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Psychological Safety in Healthcare Settings

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Editorial: Psychological Safety in Healthcare Settings

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Keywords: psychological safety, second victim, healthcare workers, quality of care, safety culture

Editorial on the Special Issue

Psychological Safety in Healthcare Settings

Patient safety is a priority in all healthcare systems. Despite this, up to 24% of hospital admissions and around 7% of primary care patients experience adverse events (AEs) annually, with approximately 50% being preventable [1, 2]. In the EU alone, these preventable AEs result in a loss of 1.5 million disability-adjusted life years (DALYs) and a cost of 19.53–43.65 billion euros in 2024 [3], with a significant impact on the quality of care.

Most of these preventable AEs are due to suboptimal working conditions [4]. Uncertainty, overload, fatigue, and complexity are common limiting factors for quality care, including patient safety. Healthcare workers often face psychological trauma from events such as life-threatening incidents, needle sticks, dramatic deaths, violence, patient deterioration, resuscitations, complaints, suicidal tendencies, and errors causing patient harm. These can alter the practice and morale of healthcare workers, impacting patient outcomes. Therefore, workforce resilience is key to providing optimal care. Otherwise, when overwhelmed and lacking coping resources, they become second victims [5]. They are "any healthcare worker directly or indirectly involved in an unanticipated adverse patient event, unintentional healthcare error, or patient injury, who becomes victimized in the sense that they are also negatively impacted."

Organizational factors and personality traits influence the second victim experience. Providing safe working conditions is part of the WHO's objectives for safer care [6]. Professionals must feel supported, trained, equipped, protected, rested, and provided with a suitable work environment, reducing the intensity of this experience as second victims. Addressing this involves healthcare authorities, health professions, scientific societies, academia, patient associations, and civil society and requires a commitment to self-care, prevention programs, and emotional support interventions.

Safety culture, particularly Psychological Safety, is crucial. Introduced by Amy Edmondson [7] in 1999, it describes the ability to speak without fear about performance, including mistakes, to improve care. Without this, patient safety is at risk [8, 9]. However, the blame culture remains prevalent in healthcare [10], impacting how professionals address safety incidents. Fear of blame hinders progress toward a safety culture. Many institutions comply with WHO's safe practices but fail to engage professionals in patient safety, reacting to

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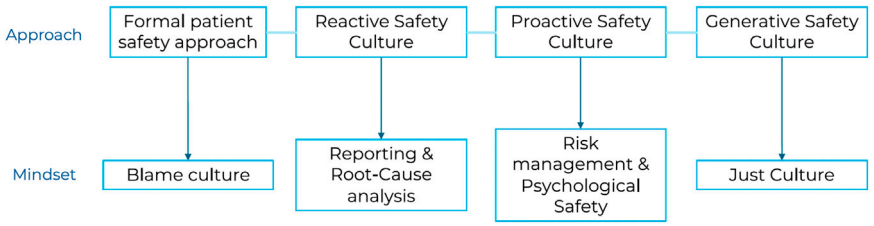

FIGURE 1 | Patient safety path: from formal culture to generative culture of patient safety (Europe, 2024).

dramatic events without preventing potential harm. Proactive risk management fosters a culture of safety. These organizations are on the verge of sharing a culture that generates safety (**Figure 1**).

Since healthcare workers are not adequately trained to warn colleagues of risky behavior, manage reactions, or support second victims (Kupkovicova et al.; Carrillo et al.) [11], educational reforms are needed to address identified educational gaps in patient safety and to integrate second victim support into the training of medical, nursing, and other healthcare students. Equipping future professionals with skills to recognize and address the second victim phenomenon fosters a supportive work environment and improves patient safety outcomes. Ultimately, these changes can lead to improved quality of care, better patient safety outcomes, and a more resilient healthcare workforce.

To support healthcare professionals and prioritize patient safety and wellbeing, organizations must:

1. Create a fair and accountable environment: Implement policies ensuring transparency and fairness in evaluating performance and handling errors, fostering trust and openness.
2. Balance safety and accountability: Understand root causes of errors and address systemic issues to prevent recurrence, balancing individual accountability with systemic improvements.
3. Commit to continuous improvement and transparency: Regularly evaluate safety protocols, using incident data to drive change, and promote openness to build trust.
4. Learn from incidents: Analyze incidents, identify contributing factors, and develop risk mitigation strategies, empowering staff to participate in safety initiatives.
5. Promote fairness in incident response: Distinguish between honest mistakes, at-risk behavior, and reckless behavior, focusing on system-wide improvements and creating a supportive environment.

By implementing these strategies, healthcare organizations can better support professionals and cultivate a just culture, benefiting patients. Encouraging self-care, resilience, and emotional support, along with fairness and continuous improvement, creates a more effective and compassionate healthcare system.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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The author(s) declare that no Generative AI was used in the creation of this manuscript.

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Evaluating the Integration of Patient Safety in Medical Training in Spain

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Objectives: The aim of this study was to determine the degree of integration of patient safety in the training of medical faculties at universities in Spain.

Methods: A descriptive, cross-sectional study was conducted. An assessment was made of the curse syllabi of Spanish medical schools, summarizing the proportion of faculties that present each of the topics recommended in the WHO's curriculum guide.

Results: Of the 49 faculties, access to the curse syllabus of the subjects for the academic year 2023-2024 was obtained from 38 (78%). Although 82% of the faculties integrated some patient safety topic, only 56% included between 1 and 3 of the 11 topics recommended by WHO. The maximum number of integrated topics was 7, and this was only achieved by 1 faculty.

Conclusion: There is progress in the incorporation of fundamental concepts in patient safety, but the comprehensive implementation of all topics recommended by the WHO in Spanish medical schools is insufficient.

Keywords: patient safety, education, medical faculties, curse syllabus, patient safety topics

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INTRODUCTION

The World Health Organization (WHO) defines Patient Safety (PS) as the discipline of healthcare aiming to prevent, reduce risks, errors, and harm to patients during the provision of healthcare services [1, 2]. Safety incidents affect not only patients and their families but also the involved healthcare staff [3].

Since the United States Institute of Medicine issued the report "To Err is Human" in 1999, awareness and importance of patient safety have been increasing [4]. Since then, plans and strategies have been developed to improve patient safety at the international level. One of these strategies is to incorporate patient safety into the training of healthcare personnel.

In 2021, at the 74th World Health Assembly, the WHO approved the Global Patient Safety Action Plan 2021–2030 [1], one of its primary objectives is the importance of patient safety education, promoting the participation of multisectoral institutions, including universities. For this purpose,

Abbreviations: WHO, World Health Organization; PS, Patient Safety; NHS, National Health Service; ANECA, National Agency for Quality Assessment and Accreditation; IRAS, Healthcare-Associated Infections.

TABLE 1 | Topics recommended in the World Health Organization patient safety curriculum guide [16]. (Geneva, Switzerland, 2009).

Topics recommended by the world health organization
What is patient safety?
What is human factors and why is it important to patient safety?
Understanding systems and the impact of complexity on patient care
Being an effective team player
Understanding and learning from errors
Understanding and managing clinical risk
Introduction to quality improvement methods
Engaging with patient and carers
Minimizing infection through improved infection control
Patient safety and invasive procedures
Improving medication safety

continuous improvement is necessary, supported by various PS tools [5]. Higher or university education is an essential environment in the transformation of society [6, 7]. Health education must ensure that graduates have achieved competencies, skills, values, and attitudes that enable them to meet the challenges their positions demand [8, 9].

In various countries such as the United States [7, 10], the United Kingdom [11, 12], Australia, and Canada [13], recommendations have been developed to improve training in patient safety. In Japan, in 2008, the Ministry of Education, Culture, Sports, Science, and Technology revised the medical curriculum to include patient safety as an important part of education [14, 15]. In Spain, although the Ministry of Health promoted the Patient Safety Strategy of the National Health System since 2005, identifying the need to create training and a culture of patient safety among health personnel [5], and in 2008 it was published in the BOE (State Official Newsletter) that among the competencies that medical students must acquire are "the evaluation of care quality and patient safety strategies" [16], little progress has been made in the basic training of health personnel [17]. Most of the patient safety training actions are focused on continuing education in postgraduate studies (Training in Patient Safety and Prevention of Adverse Events in Healthcare [18]; Training in Risk Management and Improvement of Patient Safety [19]), while in undergraduate studies, training depends more on the specific interest of a professor [20].

The WHO has published recommendations on how patient safety training should be implemented at universities [21]. This organization proposes 11 specific patient safety topics [21] and suggests various ways to provide training, from seminars to practice groups. Similarly, the National Health Service (NHS) of England has published documents about how this training should be implemented [11, 12].

In Europe, a published study [22] observed that 60% of the examined European faculties do not have any of the WHO-recommended patient safety topics integrated into their training. Other published studies that aim to measure the extent of undergraduate training in patient safety assess the level of knowledge and/or attitudes of students towards patient safety [17], evaluate the curriculum of a faculty [4], or through surveys, either of individual universities or at the national study [10, 23].

Neither in Spain nor in Latin America have studies been conducted to examine the integration of the topics recommended in the WHO's patient safety curriculum guide into the training plans of medical faculties.

The curriculum is a document that contains basic information about each degree, while as defined by the National Agency for Quality Assessment and Accreditation (ANECA), the curse syllabus of a subject is the reference document for students and teachers, describing the objectives, contents, competencies to be acquired, evaluation methodology, bibliography of a subject [24].

The aim of this study was to determine the degree of integration of patient safety in the training of medical faculties at universities in Spain. The study examined the number of medical faculties that include the WHO-recommended patient safety topics in their curse syllabi. Finally, the integration of patient safety was evaluated based on its funding.

METHODS

Study Design

This is a descriptive, cross-sectional study that involved an evaluation of the curse syllabus of medical all medical curses at various Spanish universities available on the official websites of each center. The objective was to assess whether the topics included in the WHO's proposed curriculum guide were integrated into the medical students' education.

Study Population

The study population included medical faculties in Spain in 2023, which had an official website. The list of these universities was collected from the website of the Ministry of Universities. Faculties of medicine whose curse syllabi for the year were not available on their websites were excluded from the study.

Data Collection

The data collection period was from April 2023 to August 2023.

Information available on the official websites of the medical faculties was accessed. The following information was collected: Public access to the curse syllabi of the faculty's subjects, the Spain autonomous community to which the faculties belong, and the type of funding of the university (public or private).

A review of the subjects developed in the degree was conducted, focusing on those with clinical, surgical, preventive medicine, health management, or related.

A form was filled out for each medical faculty, recording the presence of the specific patient safety topics recommended in the WHO's curriculum guide.

Definitions

Integration of patient safety topics in the curse syllabus of any of the degree subjects: It was considered that one of the topics recommended in the WHO's curriculum guide was integrated into the curse syllabus of a subject when explicit mention was made of patient safety. Therefore, when a subject addressed a topic without explicitly mentioning patient safety in the rest of the subject, it was considered not to be effectively integrated

TABLE 2 | Public/private medical schools by autonomous community. (Spain, 2024).

Autonomous community	Number faculties	Public	Private
Andalucia	7	7	0
Aragón	1	1	0
Asturias	1	1	0
C. Madrid	9	4	5
C. Valenciana	6	4	2
Cantabria	1	1	0
Castilla La Mancha	2	2	0
Castilla y León	2	2	0
Cataluña	8	6	2
Extremadura	1	1	0
Galicia	1	1	0
Islas Baleares	1	1	0
islas Canarias	3	2	1
Murcia	2	1	1
Navarrra	2	1	1
Pais Vasco	2	1	1
Total	**49**	**36**	**13**

In bold: Total number of faculties of medical school on all universities, public universities or private universities on all autonomous communities.

into the framework of training in patient safety. For example, the control of Health Care-Associated Infections (HCAIs) was not considered explicitly as part of the field of patient safety unless patient safety was specifically mentioned as a didactic topic in the subject where patient safety was mentioned.

The variables collected were the presence in any subject of the topics referred to in **Table 1**.

Statistical Analysis

A descriptive analysis of the integration of patient safety in medical faculties was conducted, summarizing the proportion of faculties that present each of the topics, the proportion of faculties, and the number of patient safety topics they develop.

The association between university funding and the presence of training in patient safety was explored using Fisher's exact test.

RESULTS

In the entire Spanish territory, a total of 49 medical faculties were identified, distributed across 16 autonomous communities (**Supplementary Material S1**). Of these, 13 belong to private university institutions, while 36 are under the management of public universities. The same table summarizes the web page address of each faculty, as well as the city and Spanish autonomous community to which they belong.

The Autonomous Community of Madrid stood out as the region with the highest concentration of medical faculties, hosting a total of 9 educational institutions of this type. Following were Catalonia, Andalusia, and the Valencian Community, with 8, 7, and 6 faculties, respectively.

When examining the type of funding for private medical faculties, it was observed that the autonomous Community of Madrid had the highest number of private faculties, with a total of 5. Catalonia and the Valencian Community followed, both with 2 private faculties each (**Table 2**).

TABLE 3 | Number of patient safety topics include in the course syllabi. (Spain, 2024).

Number of patient safety topic included	Number of faculties	%
0	7	18
1	4	11
2	9	24
3	8	21
4	6	16
5	1	3
6	2	5
7	1	3
Total	38	100

All faculties, both public and private, had a website hosting information about the medical degree program. Of the 49 faculties, access to the faculty's curse syllabi for the year 2023-2024 was obtained from 38 (78%).

Regarding the 38 faculties where access to the curse syllabi was obtained, it was observed that no faculty implemented all the recommendations of the WHO's patient safety curriculum guide, despite 14 years since its publication (**Table 3**). In addition, only 1 (3%) faculty developed 7 of the topics recommended by the curse syllabi, while 4 (11%) faculties developed between 5 and 7 patient safety topics.

