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RESEARCH ARTICLE (ORIGINAL)

Assessment of patient safety in the operating room: nurses' perceptions

Avaliação da segurança do doente no bloco operatório: perceção dos enfermeiros

Evaluación de la seguridad del paciente en el quirófano: percepción de los enfermeros

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Abstract

Background: Most healthcare incidents occur in the operating room. Thus, it is essential to implement patient safety policies.
Objective: Characterize perioperative nurses' perceptions of patient safety in the operating room.
Methodology: Descriptive study using sampling by clusters of hospitals. The sample consisted of 1,001 nurses from 46 operating rooms. The Patient Safety in the Operating Room Questionnaire was applied and IBM SPSS Statistics software, version 25.0, was used for data processing.
Results: The analysis of the percentages of positive answers revealed that most patient safety dimensions have a low level of implementation (<50%), particularly those regarding audits. Only the dimensions concerning good practices in unambiguous patient identification and antimicrobial resistance and infection control and prevention had high levels of implementation (≥75%).
Conclusion: The results point to opportunities for improvement in the generality of dimensions of patient safety in the operating room.

Keywords: patient safety; operating rooms; health policy; nursing

Resumo

Enquadramento: O bloco operatório constitui o local onde ocorre maior número de incidentes em cuidados de saúde. A implementação de políticas de segurança do doente torna-se fundamental.
Objetivo: Caracterizar a perceção dos enfermeiros perioperatórios sobre a segurança do doente no bloco operatório.
Metodologia: Estudo descritivo, com recurso a amostragem por clusters de hospitais. Inclui 1.001 enfermeiros de 46 blocos operatórios, e utiliza o Questionário de Segurança do Doente no Bloco Operatório. No tratamento de dados usa-se a aplicação IBM SPSS Statistics, versão 25.0.
Resultados: A análise das percentagens de respostas positivas revelou que a maioria das dimensões de segurança do doente tem um baixo nível de implementação (<50%), destacando-se as dimensões relacionadas com as auditorias. Apenas as dimensões no âmbito das boas práticas na identificação inequívoca dos doentes e da prevenção e controlo de infeção e resistência aos antimicrobianos apresentam um nível de implementação elevado (≥75%).
Conclusão: Os resultados indiciam oportunidades de melhoria na generalidade das dimensões de segurança do doente no bloco operatório.

Palavras-chave: segurança do paciente; salas cirúrgicas; política de saúde; enfermagem

Resumen

Marco contextual: El quirófano es el lugar donde se produce el mayor número de incidentes en la asistencia sanitaria. La implementación de políticas de seguridad del paciente es fundamental.
Objetivo: Caracterizar la percepción de los enfermeros perioperatorios sobre la seguridad del paciente en el quirófano.
Metodología: Estudio descriptivo, mediante muestreo por grupos de hospitales. Incluye a 1001 enfermeros de 46 quirófanos y utiliza el Cuestionario de Seguridad del Paciente en el Quirófano. Los datos se procesaron con la aplicación IBM SPSS Statistics, versión 25.0.
Resultados: El análisis de los porcentajes de respuestas positivas mostró que la mayoría de las dimensiones de seguridad del paciente tienen un bajo nivel de implementación (<50%), en particular las relacionadas con las auditorías. Solo las dimensiones relacionadas con las buenas prácticas en la identificación inequívoca de los pacientes, así como de la prevención y del control de la infección y la resistencia a los antimicrobianos mostraron un alto nivel de implementación (≥75%).
Conclusión: Los resultados indican oportunidades de mejora en la mayoría de las dimensiones de la seguridad del paciente en el quirófano.

Palabras clave: seguridad del paciente; quirófanos; política de salud; enfermería

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Introduction

Healthcare-associated complications in surgical patients have become a leading cause of death and disability worldwide, with surgical safety emerging as a public health issue (World Health Organization [WHO], 2009). In recognition of this concern, WHO launched the Safe Surgery Saves Lives (SSSL) project as the second global Patient Safety (PS) challenge (WHO, 2009). Portugal joined this project in 2009 and has since made efforts to operationalize it (Directorate-General of Health, Direção-Geral da Saúde [DGS], 2013). However, the National Plan for Patient Safety (*Plano Nacional para a Segurança dos Doentes* - PNSD) 2015-2020, a public policy to mitigate factors contributing to the occurrence of incidents, warns about the low adherence to the implementation of this project in Portugal and targets as a priority the adoption of strategies for improving surgical PS (Despacho n. º1400-A/2015 do Ministério da Saúde, 2015). Therefore, it is essential to understand how the PNSD is implemented in the operating room (OR) with a view to assessing PS from the perspective of health policies. Exploring this issue from the nurses' perspective will provide information about the largest workforce in hospital organizations and contribute to increasing these professionals' level of understanding, reflection, and commitment to safety policies. This study aims to characterize perioperative nurses' perceptions of PS in the OR.

