	9.08%
			Preventing	268	1.69%

Note. N = Number; *%* = Percentage.

Of the interventions performed, 74.14% were related to *observing*, 17.38% to *performing*, 4.58% to *organizing*, 2.54% to *informing*, and 1.36% to *attending*.

It can be concluded that the *observing* and *performing* actions were implemented more regularly, while the *organizing*, *informing*, and *attending* actions were less documented.

The most documented interventions were: the *monitoring* intervention in the *observing* action, the *teaching* intervention in the *informing* action, the *assisting* intervention in the *attending* action, the *optimizing* intervention in the *organizing* action, and the *preparing* intervention in the *performing* action.

Discussion

These results reflect the documentation in the information system in use, so there may be a gap between what nurses do in clinical practice and what is documented in the information system. Lack of quality in the documented nursing process, the presence of multiple information systems, nurses' limited training in these systems, lack of time, and even lack of motivation are factors that contribute to gaps in nursing documentation (Barreto et al., 2019; Varela et al., 2019).

The most frequently identified health aspects relevant to nursing practice in the perioperative period were hypothermia and the surgical wound.

> Hypothermia is defined as a decreased ability to change internal thermostat, reduced body temperature, cool, pale and dry skin, shivering, slow capillary refill, tachycardia, cyanotic nail beds, hypertension, piloerection associated with prolonged exposure to cold, dysfunction of the central nervous system or endocrine system under cold conditions or artificial introduction of an abnormal low body temperature for therapeutic reasons. (International Council of Nurses [ICN], 2019, p. 73)

Intraoperative hypothermia is a significant modifiable risk factor for postoperative infection (Andersen et al., 2024). Hypothermia is a common event in surgical patients under anesthesia, so intraoperative warming is recommended (Talhaoğlu et al., 2024). Inadvertent perioperative hypothermia occurs when the body is exposed to cold operating rooms and body temperature drops. Thermoregulation is impaired by anesthesia. These findings show that nurses play a key role in monitoring and maintaining the body temperature of perioperative patients to ensure the safety and quality of care. If nurses perceive that the perioperative patients are inadvertently exposed to risks, they should anticipate interventions to

minimize them (Regulamento n.º 429/2018, de 16 de julho). The incidence of hypothermia is estimated to vary from 26% to 90% in intraoperative patients (Azenha et al., 2017), which can lead to postoperative complications. As nurses make decisions to minimize the risk of inadvertent hypothermia, it is essential to systematize the data that contribute to the early identification of this health aspect that is relevant to nursing practice. The data that contribute to early identification are based on intrinsic factors (e.g., age, comorbidities) and extrinsic factors (e.g., patient waiting times, anesthetic modality, type of procedure, environmental influences), which are fundamental to the creation of an individual risk matrix (Humphries et al., 2024). These findings do not reveal if the risk factors for hypothermia are highlighted in the documentation. These data should be collected ad integrated into the workflow and documentation process of the health information system in use in a systematized way. The surgical wound is a relevant health aspect for perioperative nurses identified in the documentation, since surgery usually results in

> a cut of tissue produced by sharp surgical instrument to create an opening into a space the body, or into an organ resulting in drainage of serum and blood, expected to be clean i.e. not showing any signs of infection or pus. (ICN, 2019, p. 64)

The interventions with referential integrity related to the surgical wound are mostly focused on *observing* and *performing* actions and the postoperative phase. The surgical wound is associated with surgical site infection, so nurses play a key role in ensuring safety throughout the surgical procedure using a multidimensional approach. Among patients with surgical wounds, the main objective is to reduce pain and healing time, while increasing the comfort and satisfaction of patients undergoing surgery (Menoita, 2015).

The majority of interventions documented by perioperative nurses are of the *observing* type. Although they generate valuable information about the patients' clinical situation, which can be used to assess the continuity of care and future care, they do not directly result in nursing-sensitive health gains (Mota et al., 2019). In this context, it is important to highlight the significant impact that *observing*-type nursing interventions can have on ensuring the quality and safety of care. The documentation of these interventions provides other health professionals with access to useful information, thereby supporting the importance of the documentation produced by nurses (Mota et al., 2018). The data did not allow the differentiation of the interventions implemented by the nurses in the different phases of the perioperative period (pre-, intra-, and post-operative), nor the differentiation of care between the operating room and the outpatient surgery settings.

Conclusion

The majority of the implemented interventions are of the *observing* type. While they have referential integrity in the assessment of the perioperative patient's clinical status, they do not directly generate health gains. Consequently, the rigor of nursing documentation is crucial for investigating the health gains of nursing care related to sensitive nursing indicators and subsequently providing visibility to perioperative care.

With regard to the implications for nursing practice, nursing therapies allow nurses to identify the best action for maintaining and promoting health, in response to the health aspects relevant to nursing practice. This study represents an unvaluable contribution to rethinking the perioperative nursing care model and providing greater visibility to nursing practice.

A research study should be conducted to assess perioperative nurses' perceptions of the quality of documentation and the measures needed to improve and differentiate it.

Author contributions

Conceptualization: Moura, C. L., Mota, L.
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Validation: Mota, L.
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Writing – review and editing: Moura, C. L., Mota, L.

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