Regarding the 38 faculties where the course guide was accessed, it was observed that none of them implemented all the recommendations from the WHO's patient safety curriculum guide, despite 14 years having passed since its publication (**Table 3**). No faculty covered more than 7 topics recommended by the WHO, while only 1 (3%) faculty covered 7 of the recommended topics in the course guide, and 4 (11%) faculties covered between 5 and 7 patient safety topics. These results underline the limited dissemination of the topics studied, as evidenced by the median of 2 (IQR = 1; 3).

In 21 (56%) medical faculties, between 1 and 3 patient safety topics were developed. The most frequent were Introduction to patient safety, Control of HCAIs, and Patient safety associated with care quality.

In 7 (18%) faculties, none of the WHO's patient safety curriculum guide topics were detected.

On the other hand, in 22 (58%) of the faculties, patient safety was mainly addressed in the curse syllabus of the Preventive Medicine subject (**Table 4**), while in 6 (16%) faculties patient safety was addressed in the curse syllabus of the Family Medicine subject.

Finally, in 2 (5%) and 1 (3%) medical faculties, patient safety was primarily addressed in the curse syllabus of the Health Management or Public Health subject, respectively.

When analyzing the presence of each of the specific topics recommended in the WHO's patient safety curriculum guide (**Figure 1**), no medical faculty was identified that specifically addressed the meaning of the "human factor" (the interrelation between the human, their tools, and their work environment) and its importance in patient safety.

TABLE 4 | Courses that include topics on patient safety. (Spain, 2024).

Subject	N	%
Do not have subjects that mention any patient safety topics	**7**	**18**
Healthcare Management	**2**	**5**
Family Medicine	**6**	**16**
Preventive Medicine	**22**	**58**
Public Health	**1**	**3**
Total	**38**	**100**

In bold: Number and percentage of each type of courses that include topics of patient safety.

Regarding topics related to "understanding systems and the impact of complexity on patient care," "being a team player" related to patient safety, and "how to improve medication safety," these are included only by 2 (5%) medical faculties in the curse syllabus of a specific subject.

In 3 faculties (8%), training on "how to engage with patients and care providers" in the context of patient safety training was observed.

In 4 faculties (11%), the topic of "patient safety in invasive processes" was detected.

In 6 faculties (16%), the topic of "how to understand and manage clinical risk" associated with patient safety was identified.

In 7 faculties (18%), the topic on "how to understand and learn from errors in patient safety" was detected.

In 13 faculties (34%), the topic of "quality improvement methods" focused on patient safety was identified.

In 24 faculties (63%), the topic on how to minimize infection through better infection control was detected.

In 31 faculties (82%), the topic about the definition of patient safety was observed.

Finally, the presence of topics related to patient safety was compared based on the type of funding of the university. Specifically, in 5 of the 8 (62.5%) private medical faculties, some topic of patient safety was detected in some subject. In contrast, in 26 of the 30 (86.7%) public medical faculties, some topic related to patient safety was observed in the curse syllabi. These differences are statistically significant (p = 0.00) (**Table 5**).

DISCUSSION

The fundamental principle in medicine, stemming from the Hippocratic Oath and adopted by the World Alliance for Patient Safety since 2004, is "primum non nocere." This premise underscores the necessity to include patient safety in healthcare education at all educational levels. The results of this study reveal a significant disparity between this expectation and the reality in medical education in Spain. Although 82% of faculties have integrated some patient safety topics, the maximum number of WHO-recommended topics integrated into the training was 7, found in only 1 faculty, and only 11% have integrated between 5 and 7 of the 11 topics recommended by WHO. These results, although they can be inferred based on other studies at both the national and international levels [14, 22, 23, 25–28], are the first obtained with this methodology, in which the training offered in patient safety specifically by medical faculties in Spain is verified.

In our study, we observed progress in the integration of patient safety, as in most medical faculties (82%) there is an introductory topic on patient safety in some subjects. This

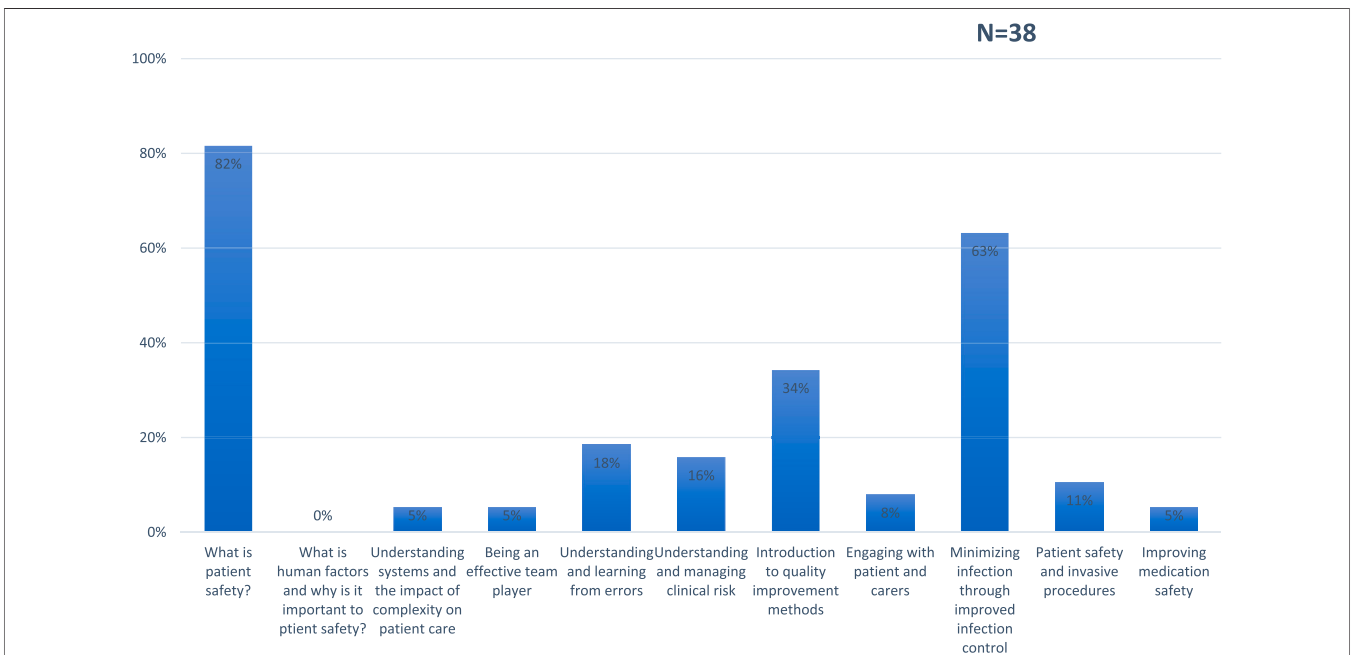

FIGURE 1 | Percentage of topics recommended in the World Health Organization Patient Safety curriculum guide include in medical faculties. (Spain, 2024).

TABLE 5 | Presence of Patient Safety as a topic in any course, based on university funding. (Spain, 2024).

		Funding			Fisher's exact test
		Private	Public	Total	
Patient safety integrated at any subject	No	3 (37.5%)	4 (13.3%)	7 (18.4%)	0.000
	SI	5 (62.5%)	26 (86.7%)	31 (81.6%)	
	Total	8 (100%)	30 (100%)	38 (100%)	

figure is well above the 45% published in a 2012 study in the United States [23]. Our results are lower than those observed in Japan [14], in a 2012 study, where the implementation rate of patient safety training was 98%. The authors justified this rate by the impetus received from the Japanese Ministry of Education at the time. Although our results may seem acceptable, we must consider the difference in methodology used in evaluating patient safety training, as our study is based on the search in the curse syllabi, while in the mentioned studies, such evaluation was conducted through surveys. Moreover, a very relevant differential factor is the year of evaluation, as there are 10 years of difference between the evaluation in those studies and ours. Therefore, it is possible that the integration of PS in universities in the EU and Japan is currently higher. If we compare ourselves with Europe, more recently in 2023, a study found an integration of patient safety training of 36% in European medical faculties, and 50% in faculties in southern Europe [22], lower values than those found in our study.

In the present study, we did not identify any medical faculty that addresses the 11 topics recommended by the World Health Organization (WHO) in their entirety. This finding is consistent with the study by Jain et al. [23]. However, unlike that study, in which the most frequently addressed topics were infection control, patient transfer, and patient treatment safety, our analysis reveals that, in most cases, the most implemented topics, in addition to the introduction to patient safety, are the control of HCAIs and the introduction to quality improvement methods. This is probably related to the existence of a Preventive Medicine subject in most Spanish medical faculties, which in our study more frequently includes topics related to patient safety. In fact, it is precisely the specialty of Preventive Medicine and Public Health that, with a transversal approach to medicine, develops these topics [29]. As for care quality, in the present study, we observed that 34% of medical faculties integrate this topic into their curse syllabus. This figure is similar to that published in a European study showing that 38% of European medical faculties integrate quality into their curricular plan, with this figure being higher in universities in southern Europe where 50% of the centers integrate quality care topics [22].

Unlike our study, in which some topics were very little addressed or not addressed at all in the curse syllabi of the subjects, such as the human factor or the systemic approach related to patient safety, the study conducted in Japan does describe the importance and integration of these factors, presenting an integration of over 70% in the curse syllabi [14]. On the other hand, the European study did not evaluate the presence of these topics.

In the present study, we detected that patient safety training is offered optionally in 2 faculties. Although probably an attempt to introduce it into the curriculum, it is clearly not sufficient, as it diminishes the relevance of such training, which is considered to be one of the cores of health education [1, 7, 11]. Additionally, it may discourage training in patient safety, a training to which the students themselves assign importance [30].

In our analysis, we found that public university institutions exhibit a significantly higher proportion of patient safety training compared to their private counterparts, a difference that is statistically significant. We found no justification to explain these differences except perhaps the tendency of private faculties to provide training focused on new technologies and topics that excite students more, leaving aside fundamental topics, which *a priori* might seem less attractive.

This finding, along with the known correlation between the phenomenon of "burnout" and the perception of safety culture [31], is relevant for all medical faculties, but even more so for private institutions. This is due to the impact on health professionals' satisfaction with the interest in health training.

Our study presents several limitations that merit consideration. First, the availability of information regarding the topics covered in the courses varied among faculties, as not all had the corresponding syllabi accessible on their websites. Additionally, there was no established process to verify the information provided on the faculties' websites. Nonetheless, the absence of patient safety-related topics in these guides implies a potential lack of emphasis in this crucial area. Despite these challenges, exhaustive searches on the faculties' websites enabled us to collect information from a substantial percentage of them, offering a broad overview of healthcare education in Spain. Furthermore, we addressed the challenge of determining the actual focus of the listed topics by conducting a comprehensive evaluation of the course contents.

The present study has several strengths. It is the first study in our country to evaluate the incorporation of Patient Safety into the educational plans of universities in Spain. The methodology used allows us to gain insight into the state of such education, independent of biases that may be provided by respondents, as seen in other studies and those based solely on students' knowledge. Furthermore, our findings underscore the urgency of reconsidering the curricular structure in medical faculties to align with the WHO's recommendations on patient safety training. Achieving this goal necessitates a thorough

understanding of the current state of patient safety integration across different medical faculties, underscoring the significance of this study.

In conclusion, according to our findings, the expectations regarding the integration of patient safety education in our setting are not adequately met. Although there is evident progress in incorporating fundamental concepts of patient safety, the comprehensive implementation of all topics recommended by the World Health Organization in medical faculties in Spain is insufficient. These results should serve as a starting point to stimulate a line of research that explores deeply the best strategy to effectively integrate patient safety-related topics into medical education programs.

AUTHOR CONTRIBUTIONS

All authors participated in the design, interpretation of the studies and analysis of the data and review of the manuscript; JA and ME wrote the manuscript and contributed equally. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

SUPPLEMENTARY MATERIAL

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Nurse Staffing, Work Hours, Mandatory Overtime, and Turnover in Acute Care Hospitals Affect Nurse Job Satisfaction, Intent to Leave, and Burnout: A Cross-Sectional Study

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Objectives: This study examined the impact of nurse staffing, working hours, mandatory overtime, and turnover on nurse outcomes in acute care hospitals. Previous studies have focused on the single characteristics of sub-optimal nurse staffing but have not considered them comprehensively.

Methods: Data were collected in July–September 2022 using convenience sampling and an online survey (N = 397). For the analysis, 264 nurses working as staff nurses at 28 hospitals met the inclusion criteria. Univariate analysis and multivariable generalized estimating equation (GEE) were performed.

Results: Both nurse staffing (β = –0.036, standard error [SE] = 0.011) and turnover (β = –0.006, SE = 0.003) were significant factors affecting job satisfaction. In the multivariable GEE, only mandatory overtime (β = 0.395, SE = 0.116) was significantly related to intent to leave. Nurse staffing, work hours, mandatory overtime, and turnover were not significantly related to burnout. Subjective health status and workload were significantly associated with burnout.

Conclusion: Nurse staffing policies and improvement programs in hospitals should be implemented to improve nurses' job satisfaction. Labor policy should ban mandatory overtime.

Keywords: nurse staffing, work hours, mandatory overtime, job satisfaction, intent to leave, burnout, hospitals, cross-sectional study

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INTRODUCTION

Nursing shortage is a global issue that many countries experience in their healthcare systems [1]. The World Health Organization [2] estimated that the world encountered a shortage of 5.9 million nurses in 2018. The International Council of Nurses projects that over 13 million nurses will be required to resolve nursing shortages by 2030 [3]. The COVID-19 pandemic has enhanced the demand for nurses and exacerbated the shortage [4]. Nurse turnover rates are as high as 27.65% and 23% in the United States [5] and Israel [6], respectively. In South Korea, the number of licensed registered nurses per 1,000 population was 8.9 in 2021, and approximately half of them

(4.6 nurses per 1,000 people) worked as clinical nurses [7]. These numbers are below average for other high-income countries (e.g., Organization for Economic Co-Operation and Development countries) [7]. The nurse turnover rate in South Korea is 15.2%, and the turnover rate of newly licensed nurses is 44.5% [8].