Background

Global estimates suggest that more than 281 million surgical procedures are undertaken each year, resulting in 7 million significant complications and 1 million deaths arising from surgical activity (WHO, 2009). The complexity of surgical activity poses several challenges to PS, namely due to the interaction of a multidisciplinary team with different perspectives on patient care, who carries out complex and interdependent activities, with a significant degree of variation and uncertainty, in an environment dominated by production pressures and risk-related stress, where even the simplest activities require essential PS aspects (e.g., the unambiguous identification of the patient, operating site, laterality, etc.).

The Conceptual Framework for the International Classification for Patient Safety, adopted by the DGS, defines PS as

> reduction of risk of unnecessary harm associated with health care to an acceptable minimum. An acceptable minimum refers to the collective notions of current given knowledge, resources available and the context in which healthcare was delivered weighed against the risk of non-treatment or other treatment. (DGS, Departamento de Qualidade na Saúde [DQS], 2017, p. 4)

There are several challenges for PS in the OR, including the prevention of surgical site infection (SSI), bleeding, thromboembolism, hypothermia, pressure ulcers (PUs), falls, inadvertent retention of medical devices, medication errors, and wrong-side, wrong-patient, or wrong-procedure surgery (WHO, 2009). This complexity requires a concerted and systematized risk management of all factors that may compromise PS. The coexistence of several risks potentiates the occurrence of adverse events, with their frequency depending on the organizational safety culture (Heideveld-Chevalking et al., 2014).

In recognition of the complexity of surgical safety, WHO has chosen it as its second PS challenge (WHO, 2009), promoting the use of the Surgical Safety Checklist (SSC) as a strategy to reduce the occurrence of adverse events, foster the implementation of safe practices, and encourage communication and teamwork (WHO, 2009). However, this paradigm shift, based on a structured and systematized approach involving all surgical team members, has faced resistance at national and international levels (Mota, 2015; Despacho n. º 1400-A/2015 do Ministério da Saúde, 2015). Adopting this strategy requires a cultural change and a strong Patient Safety Culture (PSC; DGS, 2018). The development of a PSC is a major factor in promoting PS. WHO and the European Union Council recommend that Member States assess PSC to introduce and guide improvement interventions and achieve safer and more effective care (DGS, 2018). Assessment results in Portugal are in line with those found at an international level, revealing more weaknesses in the dimensions related to incident reporting (DGS, 2018). In Portugal, studies assessing PSC in the OR reveal that the Nonpunitive response to error is the most negative dimension, which is also consistent with national and international results (Mota, 2015).

Underreporting is a global problem that hinders learning and organizational improvement (Despacho n.º 1400-A/2015 do Ministério da Saúde, 2015). Low adherence to safety incident reporting restricts the sharing and access to detailed and important information on safety issues. This aspect is particularly relevant in the OR because it is where the majority of adverse events occur (Despacho n.º 1400-A/2015 do Ministério da Saúde, 2015). Analysis of reports extracted from notification systems has helped characterize the incidents and the human and organizational errors associated with their occurrence (Heideveld-Chevalking et al., 2014). There are many different types of incidents in the OR, the most common of which are related to infections, the administration of medication and blood products, and communication problems (Heideveld-Chevalking et al., 2014).

SSIs are a common incident associated with surgical activity. In Portugal, SSIs are one of the most prevalent infections, despite the decrease in the infection rate of 12.8% between 2013 and 2017 and the increase in the number of organizations involved in the epidemiological surveillance of SSIs (42.6%), which reveal the positive impact of the measures adopted as part of the health policies priority program (DGS, 2018).

WHO recognizes that the intraoperative context is a high-risk environment for the occurrence of medication errors due to its inherent characteristics (WHO, 2009; 2019). This setting presents challenges to medication safety

because most prescriptions are verbal, several professionals can prescribe and administer medication, pharmacy services rarely validate prescriptions, and medication is often accessed through a stock available in the OR (Boytim & Ulrich, 2018). The most common type of medication errors in the OR are associated with administration, as in other care settings (WHO, 2019). In a systematic review, Boytim and Ulrich (2018) revealed that wrong dose was the most common type of medication error in the OR, followed by errors of omission and substitution, and that medication errors are mostly related to labeling and syringe-swap errors.