Sub-optimal nurse staffing characteristics can be observed during nursing shortages, such as inadequate staffing levels, longer working hours with overtime, and high turnover [9]. Several systematic reviews and meta-analyses have reported on the relationship between nurse staffing and patient outcomes. For example, sub-optimal nurse staffing has an adverse impact on the quality of care. Specifically, nurse staffing is significantly associated with patient mortality [10] and hospital-acquired conditions, including pressure ulcers, falls, central line-associated bloodstream infections, and catheter-associated urinary tract infections [11]. Long working hours are adversely associated with quality of care, patient safety, errors, patient satisfaction, and patient mortality [12]. A recent review found that turnover decreases patient satisfaction, while increasing pressure ulcers, and medication errors [13].

Regarding nurse outcomes, inadequate nurse staffing increases nurses' burnout, job dissatisfaction, and intent to leave [14]. Among nurses working in critical care units, inadequate staffing also increases burnout, fatigue, stress, job dissatisfaction, and plans to leave [15]. Long work hours were significantly associated with various nurse outcomes, such as occupational injuries, absenteeism burnout, job dissatisfaction, intent to leave, fatigue, and overweight/obesity, while mandatory overtime increased injury, illness, and absenteeism [16]. Relatively few studies have examined turnover and nurse outcomes [13]; however, turnover decreases nurses' mental health and job satisfaction [17].

The aforementioned studies have often focused on a single characteristic of sub-optimal nurse staffing, instead of the various nurse staffing characteristics, such as lower staffing levels, long work hours, and high turnover, which often occur concurrently during nursing shortages. A previous study [9] investigated comprehensive nurse staffing characteristics to examine the relationship between these nurse staffing characteristics and patient outcomes, not nurse outcomes. Another study [18] examined work-schedule and its associations with burnout and intention to leave among nurses working in psychiatric hospitals. However, these sub-optimal nurse staffing characteristics including staffing levels, work hours, and turnover have not been comprehensively considered when investigating their relationship with nurse outcomes in acute care hospitals. During nursing shortages, such sub-optimal nurse staffing characteristics can lead to poor nurse outcomes, including lower job satisfaction and high burnout, which, in turn, can influence additional nurse turnover and aggravate the nursing shortage. Thus, understanding which staffing characteristics are stronger contributing factors to specific nurse outcomes would provide more informative evidence for developing strategies and policies to improve these nurse outcomes and eventually reduce turnover and retain nurses given nursing shortages.

Based on Donabedian's structure, process, and outcomes model [19], these sub-optimal nurse staffing characteristics can be structural aspects that affect nurse outcomes through processes. This study focused on the structure and outcomes. According to previous studies, specific variables of sub-optimal nurse staffing include nurse staffing levels, work hours, mandatory overtime, and turnover [9, 18]. Similarly, previous studies indicate that nurse outcomes related to these sub-optimal nurse staffing characteristics include job satisfaction, intent to leave, and burnout [14, 16, 17]. Therefore, using Donabedian's model and findings from previous studies, this study examined the impact of sub-optimal nurse staffing characteristics on nurse outcomes including job satisfaction, intent to leave, and burnout, in acute care hospitals.

METHODS

Study Design and Sample

This cross-sectional study examined the impact of nurse staffing, work hours, mandatory overtime, and nurse turnover on nurse outcomes using data collected from nurses working in the medical and surgical nursing units of acute care hospitals. According to G*Power 3.1.9.4 [20], a minimum of 123 participants was required for a multivariable generalized estimating equation (GEE) with 11 predictors, 0.15 effect size, a significance level of 0.05, and a power of 0.80. Convenience sampling was used for data collection and was conducted from July to September 2022. Nurses who worked in the current unit for 6 months or longer and provided direct patient care were included.

Data Collection

For data collection, small- and medium-sized general hospitals in South Korea were contacted to explain the study and invite them to participate. The author delivered invitation information with the online survey link, which was sent to staff nurses and nurse managers within each hospital. Using the online survey, data confidentiality and anonymity were maintained for all participants. At the end of the survey, all participants left their mobile number to receive compensation in the form of a small gift. Of the 270 general hospitals with 201–1,000 beds, 35 agreed to participate. A total of 397 nurses and nurse managers from these hospitals responded to an online survey. Inclusion criteria included working in either a medical, surgical, or medical-surgical combined unit and working in the current unit for 6 months or more. A total of 45 and 29 participants, respectively, were excluded for not meeting these criteria. In addition, 26 participants who did not answer more than 70% of the questions were excluded. Finally, 33 nurse managers who did not provide direct patient care were excluded. The final analytical sample comprised 264 registered nurses from 28 hospitals who worked as staff nurses, which was sufficient for the multivariable GEE.

Measures

Dependent Variables

The nurse outcomes included job satisfaction, intent to leave, and burnout. The Copenhagen Psyco-Social Questionnaire Scale [21, 22] was used to measure job satisfaction. This scale comprises four items rated on a four-point Likert scale. The exam item was, "To what extent are you satisfied

with your career prospects?" The total mean score ranged from 1 to 4 points, and higher scores indicated greater job satisfaction. The Intraclass correlation coefficient (ICC (1)) was 0.071. The Cronbach's alpha for this study was 0.86, indicating good internal consistency.

Turnover intention [23] was used to measure nurses' intent to leave. Park et al. [24] modified this original instrument for nurses and used it in this study. The instrument comprised four items with a five-point Likert-type scale. The exam item was "I sometimes think of leaving my current workplace." Higher scores indicated greater turnover intention, and the total mean score ranged from 1 to 5 points. ICC (1) of turnover intention was 0.035. Good internal consistency was found in this study (Cronbach's alpha = 0.86).

Nurse burnout was measured using the Professional Quality of Likes Scale (ProQOL version 5) [25, 26]. In the ProQOL, burnout under the compassion satisfaction/fatigue subscale was used, which comprises 10 items rated on a five-point Likert-type scale. The total burnout scores ranged from 10 to 50. Higher scores indicated higher levels of burnout. A score of 22 or lower is considered "low," and a score between 23 and 41 is considered "moderate." A score of 42 or higher is considered "high [25]". The ICC (1) of burnout was 0.067. Cronbach's alpha was 0.76 for this study, indicating acceptable internal consistency.

Main Independent Variables

The nurse staffing level was measured as the number of patients per nurse during a shift. Nurses working a three-rotating shift (day, evening, and night) provided the number of patients during each shift. The average number of patients per nurse was used to measure the nurse staffing levels. Other nurses reported the number of patients during the shift. Nurses recalled their staffing levels during the previous month. When nurses did not provide the number of patients during a shift, they provided the number of beds and the total number of nurses in their unit. Using these data, the nurse staffing level during a shift (nurse to patient ratio) was calculated by the number of beds per the total number of nurses multiplied by 4.8, which was based on an assumption of 226 working days per year for nurses working 3 shifts ($3 \times 365/226 = 4.845$) [27]. For example, when the number of beds in a unit was 60 and the total number of nurses in that unit was 20, then the nurse staffing level during a shift was 14.4 ($60/20 \times 4.8 = 14.4$) for the three-rotating shifts. This method has been used previously [27]. All staffing data were manually reviewed. Outliers were also checked such as unusually high or low numbers. Among 264 nurses, 7 cases were missing, and 4 cases were the outliers and imputed as missing. The nurse staffing level (the number of patients per nurse during a shift) were used for 164 nurses, and the number of beds per the total number of nurses multiplied by 4.8 were used for 89 nurses. Sensitivity analysis was conducted to evaluate the validity of this method. The GEE models were run both with (253) and without (164) the cases. The estimates of nurse staffing remained stable, showing no difference in the significant levels or direction. The strength of estimate was similar in the job satisfaction and burnout models and a little different in the intent to leave model. The staffing calculation was found to be valid.

Nurses' work hours were defined as the mean shift length. Actual work hours were measured for day, evening, and night shifts among nurses working in a three-rotating shift. Other nurses reported the number of working hours per shift. The average actual work hours in the previous months were used. Unusually long work hours, such as outliers, were considered errors and imputed as missing data. Nurses also answered whether they had worked mandatory overtime in the previous months (yes/no), based on their perception of mandatory overtime.

Nurse turnover rates were measured using the prior six-month unit turnover rates. The nurse managers provided data on nurse turnover. Data on the number of nurses who worked at the unit and left it between 1 January 2022, and 30 June 2022 (approximately 6 months prior to data collection) were collected. The denominator is the average number of nurses working between 1 January and 30 June, 2022, and the numerator is the number of nurses who resigned during the same period. The turnover rate was calculated for nurses working with nurse managers in the same unit [28]. This six-month turnover rate was used in the analysis.

Covariates

Nurses' characteristics included sex, age, the highest level of nursing education, marital status, and subjective health status. Work-related characteristics included work type (three-shift rotation v. others), current hospital work experience, workload, type of nursing unit, and hospital size (beds). Workload, as developed by Brewer et al. [29], is measured as the level of performance required for a job in terms of the amount, intensity, and frequency of work [30]. It comprised four items with a six-point Likert scale ("never" to "five or more days a week"). The total score ranges from 4 to 24, with high scores representing higher levels of workload. The Cronbach's alpha in this study was 0.83.

Data Analysis

Data analysis was conducted using SAS 9.4 (SAS, Cary, NC, United States). The means and standard deviations of the dependent variables (job satisfaction, intent to leave, and burnout) and the main independent variables (nurse staffing, work hours, mandatory overtime, and turnover) were evaluated. The dependent variables were continuous variables. Except for mandatory overtime, the three independent variables (nurse staffing, work hours, and turnover) were used as continuous variables. Mandatory overtime was dichotomous, and the reference group comprised nurses who did not work mandatory overtime. Descriptive statistics for the covariates (nurse- and work-related characteristics) were obtained. Univariate analysis for each variable and a multivariable GEE including only the significant variables in the univariate analysis were used to examine the impact of nurse staffing, work hours, mandatory overtime, and turnover on nurse outcomes after controlling for covariates. GEEs were used to account for the

TABLE 1 | General characteristics of study variables (*N* = 264) (Nurse staffing, work hours, mandatory overtime, and turnover in acute care hospitals affect nurse job satisfaction, intent to leave, and burnout: a cross-sectional study, South Korea, 2024).

Variables	*n* (%)	Mean (SD)
Dependent variables		
Job satisfaction	*N* = 235	2.46 (0.56)
Intent to leave	*N* = 237	3.75 (0.87)
Burnout	*N* = 236	29.71 (5.35)
22 or lower (low)	30 (11.2)	
23–41 (moderate)	233 (87.3)	
42 or higher (high)	4 (1.5)	
Main independent variables		
Nurse staffing level (number of patients per nurse during a shift)	*N* = 253	12.46 (3.53)
Work hours per shift	*N* = 231	9.33 (1.00)
Mandatory overtime	*N* = 253	
Yes	102 (40.3)	
No	151 (59.7)	
Nurse turnover rate for 6 months	*N* = 217	15.49 (14.20)
Covariates (nurse-and work-related characteristics)		
Sex	*N* = 234	
Male	5 (2.1)	
Female	229 (97.9)	
Age, years in 2022	*N* = 231	32.58 (7.97)
21–30	121 (52.4)	
31–40	67 (29.0)	
41–50	32 (13.8)	
≥51	11 (4.8)	
Highest nursing education	*N* = 230	
Associate degree	41 (17.8)	
Bachelor's degree	178 (77.4)	
Master's degree or PhD in nursing	11 (4.8)	
Marital status	*N* = 233	
Married or in domestic partnership	90 (38.6)	
Widowed, divorced, separated	5 (2.2)	
Never married	138 (59.2)	
Subjective health status	*N* = 231	
Very good	20 (8.7)	
Good	57 (24.7)	
Fair	111 (48.0)	
Poor	43 (18.6)	
Work type	*N* = 264	
3-shifts rotation	239 (90.5)	
Other	25 (9.5)	
Work experience in current hospitals (years)	*N* = 234	7.62 (7.18)
Under 1 year	16 (6.8)	
1 year–under 3 years	54 (23.1)	
3 years–under 5 years	37 (15.8)	
5 years–under 10 years	60 (25.6)	
10 years or over	67 (28.6)	
Workload	*N* = 263	18.05 (3.60)
Type of unit	*N* = 264	
Medical	77 (29.2)	
Surgical	97 (36.7)	
Medical-surgical	90 (34.1)	
Hospital size (beds)	*N* = 264	372.65 (115.03)
201–300	106 (40.2)	
301–400	49 (18.6)	
401–500	83 (31.4)	
501–1000	26 (9.8)	

Note. SD, standard deviation; PhD, Doctor of Philosophy.

clustering (nursing unit). Owing to the missingness of each variable, the total number of samples used in each analytic model varied.

Ethics Statements

The Institutional Review Board of a university approved this study (no. ewha-202205-0005-01). All participants provided

TABLE 2 | Nurse staffing, work hours, mandatory overtime, turnover, and job satisfaction (Nurse staffing, work hours, mandatory overtime, and turnover in acute care hospitals affect nurse job satisfaction, intent to leave, and burnout: a cross-sectional study, South Korea, 2024).

Variables	β (SE)	*P*	β (SE)	*p*
Intercept			3.245 (0.237)	<0.001
Main independent variables				
Nurse staffing	−0.038 (0.010)	<0.001	−0.037 (0.010)	<0.001
Work hours	−0.072 (0.038)	0.059		
Mandatory overtime (ref: No)	−0.119 (0.075)	0.113		
Nurse turnover	−0.006 (0.003)	0.022	−0.006 (0.003)	0.015
Covariates (nurse-and work-related characteristics)				
Sex (ref: Female)				
Male	0.192 (0.255)	0.452		
Age, years in 2022	−0.007 (0.005)	0.144		
Highest nursing education (ref: Associate degree)				
Bachelor's degree	−0.059 (0.097)	0.546		
Master's degree or PhD in nursing	0.130 (0.190)	0.493		
Marital status (ref: Married or in domestic partnership)				
Widowed, divorced, separated	−0.303 (0.254)	0.231		
Never married	0.120 (0.075)	0.110		
Subjective health status (ref: Poor)				
Very good	0.328 (0.148)	0.027	0.379 (0.150)	0.012
Good	0.443 (0.111)	<0.001	0.402 (0.112)	<0.001
Fair	0.250 (0.098)	0.011	0.192 (0.010)	0.049
Work type (ref: Other)				
3-shift rotation	0.011 (0.126)	0.928		
Work experience in current hospitals	−0.004 (0.005)	0.458		
Workload	−0.039 (0.010)	<0.001	−0.026 (0.011)	0.014
Type of unit (ref: Medical-surgical)				
Medical	0.042 (0.093)	0.648		
Surgical	0.103 (0.087)	0.234		
Hospital size (ref: 201–300)				
301–400	0.090 (0.103)	0.381		
401–500	−0.159 (0.086)	0.064		
501–1000	−0.101 (0.125)	0.420		
N			187	

Note. SE, standard errors; PhD, Doctor of Philosophy.

informed consent online. Permission to use the instruments was obtained from the respective authors.

RESULTS

Participant Characteristics

Nurses' job satisfaction was 2.46 (standard deviation [SD] = 0.56) points on average, and intent to leave was 3.75 (SD = 0.87) points on average (**Table 1**). The average burnout was 29.71 (SD = 5.35) points, and 87% reported moderate levels of burnout. On average, nurses took care of 12.46 (SD = 3.53) patients during a shift. The average work hours for a shift were 9.33 (SD = 1.00), and 40% reported working mandatory overtime during the last month.

Most participants were female (97.9%), and nurses' mean age was 32.58 (SD = 7.97) years. More than 82% of the nurses had a bachelor's degree or higher in nursing, and 59.2% had never been married. Regarding subjective health status, 18.6% reported poor health. More than 90% worked in a three-shift rotation, and they had 7.62 (SD = 7.18) years of work experience in their current hospital. The average workload was 18.05 (SD = 0.83) points. Approximately 34% of participants worked in medical-surgical units, and 40.2% worked in hospitals with 201–300 beds.

Impact of Nurse Staffing, Work Hours, Mandatory Overtime, and Turnover on Job Satisfaction, Intent to Leave, and Burnout

Univariate and multivariable GEEs were used to examine the impact of nurse staffing, work hours, mandatory overtime, and turnover on job satisfaction, intent to leave, and burnout. In the univariate analysis, nurse staffing levels and turnover rates were significantly related to job satisfaction (**Table 2**). In the multivariable GEE, both nurse staffing (β = −0.037, standard error [SE] = 0.010) and turnover (β = −0.006, SE = 0.003) remained significant factors affecting job satisfaction. Job satisfaction decreased when nurses took care of more patients and worked in nursing units with greater turnover. Better health conditions increased job satisfaction; however, high workload levels decreased job satisfaction.

Regarding intent to leave, nurse staffing and mandatory overtime were significant factors in the univariate analysis (**Table 3**). However, in the multivariable GEE, only mandatory overtime (β = 0.395, SE = 0.114) was significantly related.

TABLE 3 | Nurse staffing, work hours, mandatory overtime, turnover, and intent to leave (Nurse staffing, work hours, mandatory overtime, and turnover in acute care hospitals affect nurse job satisfaction, intent to leave, and burnout: a cross-sectional study, South Korea, 2024).

Variables	β (SE)	*p*	β (SE)	*p*
Intercept			3.203 (0.347)	<0.001
Main independent variables				
Nurse staffing	0.032 (0.016)	0.039	0.019 (0.016)	0.212
Work hours	0.102 (0.058)	0.076		
Mandatory overtime (ref: No)	0.399 (0.114)	<0.001	0.395 (0.114)	<0.001
Nurse turnover	0.003 (0.004)	0.557		
Covariates (nurse-and work-related characteristics)				
Sex (ref: Female)				
Male	0.041 (0.391)	0.916		
Age, years in 2022	−0.006 (0.007)	0.421		
Highest nursing education (ref: Associate degree)				
Bachelor's degree	0.194 (0.148)	0.190		
Master's degree or PhD in nursing	−0.417 (0.290)	0.150		
Marital status (ref: Married or in domestic partnership)				
Widowed, divorced, separated	−0.319 (0.389)	0.411		
Never married	−0.156 (0.115)	0.174		
Subjective health status (ref: Poor)				
Very good	−0.837 (0.224)	<0.001	−0.869 (0.221)	<0.001
Good	−0.692 (0.167)	<0.001	−0.684 (0.168)	<0.001
Fair	−0.545 (0.149)	<0.001	−0.530 (0.150)	<0.001
Work type (ref: Other)				
3-shift rotation	0.328 (0.192)	0.088		
Work experience in current hospitals	−0.006 (0.008)	0.440		
Workload	0.058 (0.015)	<0.001	0.035 (0.016)	0.028
Type of unit (ref: Medical-surgical)				
Medical	−0.081 (0.142)	0.571		
Surgical	−0.050 (0.133)	0.708		
Hospital size (ref: 201–300)				
301–400	−0.007 (0.160)	0.967		
401–500	0.126 (0.133)	0.343		
501–1000	−0.025 (0.194)	0.897		
N			212	

Note. SE, standard errors; PhD, Doctor of Philosophy.

Compared to nurses who did not work mandatory overtime, those working mandatory overtime reported higher levels of intent to leave. Similar to the job satisfaction model, better health conditions decreased intent to leave, and workload increased intent to leave.

Nurse staffing, work hours, mandatory overtime, and turnover were not significantly related to burnout (**Table 4**). Univariate analysis revealed that sex, age, education level, subjective health status, workload, and hospital size were significantly associated with burnout. In the multivariable GEE, only subjective health status and workload were significantly related to burnout. Compared to nurses with poor health conditions, nurses with very good (β = −0.790, SE = 0.128), good (β = −0.602, SE = 0.094), and fair (β = −0.368, SE = 0.082) health conditions reported lower burnout. Increased levels of workload led to greater levels of burnout (β = 0.028, SE = 0.009).

DISCUSSION

This study investigated the impact of nurse staffing, work hours, mandatory overtime, and turnover on nurse outcomes, including job satisfaction, intent to leave, and burnout. The mean score of nurses' job satisfaction was 2.46, which is between "dissatisfaction (2 points)" and "satisfaction (3 points)." The average score for intent to leave was 3.75 points, which was 15.00 points in the total score; a high proportion of nurses reported that they wanted to leave their positions. The average burnout score (29.71 points) was higher than previously reported (27.49 points) [25]. Compared to a previous study [30], nurses in this study took care of fewer patients per shift and worked more than 9 h per shift, which is similar to the nurses in the previous study with a higher proportion working mandatory overtime (40%). Their turnover rate (15.49 for 6 months) was significantly higher than the national annual average (15.2%) [8].

Factors contributing to nurse outcomes differed among nurse staffing, work hours, mandatory overtime, and turnover. Job satisfaction was affected by both nurse staffing and turnover. A meta-analysis [14] reported that when the number of patients per nurse increased, nurses' job dissatisfaction increased significantly (odds ratio = 1.08). The current findings support this relationship. Regarding turnover, a Canadian study [17] found that the 1-year turnover rate decreased nurses' job satisfaction, which coincides with this study. Furthermore, the

TABLE 4 | Nurse staffing, work hours, mandatory overtime, turnover, and burnout (Nurse staffing, work hours, mandatory overtime, and turnover in acute care hospitals affect nurse job satisfaction, intent to leave, and burnout: a cross-sectional study, South Korea, 2024).

Variables	β (SE)	*p*	β (SE)	*p*
Intercept			3.119 (0.221)	<0.001
Main independent variables				
Nurse staffing	0.013 (0.010)	0.188		
Work hours	0.058 (0.037)	0.114		
Mandatory overtime (ref: No)	0.055 (0.072)	0.442		
Nurse turnover	0.001 (0.003)	0.629		
Covariates (nurse-and work-related characteristics)				
Sex (ref: Female)				
Male	−0.484 (0.240)	0.044	−0.233 (0.206)	0.258
Age, years in 2022	−0.011 (0.004)	0.016	−0.006 (0.004)	0.114
Highest nursing education (ref: Associate degree)				
Bachelor's degree	−0.038 (0.092)	0.678	−0.114 (0.079)	0.148
Master's degree or PhD in nursing	−0.364 (0.180)	0.042	−0.157 (0.161)	0.330
Marital status (ref: Married or in domestic partnership)				
Widowed, divorced, separated	−0.088 (0.247)	0.722		
Never married	0.013 (0.073)	0.856		
Subjective health status (ref: Poor)				
Very good	−0.914 (0.125)	<0.001	−0.790 (0.128)	<0.001
Good	−0.710 (0.093)	<0.001	−0.602 (0.094)	<0.001
Fair	−0.409 (0.083)	<0.001	−0.368 (0.082)	<0.001
Work type (ref: Other)				
3-shift rotation	0.153 (0.120)	0.198		
Work experience in current hospitals	−0.008 (0.005)	0.106		
Workload	0.040 (0.009)	<0.001	0.028 (0.009)	0.001
Type of unit (ref: Medical-surgical)				
Medical	0.071 (0.088)	0.420		
Surgical	−0.041 (0.082)	0.617		
Hospital size (ref: 201-300)				
301–400	0.066 (0.099)	0.508	0.020 (0.090)	0.828
401–500	0.081 (0.082)	0.322	0.033 (0.071)	0.639
501–1000	0.241 (0.119)	0.044	0.196 (0.106)	0.065
N			224	

Note. SE, standard errors; PhD, Doctor of Philosophy.

6 months turnover rate decreased job satisfaction. Nurse staffing and turnover should be improved to increase job satisfaction.

The implications of these findings are that individual hospitals should make efforts to improve nurse staffing levels. Simultaneously, nurse staffing policies should be implemented at the state and national levels. For example, the United States has implemented several nurse staffing policies, including mandating minimum nurse staffing ratios in California, a staffing committee requiring a high proportion of registered nurses as members, and public disclosure of nurse staffing levels [31]. During the COVID-19 pandemic, several states adopted nurse staffing policies [32, 33]. The findings support policy changes aimed at improving nurses' job satisfaction. Other countries should also adopt and implement nurse staffing policies.

Regarding intent to leave, mandatory overtime was the only significant factor contributing to intent to leave, although nurse staffing was significant in the univariate analysis, which differed from a previous meta-analysis [14]. Mandatory overtime increases the incidence of musculoskeletal disorders, injuries, and illnesses [16]. It did not have a relationship with intent to leave in a South Korean study [30]. In this study, working mandatory overtime increased intent to leave, which might indicate that a coercive working culture (working mandatory overtime) led to a higher intent to leave. Further studies are needed to investigate this relationship. Mandatory overtime should be prohibited to reduce nurses' intent to leave, and exceptional conditions of mandatory overtime need to be evaluated for appropriateness.

Regarding policy implications, mandatory overtime has been banned in several states in the United States [12]. For example, Washington does not allow employees of healthcare facilities to work overtime, and the acceptance of working overtime among employees should be voluntary [34]. A national study found that policies banning mandatory overtime reduce the likelihood of mandatory overtime [35]. The relationship between mandatory overtime and intent to leave found in this study can be used as empirical evidence to expand this state policy to ban mandatory overtime among nurses.

None of the main independent variables were significant factors contributing to burnout, which differs from prior findings [14, 16]. Subjective health status and workload significantly affected burnout. These two factors also affect job satisfaction and the intent to leave. Based on the current findings, subjective health conditions should be promoted. Health

promotion programs should be implemented, and their effectiveness should be evaluated. Concurrently, working conditions that may be harmful to nurses' health should also be improved. Individual nurses and organizational efforts should be made to improve health conditions. Regarding workload, a previous South Korean study also found a significant relationship between job satisfaction and intent to leave in the expected direction [30]. A previous study [36] found that workload can increase burnout. The current findings support the relationship between workload and nurse outcomes. Workloads reported by nurses should be measured, monitored, and managed to improve nurse outcomes.

This study measured multiple aspects of sub-optimal nurse staffing (nurse staffing, work hours, mandatory overtime, and turnover), which is a key strength. However, the study has certain limitations. Because convenience sampling was used, the generalizability of the findings is lacking. Nurses who are more concerned about nurse outcomes and work conditions may respond to the survey, which could lead to self-selection bias. In addition, all data were collected from an online survey and were self-reported by nurses, which could create recall and socially desirable biases. Furthermore, the use of a cross-sectional design limits the ability to infer causal relationships among nurse staffing, work hours, mandatory overtime, turnover, and nurse outcomes. The calculation of nurse staffing levels, determined by the number of beds per the total number of nurses multiplied by 4.8, was based on the assumption that staffing levels remain consistent across shifts, workdays and weekends. However, this assumption holds true in only a few cases, which might be another limitation. Additionally, the work hours per shift, not the total work hours, measured in full time equivalent were used in this study. This omitted variable might affect the findings. Finally, mandatory overtime was measured by nurses' perception of mandatory overtime. However, even without mandatory overtime, peer pressure might create a negative culture around working time. In this case, the actual value might be under estimated. These limitations should be addressed in future longitudinal studies.