PUs are another frequent type of incident in the OR, being recognized in 2014 as a high-risk environment for the development of PUs (National Pressure Ulcer Advisory Panel [NPUAP] et al., 2014). Surgical patients are prone to developing PUs because they are immobile during the procedure, positioned on a relatively hard surface, unable to feel the pain caused by pressure, friction, and shearing forces, and to change their position to relieve pressure on a particular area (NPUAP et al., 2014). The assessment of the risk for PUs is essential for its prevention, as demonstrated by Meehan et al. (2016), who applied a systemized risk assessment measure targeting specific risk factors of the intraoperative period and obtained a 60% reduction in the incidence rate of PUs. Access to medical devices for PU prevention is a key aspect of its prevention. Perioperative nurses should ensure that these devices are available, clean, intact, and functional, applied following the manufacturer's instructions, and suitable for PU prevention (NPUAP et al., 2014). Falls in the OR are rare incidents, but they can have disastrous consequences for patients (Prielipp et al., 2017). Because patients are under anesthesia, they are particularly vulnerable due to their inability to control movements and speak. In addition to the use of anesthetic agents and preoperative medication that alters patients' perceptions of the environment, other specific factors that contribute to the increased risk of falls in the OR are potential hearing and visual deficits (due to the lack of hearing and visual aids), reduced space for patient positioning, and the patient's lack of familiarity with the OR environment. Available evidence shows that most falls in the OR involve obese patients under general anesthesia with extreme surgical positioning. Most of these falls occur upon awakening from anesthesia, during surgery, and patient transfer to the bed (Prielipp et al., 2017; Soncrant et al., 2018). According to Prielipp et al. (2017), falls are caused by factors related to the patient (obesity, age, sedation, altered consciousness, and agitation), the staff (distraction, team coordination problems, the assumption that other staff members are monitoring the patient, and production pressures), and the operating table (equipment failures, improper use, lack of knowledge, absence or incorrect application of restraints, and extreme tilt positioning). To prevent falls, professionals should implement systematic practices to address the identified causes and invest in fall risk assessment for all patients undergoing surgery. During care transitions, the risk assessment should be communicated together with the occurrence or not of falls, risk factors, and the care plan, as recommended in clinical practice guidelines (DGS, DQS, 2019). Before the patient is transferred from the OR to another ward, the level of risk should be reassessed considering the change in clinical status caused by the procedure/anesthesia and the occurrence of an intra-hospital transfer, which are occasions when fall risk should be reassessed (DGS, DQS, 2019).

Incidents involving patient identification are sentinel events in the OR, namely those related to wrong-patient surgery (DGS, 2013). In Portugal, available data on the SSSL project in 2014 show that these events are rare given that the rate of wrong-patient surgery was zero (DGS, 2015). The use of the SSC, which recommends a positive confirmation of the patient's identity and validation by the whole team, may explain the positive results in this domain (DGS, 2013).

Communication failures are the most common cause of sentinel events, representing a serious threat to PS (Association of Perioperative Registered Nurses [AORN], 2018). Evidence shows that about 70% of adverse events occur due to communication failures among healthcare professionals during patient handover (DGS, 2017). Surgical patients undergo several transition processes, which should be systematically performed using a structured tool, such as the ISBAR (Introduction, Situation, Background, Assessment, and Recommendation; DGS, 2017; AORN, 2018) framework. Using these communication tools allows increasing the volume of shared information, improving the accuracy of the transmitted information, and reducing distractions and the omission of relevant information. It also promotes moments for professionals to reflect on patients' clinical status (AORN, 2018). Halterman et al. (2019) implemented a checklist for patient handoff from the OR to the postanesthesia care unit and found a decrease in item omissions and an increase in the number of complete transmissions from 13% to 82%.

The complexity around PS in the OR and the significant incidence and diversity of incidents require a coordinated and systematic risk management, as recommended by the PNSD (Despacho n.º 1400-A/2015 do Ministério da Saúde, 2015). Through cross-sectional actions and measures addressing specific issues, the PNSD aims to improve PS from a perspective of continuous improvement. Hence, it focuses on achieving nine specific objectives in the areas of PSC, communication, surgical safety, safe medication use, unambiguous patient identification, PUs, falls, incidents, infection prevention and control and antimicrobial resistance (IPCAR). Considering that these aspects are related to PS in the OR, performing an operational diagnosis on the fulfillment of the strategic objectives is essential. This diagnostic assessment will raise the awareness of the professionals involved in care delivery, namely nurses, to PS strategies, thus contributing to a greater commitment to their implementation. This diagnostic assessment will also analyze the strengths and weaknesses and help establish intervention strategies for the continuous improvement of the processes and,

consequently, to PS in the OR.