Conclusion

This study investigated the effect of sub-optimal nurse staffing on nurse outcomes. Sub-optimal nurse staffing and nurse outcomes were assessed using multifaceted variables. The study found a significant impact of nurse staffing, mandatory overtime, and turnover on job satisfaction and intent to leave. Subjective health conditions and workload affect job satisfaction, intent to leave, and burnout.

Nurse staffing policies and improvement programs in hospitals, as well as state- and national-level policy changes should be implemented to improve nurses' job satisfaction. Similarly, mandatory overtime should be prohibited and working overtime among employees should be voluntary. Labor policy should ban mandatory overtime among nurses, which can improve their intent to leave.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The studies involving humans were approved by the Ewha Womans University Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because all participants provided informed consent via online.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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CONFLICT OF INTEREST

The author declares that they do not have any conflicts of interest.

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Critical Care Nurses' Perceptions of Abuse and Its Impact on Healthy Work Environments in Five European Countries: A Cross-Sectional Study

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Objective: Workplace violence is a prevalent phenomenon in hospital settings which critical care nurses are particularly exposed to. The aim of this study was to research abuse against Critical Care Nurses in five European countries, and its association with and impact on Healthy Work Environments.

Methods: This was a multinational cross-sectional study. The 1,183 participants were nurses working in intensive care units from five European countries: Croatia, Cyprus, Poland, Spain, and Romania. The participants were selected by the convenience sampling method from 1 January 2021 to April 2022.

Results: Of 1,033 critical care nurses who answered questions about abuse, 646 reported at least one incident in the previous year. The highest number of incidents came from patients (2,050), followed by another nurse (1,453) and physicians (1,039).

Conclusion: Although nurses in ICUs are aware that a healthy working environment benefits them in their daily work, most of them still face some form of abuse. Organizations must take a realistic approach to prevent abuse and to educate nurses and nurse managers by implementing standards for healthy work environments.

Keywords: abuse, critical care, nursing, workplace violence, healthy work environment

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INTRODUCTION

The World Health Organization (WHO) and the International Council of Nurses (ICN) define workplace violence as any incident where staff are abused, threatened or assaulted in circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, wellbeing or health (ILO, ICN, WHO, and PSI, 2002) [1]. No official universal definition of workplace violence or abuse within healthcare settings exists [2].

Violence and abuse are closely related; however, by definition violence is an action which causes destruction, pain, or suffering, while abuse refers to be also prolonged maltreatment that can cause emotional as well as physical trauma [3]. Both terms are used, but in our research we decided on the term "abuse" because it covers a wider group of damaging actions and includes almost any behaviour inflicted by a perpetrator that causes a person distress or harm [4], which relates better to events occurring in intensive care units (ICU). Also, the term abuse was originally in the questionnaire "The AACN Critical Care Nurse Work Environment survey."

Nurses in ICUs, who are primarily responsible for providing acute life-saving care to the most vulnerable patients, experience abuse at a significantly higher level than other healthcare professionals [2]. Workplace violence is a prevalent phenomenon in hospital settings, and ICU nurses are particularly exposed to it due to weak points in their work environments [5, 6]. High stress, long hours, a heavy workload and constant pressure from managers and superiors, together with complex care and heightened expectations from patients and families form a basis for creating potential outbursts of any type of abuse. Violence or any form of abuse affects the health and wellbeing of healthcare workers, compromising work performance and job satisfaction [7]. An unhealthy workplace increases the possibility of medical errors, verbal and nonverbal abuse, disrespect, resistance to change, conflicts between healthcare workers and poor provision of care, and also leads to job dissatisfaction and intention to leave the job, which leads to a shortage of nursing staff [8].

According to the American Association of Critical Care Nurses (AACCN), a healthy work environment for nurses is a workplace that is safe, empowering, and satisfying [9]. Additionally, healthy work environments strongly correlate with the psychological health, satisfaction, and wellbeing of nurses [10]. Almost 20 years ago, our colleagues from the AACCN determined six essential standards which, after their implementation in intensive care units, enable a healthier work environment [10]. Intensive care units which have implemented the six standards have seen improvements at all levels, as evidenced by the AACCN data [10, 11]. According to the AACCN, Skilled Communication, True Collaboration, Effective Decision-making, Appropriate Staffing, Meaningful Recognition, and Authentic Leadership are the basic standards which all ICUs need to implement if they want to create a healthier work environment and achieve less moral distress and lower rates of workplace violence [12–14].

After numerous studies of healthy work environments in ICUs, many researchers claim that there is a significant link between the existence of zero-tolerance policies against abuse in hospitals and the amount of verbal and physical abuse which the nurses in their studies experienced [10, 13]. In the available literature there are many articles on the abuse of healthcare workers and the risk factors and risk assessment of abuse, as well as conflict prevention methods and successful management [15–19]. However, we found only one study in Europe and Asia that used the American Healthy Work Environment questionnaire on ICU nurses and linked it to abuse [5]. Despite many findings of abuse against healthcare workers, especially ICU nurses, the prevalence of abuse remains high [4, 5, 17, 20, 21].

Our intention was to explore the perceptions of ICU nurses on abuse in five European countries, the differences in levels of abuse between them, and how much abuse affects healthy work environments. We want to emphasize the importance of a healthy working environment and how necessary it is to try to establish zero tolerance to abuse through hospital policy and nurse managers.

The aim of this study was to explore abuse against critical care nurses in five European countries, and its association with and impact on healthy work environments.

METHODS

Research Design

This was a multinational cross-sectional study. The 1,183 participants were nurses working in intensive care units in five European countries: Croatia, Cyprus, Poland, Spain, and Romania. The participants were selected by using the convenience sampling method in the period January 2021 to April 2022. A digital questionnaire, with an information part on the first page about the nature of the study, was distributed through the emails of ICU nurses; most of the researchers in this study work in ICUs and have access to their fellow employees' emails through the websites of the national organizations of each country. Only the researchers from Romania needed to ask head nurses and directors of ICUs to help them distribute the materials; the questionnaire in Romania was delivered both electronically and in printed form, according to the individual preference of each ICU taking part in the study. In the case of Romania, invitation to take part in the study was sent to all hospitals with an ICU in the country. All the Registered Nurses working in adult ICUs from the five countries were eligible to participate. Ethics approval was obtained from the Cyprus Bioethical Committee, as Cyprus was the lead co-ordinating country for the project. The completed questionnaires were digitally and anonymously returned by the participating CCNs simply by answering the final question. Prior the questionnaire informed consent was signed. Each participant registered under a unique code, so our chief statistician could monitor the number of completed questionnaires at any time.

Participants

The participants were CCNs working in ICUs from five European countries: Croatian, Cyprus, Poland, and Romania. The participants were selected by using the convenience sampling method. From a total of 1,183 respondents to the questionnaire, 1,033 answered questions about abuse, thus meeting the inclusion criteria and making up the sample.

Questionnaire

The AACN Critical Care Nurse Work Environment survey version 1 was used. The key parts of the Healthy Work

TABLE 1 | Demographic data from respondents who answered questions related to abuse, Improving Working Environments for Nurses in the Critical Care Unit Cyprus, Croatia, Poland, Spain, Romania (2019–2022).

		Croatia *N* = 257	%	Cyprus *N* = 226	%	Poland *N* = 75	%	Spain *N* = 232	%	Romania *N* = 243	%	Overall *N* = 1,033	%
Gender	Male	**62**	24.1	**67**	29.6	**7**	9.3	**40**	17.2	**22**	9.0	**198**	19.1
	Female	**172**	66.9	**112**	49.5	**65**	86.7	**189**	81.5	**178**	73.3	**716**	69.3
	Prefer not to answer	**23**	8.9	**47**	20.8	**3**	4.0	**3**	1.3	**43**	17.7	**119**	11.6
Age	20–35	**166**	64.6	**123**	54.4	**23**	30.7	**93**	40.1	**38**	15.7	**443**	42.9
	36–50	**74**	28.8	**56**	24.8	**34**	45.3	**92**	39.6	**131**	53.9	**387**	37.5
	51–65	**17**	6.6	**47**	20.8	**18**	24.0	**47**	20.3	**74**	30.4	**203**	19.6
Years of nursing experience in ICU	0–5	**128**	49.8	**96**	42.5	**25**	33.3	**82**	35.3	**65**	26.7	**396**	38.4
	6–15	**70**	27.2	**57**	25.2	**26**	34.7	**73**	31.5	**76**	31.3	**302**	29.2
	16–40	**59**	22.9	**73**	32.3	**24**	32.0	**77**	33.2	**102**	42.0	**335**	32.4
Type of ICU	General	**61**	23.7	**148**	65.5	**55**	73.3	**162**	69.8	**204**	84.0	**630**	60.9
	Cardio-neuro surgical	**158**	61.5	**14**	6.2	**17**	22.7	**54**	23.3	**36**	14.8	**279**	27.1
	Other	**38**	14.8	**64**	28.3	**3**	4.0	**16**	6.9	**3**	1.2	**124**	12.0

Environment scale, based on the six AACN HWE standards, consist of a 32-item survey with 16 individual items, which include ratings of the critical care nurses' work units and organizations. The scale measures the health of the work environment using Likert-type statements with 4-point response options: strongly disagree (1), disagree (2), agree (3), and strongly agree (4). Since this was a survey, we did translation/back translation and reliability internal consistency of the scale check using Cronbach's alpha coefficient 0.78 to 0.97.

The questionnaire comprises four sections: Section A has 6 questions related to knowledge of the healthy working environment standards; Section B has 16 questions related to respondents' attitudes towards the HWE standards; Section C has 20 questions related to managers' communication and cooperation skills, and questions related to undesirable professional behaviour such as abuse (verbal, physical, sexual) and ways to react in these situations. Section D contains 8 questions referring to demographic data such as gender, age and education level. For this study we added a demographic section, and we adjusted section C so that it was better adapted to nurses from Europe. In agreement with the AACCN we did not change the questions in Section B.

Data Analysis

The data was analysed using the SPSS R Version 4.1.0, R Core Team (2021), with the following statistical analyses: descriptive statistics, chi-square tests of association, Pearson's chi-squared test and the Welch two sample t-test for correlation. For categorical variables, only frequencies and percentages of respondents were shown. Chi-squared test was used to analyse the association between categorical variables, mainly differences between countries. For the description of nurse managers' skills, Mean and Standard Deviation was used, and statistical significance of differences between 2 groups was calculated by T-test for independent samples. All differences that had $p < 0.05$ were considered statistically significant.

RESULTS

A total of 1,033 respondents from the five countries participated in the study: Croatia $n = 257$, Cyprus $n = 226$, Poland $n = 75$, Spain $n = 232$, Romania $n = 243$. Most of the respondents were women (69.3%). With regard to the age of the respondents, the largest group in the total sample consisted of 20–35-year-olds, totalling 443 respondents (42.9%). In terms of years of work experience in the ICU, although the largest group of respondents (38.4%) had 0–5 years of work experience, the difference with respect to the other two categories was small. Most respondents worked in a general ICU (60.9%). This data is presented in **Table 1**.

Of the 1,033 critical care nurses who answered the questions about abuse, 646 (Croatia $n = 145$, Cyprus $n = 133$, Poland $n = 63$, Spain $n = 133$, Romania $n = 172$) reported at least one incident in the previous year (harassment/verbal or physical abuse) (**Table 2**).

The highest number of incidents is coming from patients (2,050), followed by another nurse (1,453) and physicians (1,039) (**Table 2**).

In answer to the question "Have you reported the incidents?", 294 (46%) said they did not report any of the incidents that occurred, while 352 (54%) reported at least some of them, and 191 (30%) reported all of them.

Of the respondents who reported the incident(s) (or some of them), 43% reported that subsequently there was some discussion, but nothing was done or there was no follow up. There were significant differences across the countries ($p < 0.001$). In Cyprus (the highest), this type of response was indicated by 66% of the RNs, and in Spain (the lowest) by 33%.

We wanted to determine whether there was an association between the items "What happened when you reported the incident(s)?" and "My organization values my health and safety." There was a significantly higher level of agreement (Pearson's Chi-squared test <0.001) with the statement "The organization values my health and safety" among those

TABLE 2 | Percentage of abuse in the past year, by type and perpetrator—all countries, Improving Working Environments for Nurses in the Critical Care Unit Cyprus, Croatia, Poland, Spain, Romania (2019–2022).

Perpetrator	Verbal abuse—%					Harassment—%					Physical abuse—%				
	Cy	Sp	Cro	Ro	Pol	Cy	Sp	Cro	Ro	Pol	Cy	Sp	Cro	Ro	Pol
Patient	13.2	19.8	43.9	45.6	58.6	1.7	2.5	4.2	0.0	4.0	5.3	6.0	13.6	10.2	50.6
Another nurse	11.5	10.3	36.5	20.1	56.0	1.7	1.2	0.7	0.3	1.3	2.2	0.4	1.1	0.3	4.0
Physician	10.6	13.3	33.4	24.2	52.0	1.3	0.8	1.9	0.0	4.0	0.8	1.2	1.1	0.3	4.0
Nurse manager	6.6	5.6	22.5	9.0	46.6	0.4	0.0	0.0	0.0	0.0	0.4	0.0	1.1	0.0	0.0
Patient's family	14.6	15.9	24.1	30.4	50.6	0.4	0.4	0.7	0.0	0.0	0.8	1.2	0.7	0.3	9.3
Other healthcare personnel	2.6	3.8	14.7	6.9	12.0	0.8	0.4	0.0	0.3	0.0	0.4	0.8	0.0	0.3	0.0
Administrator	3.0	6.8	10.5	0.8	17.3	0.4	0.4	0.0	0.0	0.0	0.4	0.8	0.0	0.0	0.0

**Cy, Cyprus; Sp, Spain; Cro, Croatia; Ro, Romania; Pol, Poland.*

TABLE 3 | Answers of participants about their organization's zero-tolerance policy on verbal/physical abuse, Improving Working Environments for Nurses in the Critical Care Unit Cyprus, Croatia, Poland, Spain, Romania (2019–2022).

		Overall, *N* = 1,033[a]	Cyprus, *N* = 194[a]	Spain, *N* = 232[a]	Croatia, *N* = 257[a]	Poland, *N* = 75[a]	Romania, *N* = 275[a]	Chi-square *p*-value[b]
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Does your organization have a zero tolerance policy on verbal abuse?	Yes	287 (28%)	31 (16%)	66 (28%)	85 (33%)	13 (17%)	92 (33%)	<0.001
	No	279 (27%)	60 (31%)	39 (17%)	59 (23%)	38 (51%)	83 (30%)	
	Don't know	467 (45%)	103 (53%)	127 (55%)	113 (44%)	24 (32%)	100 (36%)	
Does your organization have a zero tolerance policy on physical abuse?	Yes	432 (42%)	54 (28%)	110 (47%)	128 (50%)	30 (40%)	110 (40%)	<0.001
	No	146 (14%)	29 (15%)	17 (7.3%)	25 (9.7%)	17 (23%)	58 (21%)	
	Don't know	455 (44%)	111 (57%)	105 (45%)	104 (40%)	28 (37%)	107 (39%)	

[a]*n (%).*
[b]*Pearson's Chi-squared test.*

respondents who reported that the incidents were resolved in a satisfactory manner, than among those respondents who were blamed for the incident or those who specified some other turn of event.

When asked if their organization has a zero-tolerance policy on verbal abuse, the respondents answered yes in the smallest percentage in Poland (17%), and in the highest percentage in Croatia and Romania (33%). It is interesting that the largest percentage of respondents in all countries except Poland answered that they did not know if their organization had a zero-tolerance policy. Similar results were obtained when asked if their organization has a zero-tolerance policy on physical abuse. 50% of respondents in Croatia answered yes, while in Cyprus only 28% answered yes (**Table 3**).

An association was determined between the questions "Does your organization have a zero-tolerance policy on physical abuse?", and "How would you rate the quality of communication in your unit among the following?". Nurses who agreed with the statement that their organization has a zero-tolerance policy to physical abuse rated the communication between nurses (0.002), as well as between nurses and unit nurse managers (<0.001) and nurses and hospital administration (<0.001), as significantly better than the other two subgroups (those who thought that their organization does not have a zero-tolerance policy to physical abuse and those who did not know). Communication between nurses and physicians (<0.001) was perceived as being better among the nurses who stated that there is a zero-tolerance policy in their organization than among the nurses who did not know whether there is a zero-tolerance policy or not.

An association was determined between the questions "Does your organization have a zero-tolerance policy on physical abuse?", and "How would you rate the quality of collaboration in your unit among the following?". Nurses who stated that their organization has a zero-tolerance policy to physical abuse significantly more often considered collaboration between nurses (<0.001), and between nurses and physicians (<0.001), to be excellent, compared to the other two subgroups (those who thought their organization does not have zero tolerance policy to physical abuse and those who did not know). Collaboration between nurses and unit nurse managers (<0.001), as well as between nurses and the hospital administration (<0.001), was perceived as being significantly better by nurses who stated that their organization has a zero-tolerance policy to physical abuse, than by the other two subgroups (those who thought their organization does not have zero tolerance policy on physical abuse and those who did not know).

An association was determined between the questions "Does your organization have a zero-tolerance policy on physical abuse?", and "In your unit how would you rate the respect for

TABLE 4 | Abuse incidents by nurse managers vs. managers' skills, Improving Working Environments for Nurses in the Critical Care Unit Cyprus, Croatia, Poland, Spain, Romania (2019–2022).

	Any incident of abuse from a nurse manager								
	Verbal abuse			Physical abuse			Sexual harassment		
Please rate the skill of your unit nurse managers in the following areas	No, $N = 526$[a]	Yes, $N = 120$[a]	p-value[b]	No, $N = 640$[a]	Yes, $N = 6$[a]	p-value[b]	No, $N = 642$[a]	Yes, $N = 4$[a]	T-test p-value[b]
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	
Communication	2.8 (0.9)	2.0 (0.9)	<0.001	2.7 (1.0)	2.2 (1.5)	0.4	2.7 (1.0)	2.0 (0.0)	<0.001
Collaboration	2.9 (0.9)	2.0 (0.9)	<0.001	2.7 (1.0)	2.2 (1.5)	0.4	2.7 (1.0)	2.2 (0.5)	0.14
Proving staff resources	2.5 (1.0)	1.9 (0.8)	<0.001	2.4 (1.0)	1.7 (0.5)	0.021	2.4 (1.0)	1.3 (0.5)	0.020
Providing supplies, equipment, and other non-human resources	3.0 (0.8)	2.4 (0.8)	<0.001	2.9 (0.9)	1.7 (0.5)	0.002	2.9 (0.9)	3.0 (0.0)	<0.001
Effective decision-making	2.8 (0.9)	2.0 (0.8)	<0.001	2.7 (1.0)	1.2 (0.4)	<0.001	2.6 (1.0)	2.2 (0.5)	0.2
Recognition of others' contribution	2.7 (1.0)	1.8 (0.9)	<0.001	2.5 (1.0)	1.7 (0.8)	0.052	2.5 (1.0)	1.5 (1.0)	0.14
Leadership	2.7 (1.0)	2.0 (1.0)	<0.001	2.6 (1.0)	1.7 (0.8)	0.039	2.6 (1.0)	1.5 (1.0)	0.12
Ensuring the provision of high-quality patient care	2.9 (0.9)	2.3 (0.9)	<0.001	2.8 (0.9)	1.8 (0.8)	0.024	2.8 (0.9)	1.3 (0.5)	0.008
Promoting a professional practice environment	2.8 (1.0)	2.0 (0.9)	<0.001	2.7 (1.0)	1.8 (0.4)	0.003	2.7 (1.0)	1.3 (0.5)	0.010
Overall effectiveness	2.8 (0.9)	2.1 (0.8)	<0.001	2.7 (0.9)	1.3 (0.5)	0.001	2.7 (0.9)	1.3 (0.5)	0.009

[a]*Mean (SD).*
[b]*Welch Two Sample t-test.*

nurses by each of the following?". Respect for nurses by other nurses (<0.001) was perceived as excellent by statistically more nurses who stated that there was a zero-tolerance policy on physical abuse in their organization, than by those who said there was not, or who did not know. Physicians' respect (0.019) and respect by the hospital administration (<0.001) was perceived as being better by nurses who stated that there was a zero-tolerance policy on physical abuse in their organization, compared to the other two subgroups. Nurses who had a zero-tolerance policy on physical abuse in their organization experienced significantly higher levels of respect from other healthcare colleagues (<0.001) and unit nurse managers (<0.001), than nurses who did not think their organization has a zero-tolerance policy.

An association was determined between the questions "Does your organization have a zero-tolerance policy on physical abuse?", and "Please rate the skill of your unit nurse managers in the following areas." Nurses who stated that there is a zero-tolerance policy rated their unit's nurse managers as statistically significantly better than the other two subgroups (those who did not have a zero-tolerance policy in their organizations and those who did not know) on all the evaluated aspects: communication; collaboration; providing staff resources; providing supplies, equipment, and other non-human resources; effective decision-making; recognition of others' contribution; leadership; ensuring the provision of high quality patient care; promoting a professional practice environment; and overall effectiveness (<0.001).

Table 4 shows the mean level [SD] of the rating of the manager's skills across the groups of nurses who had experienced at least one incident of abuse. Higher means score in **Table 4** shows better skill for nurse manager. Nurses who had experienced verbal abuse from a nurse manager evaluated all their nurse managers' skills as significantly lower than nurses who had not experienced verbal abuse in the past year. Nurses who had experienced physical abuse from a nurse manager ($N = 6$) evaluated their nurse managers significantly lower than nurses who had not experienced that type of abuse in many skills: proving staff resources; providing supplies, equipment and other non-human resources; effective decision-making; leadership; promoting a professional practice environment; overall effectiveness; and ensuring the provision of high-quality patient care. Nurses who had experienced sexual harassment from nurse managers tended to give lower evaluations of managers' skills, with significantly lower evaluations of managers' communication, providing staff resources, providing supplies, equipment, and other non-human resources, ensuring the provision of high-quality patient care, promoting a professional practice environment, and overall effectiveness.

DISCUSSION

Our study showed that nurses in critical care units are exposed to workplace abuse; 62.5% of them had experienced at least one incident in the past year. This is not a surprising finding, because other authors have obtained similar data [18–23]. In their study, Cheraghi et al. found that 74.1% of nurses had been exposed to some form of abuse similar to the results from our study [18]. Fahimeh et al. found that 68.3% of nurses had experienced violent behaviour at their workplace [24], and Roche et al. stated that as many as 80.3% of nurses had experienced some form of abuse during their last five shifts [21]. Georgiu et al. found that proposed blended training program may be used by trainers, who can enable nurses develop the competencies required to influence their work environment, in a context of shared responsibility [22]. In their systematic review, Liu et al.,

investigating the prevalence rate of violence against healthcare workers in the workplace by patients and family members, concluded that nurses and physicians are the most vulnerable groups, and that in total, from all the studies included in the analysis (253, with a total number of 331,544 participants), 61.9% of the participants stated that they had been exposed to some form of violence in the workplace which is in concordance with results of this study [20].

In 2005, the American Association of Critical Care Nurses published six standards for establishing and maintaining a healthy working environment, the second edition of which was published in 2016. Studies were conducted in 2006, 2008, 2013, 2018 and 2021, which refer to the state of the work environment, and based on the results, propose measures for improvement. The results of the 2021 study show that of the total number of nurses who responded to the online questionnaire (7,399), as many as 5,334 (72%) reported at least one incident of abuse in the past year [10].

Violtence in the workplace has consequences for the work of nurses. Fahimeh et al. state in their research that abuse negatively affects the quality of the working life of nurses; a significant negative correlation was obtained between abuse and the quality of nurses' working lives ($p = 0.01$, $r = -0.173$) [24]. Some authors highlight that the state of the work environment is related to the violence experienced by nurses. Roche et al. believe that nurse managers should direct interventions to improve the working environment [21, 25, 26].

Cheraghi et al. state that a large number of nurses are dissatisfied with the management of violence in their institution and suggest interventions such as violence management strategies and zero tolerance for any form of violence [18]. Some other authors state that human resource management is important in violence management strategies and suggest regular staff training programmes for working with aggressive patients, as well as support programmes for people who experience some form of violence [15, 24, 27, 28].

The data of our study, which states that only 28% of nurses from all five countries answered that there is zero tolerance for verbal abuse in their institutions, also shows that violence management strategies should be improved. There are slightly better data when talking about zero tolerance for physical abuse; 42% of the total number of nurses answered that their institution has a zero-tolerance policy on physical abuse.

Limitations

The major limitation of the current study is the convenience sample that does not allow the generalisation of the findings. The potential bias in this study was that researchers belong to the study population and performed recruitment. This weakness has to be discussed in a prevalence study, as the prevalence might be overestimated. Furthermore, the study has been performed during the COVID-19 pandemic. There is a high probability that abuse incidences were driven in this high workload period on ICUs, and for future research it would be interesting to repeat the study after COVID-19 period with reduced biases.

Conclusion

Although nurses in ICUs are aware that a healthy working environment benefits them in their daily work, most of them still face some form of abuse. Based on the American example of the implementation of healthy work environment standards, it is time to create and sustain healthy work environments that lead to more satisfied nurses. Organizations must take a realistic approach to stop abuse, and to educate nurses and nurse managers by implementing standards for healthy work environments. Fostering a healthy work environment takes continual effort, and it is necessary to begin it as soon as possible in each European country. Future recommendation is urgent implementation of healthy work environments standards in healthcare institutions.

ETHICS STATEMENT

Ethics approval was obtained from the Cyprus Bioethical Committee, as Cyprus was the lead co-ordinating country for the project. The completed questionnaires were digitally and anonymously returned by the participating CCNs simply by answering the final question. Prior the questionnaire informed consent was signed. Each participant registered under a unique code, so our chief statistician could monitor the number of completed questionnaires at any time.

AUTHOR CONTRIBUTIONS

AF, JS, SR, AC-D, M-AC, MH, AA-W, BD, CA-A, MB, EC-S, ML-S, AS, and EG were involved in the conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing the original draft, review and editing, visualization, supervision, validation, and review.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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Psychological Safety as an Enduring Resource Amid Constraints

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Objectives: While psychological safety is recognized as valuable in healthcare, its relationship to resource constraints is not well understood. We investigate whether psychological safety mitigates the negative impact of resource constraints on employees.

Methods: Leveraging longitudinal survey data collected from healthcare workers before and during the COVID-19 crisis (N = 27,240), we examine how baseline psychological safety relates to employee burnout and intent to stay over time, and then investigate this relationship relative to resource constraints (i.e., the inadequacy of staffing and tools).

Results: Using hierarchical linear models, we find that psychological safety has enduring protective benefits for healthcare workers during periods of stress, and that these benefits mitigate the negative consequences of resource constraints for burnout and turnover intent over time.

Conclusion: These findings extend the empirical basis for psychological safety and suggest that investments in building psychological safety can foster employee resilience and organizational commitment, even when resources are strained.

Keywords: psychological safety, burnout, turnover, conservation of resources, crisis management

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INTRODUCTION

Since its initial conceptualization, psychological safety—defined by the belief that speaking up will not lead to embarrassment, rejection, or punishment—has become well established in the organizational literature [1, 2]. It has been linked to improving aspects of team behavior, such as information sharing [3] and performance [4], as well as to various aspects of employee wellbeing, such as feelings of vitality [5], engagement and creativity at work [6] and reduced emotional exhaustion and burnout [7]. In the context of healthcare, which often involves multidisciplinary, complex, high stakes work that requires input and engagement from all team members, the concept of psychological safety has been documented as particularly important, both in research [8–10] and practice [11].