Research question

What are perioperative nurses' perceptions of PS in the OR?

Methodology

This descriptive study is part of an initial research project (Mota & Castilho, 2019) that used the same sample and followed the same ethical-legal procedures. The target population consisted of perioperative nurses working in ORs (adult patients) of hospitals with surgery areas of the National Health Service (*Serviço Nacional de Saúde* – SNS), included in the benchmarking groups of the Central Health System Administration (Despacho n.º 1400-A/2015 do Ministério da Saúde, 2015). Hospitals from each benchmarking group and the several Regional Health Administrations (*Administrações Regionais de Saúde* – ARS) were selected to make the sample more representative of the ORs in the SNS, using the cluster sampling method. A total of 24 hospitals were included, with a percentage per benchmarking group between 50% (groups B and E) and 66.7% (group F) and per ARS between 42.86% (Lisbon and Tagus Valley) and 100% (Algarve), corresponding to a total of 46 ORs. The sample inclusion criterion was to have more than six months of work experience. The exclusion criteria were to work as a nurse manager and be temporarily absent from work during the data collection period due to medical, vacation, or any other leave. The data collection period ran from January to October 2018. A total of 1,798 questionnaires were delivered to all nurses who met the inclusion and exclusion criteria for the 46 ORs. A total of 1,001 properly completed questionnaires were returned, representing an adherence rate of 55.70%. The Patient Safety in the Operating Room Questionnaire (PSOR; Mota & Castilho, 2019) was used for data collection. This questionnaire consists of 79 items, scored on a Likert-type scale from 1 (*never*) to 5 (*always*), which assess 19 PS dimensions divided into nine areas, according to the PNSD. The first part of the questionnaire was designed to collect information about the participants' socio-demographic characteristics (gender, age, length of service, length of OR experience, academic qualifications, professional qualifications) and the characteristics of the ORs where they work (type of OR and accreditation/certification). The data collection tool had good psychometric properties, with Cronbach's alpha values between 0.66 and 0.98 in the 19 dimensions (Mota & Castilho, 2019). The analysis of the item-dimension correlations showed high positive correlations in most items ($r \geq 0.70$).

To comply with the ethical-legal principles, the study was submitted to the Ethics Committee of the Health Sciences Research Unit: Nursing (UICISA: E) of the Nursing School of Coimbra for approval, and authorization was requested from the Boards of Directors (BoDs) of the hospitals involved in the study for data collection. Both the Ethics Committee (P 458-09-2017) and the BoDs of the 24 hospitals gave a positive opinion. Meetings were then held with the nurse managers from ORs to explain the study's objective and ask their collaboration in the distribution of the questionnaires. The questionnaires were delivered in open envelopes with the study's objectives and an informed consent request. The participants were asked to return the questionnaires in a sealed envelope. The informed consent should be returned separately from the questionnaire. Data were processed using IBM SPSS Statistics software, version 25.0. A frequency analysis was performed to calculate the mean percentage of positive answers and, consequently, identify the items and dimensions with the highest and lowest levels of implementation within the scope of PS. The authors of this study followed the recommendations by the authors of the Hospital Survey on Patient Safety Culture scale (Sorra & Nieva, 2004), namely that the two lowest response categories (*never*/*rarely*) and the two highest response categories (*most of the time*/*always*) be combined. Thus, the answers were recoded into three categories: 1- Negative answers, 2- Intermediate answers, and 3- Positive answers. The mean score of positive answers in each dimension was also calculated. Based on Sorra and Nieva's (2004) guidelines, mean scores of positive answers equal to or greater than 75% indicate high levels of implementation, scores between 50 and 74% identify dimensions with a moderate level of implementation, and scores of positive answers less than 50% refer to dimensions with low levels of implementation.