The COVID-19 pandemic provided an unfortunate but informative context in which to explore how sudden and intense resource constraints might interact with psychological safety to affect clinician and staff experience at work. The pandemic led to an unprecedented crisis in healthcare characterized first by resource depletion (e.g., lack of personal protective equipment) and over time by increasingly intense staffing shortages as personnel quit or moved to non-acute care settings or administrative positions [12]. Many have talked about the importance of psychological safety during the pandemic [13]. However, research has not yet, to our knowledge, examined whether or how psychological safety prior to the COVID crisis related to feelings of burnout and intent to stay during

the crisis, particularly in relation to sudden and strong constraints in staffing and other resources at the time.

In this paper, we conduct longitudinal and cross-sectional analyses to examine how baseline psychological safety as perceived by healthcare workers prior to the pandemic in 2019, and later in 2021, across a large number of departments in a US-based healthcare system, relates to employee burnout and intent to stay in their jobs in 2021—after employees had been through the initial crisis of the COVID-19 pandemic. In addition, we explore how resource and staffing constraints relate to burnout and intent to stay with the organization in 2021. These analyses are followed by a cross-sectional and longitudinal moderation analyses in 2021 to examine if and to what extent psychological safety can mitigate the deleterious relationship of staffing and resource constraints with intent to stay and burnout.

Conceptual Model and Hypotheses

We draw on the conservation of resources theory [14] to conceptualize how psychological safety relates to employee burnout and intent to stay in an organization during periods of crisis that bring resource depletion and staffing constraints. Burnout is defined as a work-related syndrome consisting of the three elements: emotional exhaustion, depersonalization, and reduced sense of personal accomplishment [15]. In the past, scholars have applied conservation of resources theory to burnout [16, 17]; we build on this to argue that psychological safety is particularly salient during periods of high uncertainty. Conservation of resources theory posits that individuals experience stress when they lose resources [18]. If resource loss is substantial, it can hamper employees' ability to meet the demands of their jobs and thereby induce stress, which can lead to burnout and employee turnover if the situation persists [19].

Psychological Safety as Protective Against Burnout and Turnover During Periods of Stress

Conservation of resources theory defines resources broadly, ranging from objects to the social environment. The social environment, if it increases the chances of obtaining positive reinforcement and social support, can be perceived as resource replenishing [20]. Hence, we hypothesize that a psychologically safe climate, where speaking up is encouraged and addressing errors emphasizes learning rather than interpersonal judgement, can be considered a social resource surplus, offsetting the unexpected material resource loss induced by the COVID-19 pandemic. More specifically, we hypothesize that psychological safety (both when established prior to crisis and when reaffirmed during crisis) is a resource associated with lower burnout and greater organizational commitment.

Hypothesis 1. Psychological safety during crisis is associated with lower levels of burnout (1a) and greater levels of intent to stay (1b).

Hypothesis 2. Psychological safety established prior to crisis is associated with lower levels of burnout (2a) and greater levels of intent to stay (2b) during crisis periods.

Resource Constraints as Amplifiers of Burnout and Turnover During Periods of Stress

Conservation of resources theory describes a clear relationship between resources and the stress that employees experience; when resources are suddenly or gradually depleted, individuals experience stress that can lead to burnout and potentially turnover as employees quit. Research indicates that individuals who possess resource surpluses- by engaging in resource replenishing activities- are more likely to experience wellbeing and resilience [21, 22], whereas individuals who do not possess resource surpluses are more vulnerable to experiencing loss spirals through which initial losses cannot be offset by already scarce resources and it becomes increasingly difficult for individuals to recover [23–27]. During the COVID-19 pandemic, resources were constrained for many healthcare delivery organizations, particularly material resources like personal protective equipment and staffing resources (i.e., people quit or fell ill), leading to high levels of vacancies and absenteeism. However, the degree of resource constraints varied across departments, we thus hypothesize that individuals in departments experiencing more acute resource constraints experienced relatively stronger burnout and turnover intentions than their peers in less constrained environments.

Hypothesis 3. Greater level of adequate tools is associated with lower levels of burnout (3a) and greater intent to stay (3b).

Hypothesis 4. Greater level of adequate staffing is associated with lower levels of burnout (4a) and greater intent to stay (4b).

Psychological Safety as Moderator of the Relationships Between Resource Constraints and Burnout/Turnover

Healthcare workers are known to have limited resource surpluses; nurses and physicians are faced with time pressure, limited tools, and high stakes, impeding their ability to execute their clinical tasks and engage in resource-replenishing activities that can help them build resource surpluses [28, 29]. In practice, the immediate nature of concrete resources like material and time pressure can give rise to the assumption that focusing on less concrete resources like psychological safety is less important, or would occur at the expense of ensuring concrete resources [30]. This concern became particularly salient as the COVID pandemic intensified the strained conditions under which caregivers were providing care. Returning to conservation of resources theory, however, we suggest an alternate view and hypothesis.

If psychological safety is conceptualized as a social resource, then it is likely to play an interactive role with constrained material and human resources—rather than being substitutive—in lowering the barrier to speaking up about concerns and asking questions. In this way, psychological safety may make it easier for people to ameliorate the material losses they experience (e.g., by voicing a concern about lack of personal protective equipment or a need for days off). If so, psychological safety would mitigate the effects of resource constraints on burnout and turnover. We thus hypothesize that psychological safety beneficially moderates the

relationships between resource/staffing constraints and burnout/turnover. We hypothesize these relationships to hold both for psychological safety experienced in the current moment of organizational stress and for psychological safety as experienced prior to the current moment of organizational stress.

Hypothesis 5. Psychological safety (2021) moderates the relationship of adequate tools with burnout (5a) and intent to stay (5b) in 2021.

Hypothesis 6. Psychological safety (2021) moderates the relationship of adequate staffing with burnout (6a) and intent to stay (6b) in 2021.

Hypothesis 7. Baseline psychological safety (2019) moderates the relationship of adequate tools with burnout (7a) and intent to stay (7b) in 2021.

Hypothesis 8. Baseline psychological safety (2019) moderates the relationship of adequate staffing with burnout (8a) and intent to stay (8b) in 2021.

METHODS

Survey Instrument and Administration

We obtained data from a large, multi-site health system with a main campus in the midwestern region in the United States. The health system administers a bi-annual electronic census survey in English to all employees to examine their perception of their work environment. The data used for this study was collected in May 2019 (n = 42,196, response rate 87%) and May 2021 (n = 50,471, response rate 80%). The data we obtained was anonymized (i.e., with no individual employee identifiers beyond a randomized identification code). In 2019, the survey included items measuring the perceptions of psychological safety, presence of adequate tools, presence of adequate staffing, and how likely respondents were to stay with their organization if they were offered a similar position elsewhere. In 2021, an item was added to measure the extent to which employees felt burned out from their job. Since psychological safety is a measure of climate within an organization that is experienced by all employees, we included both clinical and non-clinical staff, resulting in an analytic sample of 27,240 respondents, attributed to approximately 2,030 departmental units in distinct locations. Because this study relied on deidentified secondary data, it was deemed as Not Human Subjects Research; institutional review board ethics approval was waived.

Measures

Independent Variables

We use two measures for resource constraints: 1) the presence of adequate tools, and 2) having adequate staffing, given the centrality of labor as a key resource in care delivery. These were assessed by the item "I get the tools and resources I need to provide the best care/service for our patients" and the item "My team/department is adequately staffed," both on a five-point agreement scale ranging from strongly disagree [1] to strongly agree [5]. To check for collinearity, we examined the correlation between the two items and found r = 0.49, and hence used the items as two separate independent variables. To clarify our terminology in this paper, we speak of "resources constraints" as an umbrella term to describe constraints in both tools and staffing; when describing the distinct sub-categories, we use the terms "adequate tools" and "adequate staffing" specifically.

Psychological safety was measured using four items reflecting the extent to which respondents felt safe to speak up and effectively address care delivery and patient safety concerns within their organization, adapted from the original psychological safety scale used by Edmondson (1999). The items include 1) "I can report patient safety mistakes without fear of punishment" 2) "I feel free to raise workplace safety concerns" 3) "Caregivers will freely speak up if they see something that may negatively affect patient care", and 4) "Caregivers feel free to question the decisions or actions of those with more authority." All items were measured on a five-point Likert scale ranging from strongly disagree [1] to strongly agree [5]. The Cronbach's alpha was 0.79 in 2019 and 0.83 in 2021, indicating internal consistency. The measure was operationalized as a mean over these four variables. All items are measured the same in 2019 and in 2021. The 2019 composite measure indicates a respondent's baseline psychological safety which refers to the respondents' perception of psychological safety within his/her department prior to entering a period of organizational crisis as induced by the COVID-19 pandemic. The psychological safety composite measure in 2021 measures psychological safety at the same time as the outcome measures are reported.

Dependent Variables

We used burnout and intent to stay measured by the items "I do not feel burned out from my work" and "I would stay with this organization if offered a similar position elsewhere" as dependent variables. The dependent variables were measured at the individual level with five answer options corresponding to increasing intent to stay and decreasing experience of burnout due to the positive wording of the latter item. To ease interpretation, we reverse-scored burnout so that an increasing score corresponded to higher levels of burnout as perceived by the respondent. The single-item burnout measure draws on prior studies validating a single item measure of emotional exhaustion, which have found this approach to exhibit strong and consistent associations with clinician dropout, major medical errors, and suicidality, generating support for the use of single item measure of emotional exhaustion for efficiency in healthcare contexts [31, 32]. The intent to stay variable is used as an indicator for future turnover. We checked for the plausibility of this measure as an indicator of real future turnover by examining the percentage of respondents who do not reappear in the data in 2021 after reporting an intent to leave in 2019; we found that about half of those who reported an intent to leave in 2019 do not then respond to the survey in 2021. While we cannot observe directly the reason for later non-response, given the high response rate of the survey overall, this is indicative of a plausible relationship between intending to leave and actually leaving—or at least, being sufficiently disengaged to stop responding to organizational surveys.

Control Variables

Control variables for gender, role, race, and tenure were included based on prior literature associating demographic and status characteristics with psychological safety and burnout [10, 33, 34]. Gender was operationalized as a binary variable indicating male/female, with female being the reference category. Role and race were also included as binary variables indicating physician versus other (e.g., nurses, other clinical professionals, and non-clinical professional), and White versus other, respectively. The choice for White as reference category was informed by the race distribution in our sample as the majority of our respondents reported being White. Tenure was collapsed in categories 1–10 years and >10 years.

Statistical Analyses

For this study, we leveraged organizational survey data in 2019 and 2021, merging the datasets at the individual level and only including respondent for whom we had data in both years. We conducted univariate analysis to examine the mean, standard deviation and distribution of each measure. We computed Cronbach's alpha to assess the internal consistency of the items measuring psychological safety and explored correlation between the independent and dependent variables to explore potential collinearity (**Supplementary Table S1**). Our first set of analyses (main effect analyses) examined how psychological safety in 2019 and in 2021 each relate to burnout and intent to stay in 2021. We then explored the association between the perception of adequate tools and adequate staffing in 2021 with intent to stay and burnout in 2021. All models were hierarchical linear regression models accounting for the nested nature of our data: clinical and non-clinical staff are nested within their departments in specific locations. We used linear regression models to ease the interpretation of the models [35, 36].

We conducted moderation analysis examining how psychological safety affects the relationships between resource constraints and burnout/intent to stay in 2021. To examine the resource surplus properties of psychological safety over time, we repeated our moderation analyses using baseline psychological safety in 2019 to examine how psychological safety before the pandemic relates to burnout and intent to stay with the organization in 2021. We graphically visualized the moderating effects and performed simple slope analyses to confirm consistency in direction, magnitude, and significance of the slope between varying levels of psychological safety and resources constraints. The main effect analyses and moderation analyses are reported in separate tables for clarity. All analyses were conducted using STATA version 17.

RESULTS

Respondent characteristics of the analytic sample are reported in **Table 1**. Among the 27,240 respondents, 77.56% were female. For role, 34.65% were nurses, 6.27% physicians, 18.23% other clinical professionals, and 40.85% other non-clinical professionals. Over half of the respondents reported a tenure between 1 and 10 years (54.63%), with 0.21% reporting a tenure of less than 1 year and the remaining 45.36% a tenure of more than 10 years. The majority of the respondents were White (78.05%), followed by 12.58% Black or African American, 3.97% Asian, and 3.65% Hispanic respondents.

TABLE 1 | Sample characteristics (*N* = 27,240; United States, 2021).

Characteristics	*N* (%)
Female*	21,082 (77.56%)
Role	
Physician	1,709 (6.27%)
Nurse (NO, RN, LPN, CRNA, Nursing Asst)	9,439 (34.65%)
Other Clinical Professional	4,965 (18.23%)
Other Non-Clinical Professional	11,127 (40.85%)
Race*	
White (not of Hispanic origin)	21,205 (78.05%)
Black or African American	3,417 (12.58%)
Asian	1,078 (3.97%)
Hispanic or Latino	993 (3.65%)
Other	475 (1.75%)
Tenure	
Less than 1 year	56 (0.21%)
Tenure 1–10 years	14,827 (54.63%)
Tenure >10 years	12,357 (45.36%)

**Female and race do not up to 100% due to missingness in reporting these items.*

Table 2 presents descriptive statistics. In 2019, the composite measure for psychological safety with mean 4.15 and standard deviation 0.72, corresponds qualitatively closest to respondents agreeing on the presence of a psychologically safe climate. In 2021, the mean of the composite measure for psychological safety decreased somewhat to 4.11 and the standard deviation increased to 0.77. For the items measuring resource constraints, 75.70% of respondents agreed to having the tools to provide the best care for their patients; 45.56% agreed there was adequate staffing in their team or department. For the outcome variables, 73.08% at least agreed that if offered a similar position elsewhere, they would stay with their organization. The mean for burnout was 2.85, which is close to the scale midpoint and the qualitative answer "neither agree nor disagree."