Results

The sample of 1,001 nurses was mostly composed of women (84.90%). The respondents had a mean age of 42.74 years (*SD* = 0.27) and a mean length of service of 19.76 years (*SD* = 0.27). These nurses had a mean length of experience in the OR of 13.52 years (*SD* = 0.28) and in their current service of 11.56 years (*SD* = 0.27). Concerning their academic qualifications, most professionals held a bachelor's degree (79.10%), 18.50% a master's degree, 1.90% a three-year degree (*bacharelato*), and 0.50% a doctoral degree. Only 17.90% of them hold the title of specialist. Most respondents worked in central ORs (76.9%), 15.60% in outpatient surgery ORs, and 7.40% in peripheral ORs. Over half of the nurses worked in accredited/certified ORs (59.7%).

The analysis of the percentages of positive answers showed that only nine (D2, D4, D6, D9, D11, D13, D15, D16, D18) of the 19 dimensions studied (47.36%) had a percentage of positive answers ≥ 50% (Table 1). The only dimensions with high levels of implementation were the dimensions Unambiguous patient identification – good practices, with a percentage of positive answers of 94.8%, and IPCAR –good practices, with a percentage of positive answers of 77.7%. On the other hand, more than 50% of the dimensions (D1, D3, D5, D7, D8, D10, D12, D14, D17, and D19) had a percentage of positive answers below 50%. All dimensions related to audits (D3, D5, D7,

D10, D12, and D14) obtained negative results, revealing a low level of implementation. The more critical results emerged in the dimensions related to PU prevention – audits (22.6%) and Falls prevention – audits (26.7%). The dimensions Medication use safety – prescription (D8, 41%), Internal environment safety culture (D1, 42.8%), IPCAR – epidemiological training and monitoring (D19, 46.3%), and Incident analysis and prevention (49.5%) also had a low level of implementation.

Table 1

Analysis of the frequency of positive answers to the dimensions of the PSOR questionnaire (n = 1001)

Dimensions	Dimension Items	*n*	% positive answers
D1 Internal environment safety culture	b1, b2, b3, b4, b5	998	42.8%
D2 Communication safety – good practices	c2, c3, c4	992	69.2%
D3 Communication safety – audits	c1, c5, c6, c7, c8	1001	29.9%
D4 Surgical safety – good practices	e1, e2, e3	994	72.8%
D5 Surgical safety – audits	e4, e5, e6, e7, e8	976	41.6%
D6 Medication use safety – good practices	f3, f4, f5	996	66.1%
D7 Medication use safety – audits	f1, f7, f8, f9, f10	996	32.1%
D8 Medication use safety – prescription	f2, f6	990	41%
D9 Unambiguous patient identification – good practices	g1, g2, g3, g4	990	94.8%
D10 Unambiguous patient identification – audits	g5, g6 g7, g8, g9	995	29.9%
D11 Prevention of falls – good practices	h1, h2, h3, h4, h5	993	65.5%
D12 Prevention of falls – audits	h6, h7, h8, h9	999	26.7%
D13 PU prevention – good practices	i1, i2, i3, i6, i7	991	72.8%
D14 PU prevention – audits	I8, i9, i10, i11	1001	22.6%
D15 PU prevention – resources	i4, i5	1000	63.9%
D16 Incident notification	j1, j2, j3, j4, j5	985	61.7%
D17 Incident analysis and prevention	j6, j7, j8, j9, j10	995	49.5%
D18 IPCAR – good practices	k2, k3, k4, k5, k6	992	77.7%
D19 IPCAR – epidemiological training and monitoring	k1, k7, k8, k9	999	46.3%

According to nurses' perceptions, only 15 out of 79 items (19%) had a high level of implementation (percentage of positive answers ≥ 75%, Table 2) in the Portuguese ORs. These items are mostly related to the dimensions of Unambiguous patient identification – good practices (all items of the dimension), IPCAR – good practices (all items except item k2, regarding trichotomy), and PU prevention (items i3, i6, and i7). Items related to the application of the SSC (e1: 88.5%), the promotion of patient communication (c2: 82.9%), the storage of high-alert medications (f4: 77%), and the access to appropriate fall prevention medical devices (h3: 75.6%) also had high levels of implementation.

Table 2

Frequency analysis of the items with a higher percentage of positive answers in the PSOR questionnaire (n = 1001)

Dimensions	Items	*n*	% Positive Answers
D9 Unambiguous patient identification – good practices	g3 - Prior validation between patient identification and the collection of blood or other specimens for testing and the correct patient identification on the label.	998	97.7
	g4 - Prior validation between patient identification and the administration of blood and blood products and the correct patient identification on the label.	995	97.7
	g1 - Patient identification through at least two reliable identifiers (full name, date of birth, or medical record identification number)	999	93.7
	g2 – Patient identification wristbands are used as an additional resource in safe patient identification.	999	90
D18 IPCAR – good practices	k4 – The compliance with sterilization indicators is assessed before skin incision.	997	94.2
	k5 - Steps are taken to maintain normothermia throughout the patient's stay in the OR.	1000	89.7
	k6 - Steps are taken to maintain normoglycemia throughout the patient's stay in the OR.	999	88
	k3 - Prophylactic antibiotics should be given 60 minutes before the incision if indicated (except for antibiotics that require a longer infusion time, such as Vancomycin).	999	78.4
D13 PU prevention – good Practices	i7 - The existence of PUs is communicated during patient handover	999	81.3
	i3 - PU prevention measures are applied in the service based on an assessment of the patient's risk factors.	995	78.5
	i6 - Skin integrity is assessed before the patient leaves the OR.	1001	75.9
D4 Surgical safety – good Practices	e1- The surgical team applies the Surgical Safety Checklist (SSC) to patients undergoing surgical procedures, including those with local anesthesia.	997	88.5%
D2 Communication safety – good practices	c2 - The team communicates with patients during care delivery to ensure that they receive and understand the information upon which they base their decision on the consent to care.	1000	82.9%
D6 Medication use safety – good practices	f4 - High-alert medications in stock are labeled differently to stand out from the other medications.	1000	77%
D11 Prevention of falls – good Practices	h3 – The appropriate fall prevention medical devices are available.	1000	75.6%

As shown in Table 3, the most critical items with lower levels of implementation relate to the audits, particularly regarding PU prevention (i9, i8, i11, i10). The results also indicated the low level of implementation of audits on fall prevention practices (h6), information transmission during care transitions (c5), and safe medication practices (f7). The most critical audit-related aspects were the analysis of results within the teams (i9, h7, c6, f8, g7) and the assessment of the impact of improvement measures resulting from the audits (i11, h9, g9, c8, f10). The use of the national reporting system also had one of the lowest levels of implementation (j6).

Table 3

Frequency analysis of the items with a lower percentage of positive answers in the PSOR Questionnaire (n = 1001)

Items	*n*	% Positive Answers
i9 - The team analyzes the results of the audits on PU prevention practices.	1001	20.2%
i8 - Internal audits of PU prevention practices are carried out in the service every six months.	1001	21.6%
i11- The impact of the measures to improve PU prevention practices is assessed based on the audit results.	1001	23.2%
j6 - In case of reporting, I use the DGS National Incident Reporting System (NOTIFICA).	999	23.6%
i10 - Measures for improvement are implemented based on the results of the audits on PU prevention practices.	1001	25.2%
h6 - Internal audits on fall prevention and reduction practices are carried out in the service every six months.	999	25.3%
h7 - The team analyzes the results of the audits on the implementation of fall prevention and reduction practices.	1001	25.3%
c6 - The team analyzes the results of the internal audits on information transmission.	1001	26.4%
h9 - The impact of the measures to improve fall prevention and reduction practices is assessed based on the audit results.	1001	26.5%
f8 - The team analyzes the results of the audits on safe medication practices.	1000	26.9%
g7 - The team analyzes the results of the audits on unambiguous patient identification and the procedure to be followed.	1000	27.2%
c5 - Internal audits on information transmission during patient handover are carried out in the service every six months.	1001	27.3%
f7 - Internal audits on safe medication practices are carried out in the service every six months.	998	28.3%
g9 - The impact of measures for improvement of unambiguous patient identification and the procedure to be followed is assessed based on the audit results.	1001	28.4%
c8 - The impact of measures to improve information transmission during patient handover is assessed based on the audit results.	1001	28.9%
f10 - The impact of measures to improve safe medication practices is assessed based on the audit results.	1000	29%
h8 - Measures for improvement of fall prevention practices are implemented based on the audit results.	1001	29.7%

Discussion

Due to the complexity of healthcare delivery in the OR, it is essential to implement PNSD measures to promote PS and prevent incidents. Characterizing nurses' perceptions of PNSD implementation in the OR allows performing a diagnosis of the interventions with the highest or lowest levels of implementation with a view to continuous improvement.

Globally, there is considerable margin for improving PS in the OR given that more than 50% of the dimensions have low levels of implementation and only two dimensions have high levels of implementation, namely the good practices in patient identification and IPCAR. The results show good practices regarding patient identification, revealing a concern with the implementation of standards to prevent wrong-patient surgery (DGS, 2013). Using the SSC may have strengthened this topic given that it recommends the patient's positive confirmation of two identifiers and the confirmation of the patient's identity by the whole team (DGS, 2013). Furthermore, wrong-patient surgery is a sentinel event monitored by the SSSL project and under the attention of both professionals and organizations (DGS, 2013). The recognition of the IPCAR program as a health priority program has prompted professionals to achieve a more robust implementation of IPCAR good practices, namely through the publication of guidelines on this area, which may have contributed to the promotion of good practices in surgical care (DGS, 2018). The implementation of good practices in this domain may have also been strengthened by the systematic use of the SSC, which recommends rigor in the times for antibiotic administration and verification of compliance with the indicators of sterilization processes. The decrease in the SSI incidence rate from 2013 to 2017 follows the positive perception of the implementation of IPCAR good practices and supports the results of this study (DGS, DQS, 2018). The results of the dimension PU prevention – good practices show that the percentage of positive answers is close to a high level of implementation, revealing that nurses identify surgical patients' susceptibility to developing PUs and seek to improve this indicator, which is recognized as a nursing-sensitive indicator (NPUAP et al., 2014). On the other hand, the dimensions related to audits were more negatively perceived by the professionals, all with negative scores. These results demonstrate that this methodology is not yet systematically used in ORs to assess the implementation

of PS measures in the OR as recommended by the PNSD (Despacho n.º 1400-A/2015 do Ministério da Saúde, 2015). The nurses highlighted that the most critical aspect in auditing was the lack of discussion of the results within the team, limiting the professionals' opportunity to learn and discuss critical aspects for improvement. Implementing the auditing methodology requires professionals' training, resource availability, and a continuous improvement culture based on the assessment of process compliance and the identification of opportunities for improvement, for which organizations must gather efforts. We believe that introducing audit-based indicators in program contracts can contribute to a greater organizational and individual commitment to this strategy. Apart from audit-related aspects, the dimension Medication use safety – prescription (D8) also showed a low level of implementation, which is in line with studies that found that most prescriptions are verbal orders (Boytim & Ulrich, 2018). Therefore, organizations should invest in the formalization of prescriptions in the therapeutic process to reduce medication errors, particularly due to misinterpretations that are enhanced by the stressful and noisy environment of ORs, the use of masks that hinder communication, and the use of look-alike and sound-alike (LASA) drugs. The nurses also perceived the dimension Internal environment safety culture (D1) as having a low level of implementation, which may compromise PS given that PSC is one of the main factors contributing to PS promotion (DGS, DQS, 2018). It is essential to invest in PS training for professionals, motivating them to participate in PSC assessment, analyze results within the team, implement measures for improvement, and assess the outcomes of these measures, thus establishing cycles of continuous improvement. Nurses also perceived the need for greater investment in IPCAR – epidemiological training and monitoring (D19), despite the decrease in the SSI rate and the significant increase in the number of organizations involved in epidemiological surveillance (DGS, DQS, 2018). According to perioperative nurses, incident analysis and prevention is an area that should be improved because they do not reflect on and learn from the errors. This fact is in line with the results of PSC assessment studies, which identify reporting-related dimensions as critical areas, both nationally and internationally (DGS, DQS, 2018). Most nurses do not use the national incident reporting system (NOTIFICA), and the reasons for this low adherence should be explored. It is essential to encourage professionals to report the incidents because it provides the opportunity to describe the epidemiology of safety incidents and promotes learning from error. Understanding the causes of incidents, implementing corrective and preventive measures, and evaluating their effectiveness will be determining factors for more PS. Providing feedback to the reporter is crucial to demonstrate the importance of reporting in building more resilient systems. This study made for the first time a diagnosis of the implementation of the safety policy in Portuguese ORs, enhancing knowledge in this area. The researcher's decision to only include the nurses' perceptions in this phase of the study is a limitation of this study because a better understanding of the reality would benefit from the involvement of other professionals, namely anesthesiologists and surgeons who are responsible for implementing the measures foreseen in the PNSD. Thus, future studies should include these professional groups.

Conclusion

The results point opportunities for improvement of most PS dimensions in the OR, namely the need to implement internal audits, promote organizational learning, and continuously improve PSC. The dimensions of medication prescription, incident analysis and prevention, and IPCAR – epidemiological training and monitoring require immediate investment. The results obtained contribute to enhancing knowledge in a priority area of safety policy, considering the lack of studies in this context in Portugal, assessing PS in the OR, and identifying areas that require immediate investment from organizations and researchers. These results may provide a basis for future studies. Important research areas include understanding whether there are significant differences in the perceptions of several professional groups and identifying the factors promoting and limiting PNSD implementation.

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References

Association of Perioperative Registered Nurses. (2018). *Guideline for team communication. Guidelines for perioperative practice*. AORN.

Boytim, J. & Ulrich, B. (2018). factors contributing to perioperative medication errors: A systematic literature review: 2.1 www. *Association of Operating Room Nurses Journal, 107*(1), 91-107. https://doi.org/10.1002/aorn.12005

Despacho nº 1400-A/2015 do Ministério da Saúde. (2015). *Diário da República: II Série, n. º 28*. https://dre.pt/application/conteudo/66463212

Direção-Geral da Saúde. (2013). *Norma nº 2: Cirurgia segura, salva vid*as. Autor.

Direção-Geral da Saúde. (2015). *Cirurgia segura salva vidas. Relatório de monitorização-2014*. Autor.

Direção-Geral da Saúde, Departamento de Qualidade na Saúde. (2017). *Norma nº 1: Comunicação eficaz na transição de cuidados de saúde*. Autor.

Direção-Geral da Saúde. (2018). *Infeções e resistências aos antimicrobianos: Relatório anual do programa prioritário 2018*. Autor.

Direção-Geral da Saúde, Departamento de Qualidade na Saúde. (2018). *Norma nº 5: Avaliação da cultura de segurança do doente*

nos hospitais (updated on 20/02/2020). Autor.

Direção-Geral da Saúde, Departamento de Qualidade na Saúde. (2019). *Norma nº 8: Prevenção e Intervenção na queda do adulto em cuidados hospitalares.* Autor.

Halterman, R. S., Gaber, M., Janjua, M. S., Hogan, G. T., & Cartwright, S. M. (2019). Use of a checklist for the postanesthesia care unit patient handoff. *Journal of PeriAnesthesia Nursing*, *34*(4), 834-841. https://doi.org/10.1016/j.jopan.2018.10.007

Heideveld-Chevalking, A. J., Calsbeek, H., Damen, J., Gooszen, H., & Wolff, A. P. (2014). The impact of a standardized incident reporting system in the perioperative setting: A single center experience on 2,563 'near-misses' and adverse events. *Patient safety in surgery*, *8*(1), 46. https://doi.org/10.1186/s13037-014-0046-1

Meehan, A. J., Beinlich, N. R., & Hammonds, T. L. (2016). A nurse-initiated perioperative pressure injury risk assessment and prevention protocol. *Association of Operating Room Nurses Journal, 104*(6), 554-565. https://doi.org/10.1016/j.aorn.2016.10.004

Mota, A. S. (2015). *Cultura de segurança do doente e lista de verificação de segurança cirúrgica: Perceção dos profissionais do bloco operatório* [Master's thesis, Escola Superior de Enfermagem de Coimbra]. https://repositorio.esenfc.pt/rc/

Mota, A., & Castilho, A. F. (2019). Construção e validação psicométrica do Questionário de Segurança do Doente no Bloco Operatório. *Revista de Enfermagem Referência*, *4*(21), 67-78. http://dx.doi.org/10.12707/RIV19012

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, & Pan Pacific Pressure Injury Alliance. (2014). *Prevention and treatment of pressure ulcers: Clinical practice guideline*. Cambridge Media.

World Health Organization. (2009). *WHO guidelines for safe surgery: 2009: safe surgery saves lives*. World Health Organization.

Prielipp, R. C., Weinkauf, J. L., Esser, T. M., Thomas, B. J., & Warner, M. A. (2017). Falls from the O.R. or procedure table. *Anesthesia & Analgesia*, *125*(3), 846-851. http://doi.org/10.1213/ANE.0000000000002125

Soncrant, C. M., Warner, L. J., Neily, J., Paull, D. E., Mazzia, L., Mills, P. D., Gunnar, W., & Hemphill, R. R. (2018). Root cause analysis of reported patient falls in ORs in the Veterans Health Administration. *Association of Operating Room Nurses Journal 108*(4), 386-397. https://doi.org/10.1002/aorn.12372

Sorra, J., & Nieva, V. (2004). *Hospital survey on patient safety culture: User's guide*. Agency for Healthcare Research and Quality.

World Health Organization. (2019). *Medication safety in high-risk situations* (No. WHO/HIS/SDS/2018.3). Author.