Table 3 presents the main associational analyses. We found support for hypotheses 1a through 2b: psychological safety in the moment (2021) and baseline psychological safety (2019) had a statistically significant protective relationship with burnout (H2a) and related positively with intent to stay in 2021 (H2b). For example, these findings can be interpreted as: a one-point increase in psychological safety relates to a 0.72-point decrease in burnout and 0.63-point increase in intent to stay in 2021. We also found support for hypotheses 3a through 4b: the presence of adequate tools and adequate staffing are related to lower levels of burnout and higher intent to stay, where a one-point increase in the perception of adequate tools and a one-point increase in the perception of adequate staffing led to, respectively, a 0.60-point and 0.50-point decrease in burnout and a 0.50-point and 0.28-point increase in intent to stay.

Table 4 displays the moderation analyses, indicating a stable pattern of psychological safety moderating how adequate tools and staffing relate to burnout and intent to stay. In the cross-

TABLE 2 | Measure descriptives: N, mean, standard deviation (SD), and response distribution (United States, 2019–2021).

Measures	N	Mean	SD	Response distribution (%)				
				1	2	3	4	5
Psychological safety (2019)	27,240	4.15	0.72					
Report patient safety mistakes without fear of punishment	24,731	4.42	0.83	1.59	2.28	6.11	32.11	57.91
Feel free to raise workplace safety concerns	26,868	4.36	0.8	1.06	2.31	7.23	38.31	51.08
Caregivers speak up if something negatively affects patient care	25,604	4.32	0.84	1.23	3.21	7.88	38.19	49.5
Caregivers feel free to question those with more authority	26,680	3.55	1.09	4.62	13.34	23.92	38.21	19.91
Psychological safety (2021)	27,240	4.11	0.77					
Report patient safety mistakes without fear of punishment	24,840	4.39	0.85	1.48	2.72	6.91	32.85	56.04
Feel free to raise workplace safety concerns	26,664	4.3	0.87	1.48	3.41	7.83	38.25	49.03
Caregivers speak up if something negatively affects patient care	25,505	4.28	0.88	1.38	3.76	8.61	37.88	51.64
Caregivers feel free to question those with more authority	26,811	3.52	1.1	5.19	13.65	24.88	36.99	19.3
Burnout	27,096	2.85	1.25	14.91	30.05	22.72	19.98	12.34
Intent to stay	26,887	4.01	0.96	1.82	4.47	20.63	36.63	36.45
Adequate tools and resources	25,964	3.96	0.99	2.52	6.97	14.82	43.15	32.55
Adequate staffing	27,046	3.11	1.33	14.45	22.84	17.14	28.23	17.33

TABLE 3 | Hierarchical linear regression models relating psychological safety, adequate tools and resources, and adequate staffing to burnout and intent to stay (United States, 2019–2021).

	Dependent variables							
	Burnout (2021)				Intent to stay (2021)			
	H1a	H2a	H3a	H4a	H1b	H2b	H3b	H4b
Psychological safety (2019)		–0.40**				0.37**		
Psychological safety (2021)	–0.72**				0.63**			
Adequate tools and resources (2021)			–0.60**				0.50**	
Adequate staffing (2021)				–0.50**				0.28**
Controls								
Female	0.08**	0.13**	0.13**	0.12**	0.05**	0.01	0.01	–0.01
Physician	0.15**	0.13**	0.08*	0.08*	–0.04	–0.02	0.02	–0.01
White	0.07**	0.06**	–0.01	0.02	0.05**	0.06**	0.11**	0.09**
Tenure 1–10 years	0.26	0.40*	0.19	0.38**	–0.08	–0.19	–0.02	–0.2
Tenure >10 years	0.12	0.2	0.01	0.26	0.07	0.01	0.15	–0.04
N	27,037	27,037	25,788	26,864	26,828	26,828	25,611	26,660
Department teams	2,036	2,036	2,031	2,036	2,035	2,035	2,030	2,035

* $p < 0.05$; ** $p < 0.01$.

sectional moderation models, we find support of hypothesis 4a through 5b: Psychological safety significantly moderates how adequate tools and adequate staffing relate to burnout and intent to stay, where a one standard deviation increase in psychological safety leads to a respectively 0.13-point and 0.05-point decrease in burnout and 0.05-point and 0.03-point increase in intent to stay. In the longitudinal models, we see that baseline psychological safety moderates how adequate tools relate to burnout ($\beta = -0.08$, $p < 0.01$) and intent to stay ($\beta = 0.03$, $p < 0.01$), but the finding is not statistically significant for staffing in that time period. Where significant moderation effects were found, simple slope test confirmed consistency in direction, magnitude, and significance of the slope between varying levels of psychological safety and resources constraints.

Across all models in **Tables 3**, **4**, female respondents and respondents who identify as physician report higher levels of burnout compared to male respondents and respondents in other professions. Additionally, respondents identifying as White report higher intent to remain with the organization, compared to respondents who do not identify as White.

Figure 1 graphically depicts the relationship between adequate tools and burnout as moderated by baseline psychological safety. It shows how psychological safety interacts with having adequate tools to reduce levels of burnout across levels of resources, though the interactive benefit appears to diminish at extremely low resource levels (about two standard deviations below the mean). **Figure 2** depicts psychological safety's moderating relationship for adequate tools using intent to stay (rather than burnout) as the outcome. We do not graphically present the moderation between adequate staffing and the outcomes since these findings were not statistically significant (the visual pattern is similar).

DISCUSSION

Amid interest in how to protect healthcare workers' wellbeing and reduce turnover, our longitudinal study identifies psychological safety as a key resource with sustained benefit during a period of high stress and constrained resources. We

TABLE 4 | Hierarchical linear moderation models relating psychological safety, adequate tools and resources, and adequate staffing to burnout and intent to stay (United States, 2019–2021).

	Dependent variables							
	Burnout (2021)				Intent to stay (2021)			
	H5a	H6a	H7a	H8a	H5b	H6b	H7b	H8b
Psychological safety (2019)			–0.17**	–0.21**			0.18**	0.28**
Psychological safety (2021)	–0.48**	–0.48**			0.41**	0.54**		
Adequate tools and resources (2021)	–0.43**		–0.57**		0.33**		0.46**	
Adequate staffing (2021)		–0.38**		–0.47**		0.14**		0.24**
Psych safety × adeq tools	–0.13**		–0.08**		0.05**		0.03**	
Psych safety × adeq staffing		–0.05**		0.01		0.03**		–0.01
Controls								
Female	0.08**	0.07**	0.11**	0.10**	0.05**	0.05**	0.03**	0.03
Physician	0.10**	0.09**	0.07*	0.07*	–0.00	–0.03	0.02	–0.00
White	0.03	0.04**	0.01	0.03	0.08**	0.06**	0.10**	0.07**
Tenure 1–10 years	0.16	0.27*	0.19	0.36**	–0.00	–0.09	–0.02	–0.18
Tenure >10 years	0.02	0.18	0.02	0.25	0.14	0.04	0.15	–0.03
N	25,788	26,864	25,788	26,864	25,611	26,660	25,611	26,660
Department teams	2,031	2,036	2,031	2,036	2,030	2,035	2,030	2,035

* p < *0.05;* ** p < *0.01*.

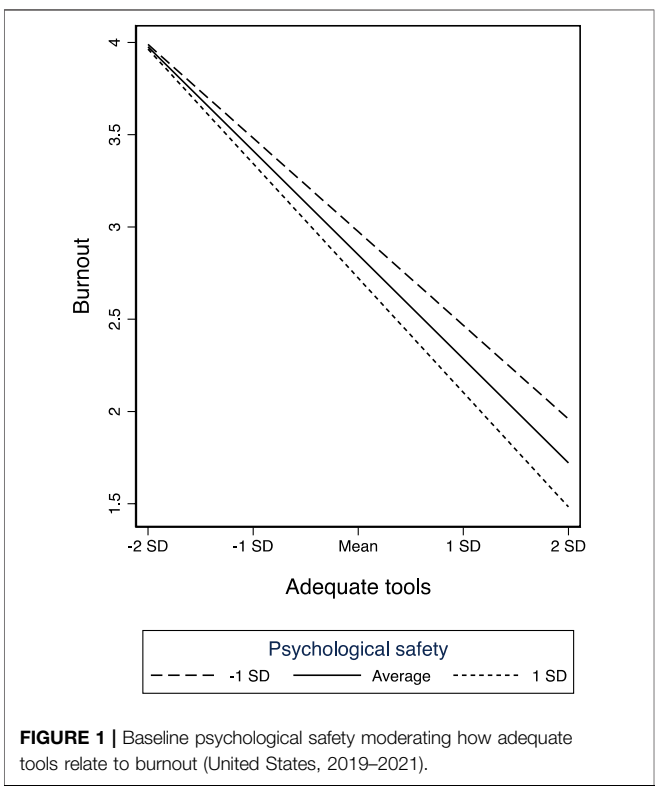

FIGURE 1 | Baseline psychological safety moderating how adequate tools relate to burnout (United States, 2019–2021).

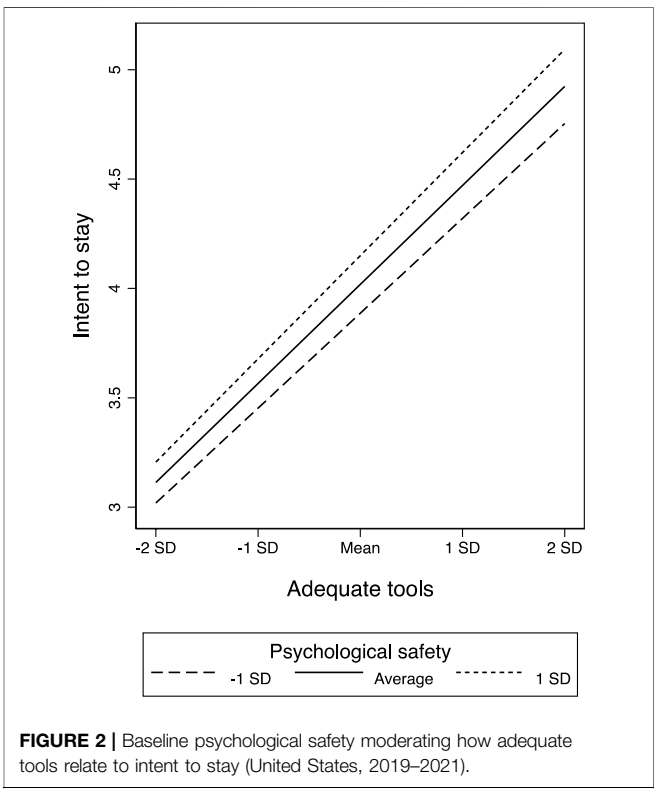

FIGURE 2 | Baseline psychological safety moderating how adequate tools relate to intent to stay (United States, 2019–2021).

found that psychological safety prior to COVID-19 offered a protective benefit for healthcare workers well into the pandemic. These benefits mitigated the negative consequences of resource and staffing constraints for burnout and turnover intent.

While psychological safety is widely accepted as an important aspect of a safety climate in healthcare [2], its longitudinal impact and importance in retaining and protecting employees from burnout amidst organizational crisis has received limited attention. Incorporating time through a longitudinal research design, our results support an enduring protective association between the presence of high psychological safety and employee wellbeing and intent to stay with the organization. Our finding that psychological safety acts as a source of continued individual resilience amid straining circumstances is consistent with the idea that positive relationships and social support are valued social resources in organizations [20]. This finding is particularly salient

given that we studied the longitudinal protective properties of psychological safety over a period of crisis that was characterized by intensification of resource shortages and staffing constraints in an already challenging setting [12].

Despite resource constraints weighing heavily on employees, their commitment to the organization appears to remain higher in a psychologically safe environment. Employees value and prioritize working in an environment where they feel respected and part of a team that focuses on addressing errors to enhance care delivery rather than judging each other [10, 37]. Instability and high turn-over can impede the benefits of social systems in organizations [38]. In these periods, creating a psychologically safe environment helps assure patient and workplace safety while enhancing effective teamwork [10]. Our findings support Edmondson's (1999) reasoning that for teams facing uncertainty, the gain from engaging in learning behavior to enhance coordination and collaboration can offset the risk of wasting time.

In alignment with conservation of resources theory, which explains how persistent resource constraints can lead to burnout, our analysis suggests that inadequate tools and staffing are associated with higher burnout and greater likelihood of intending to leave the organization. More importantly, our findings echo earlier research indicating that individuals who possess resource surpluses are more likely to experience wellbeing and be more resilient in the face of resource loss, whereas individuals who do not possess resource surpluses are more vulnerable to experiencing loss spirals, impeding their resilience when faced with adversity [23–27].

Our moderation analyses indicate that high psychological safety can ameliorate the effects of the loss of material resources even at highly constrained resource levels—with the benefits diminishing only in the far tail of the distribution. This suggests that there is perhaps a threshold of material resource constraint after which psychological safety may no longer yield a multiplicative positive impact—but that threshold appears to be at the extreme end of resource constraint, below the lowest 2.5th percentile. For those units below this threshold, it may be that rapid practical intervention for improving concrete material resources is vital and no amount of psychological safety will help substantially. For all other units, however, even those that are well below the mean in resources, it appears that psychological safety plays an important role. Hence, even amid organizational crises with other acutely pressing constraints, psychological safety appears to offer a critical resource to help keep employees committed to the organization and mitigate burnout. We note that the moderation finding for staffing constraints, unlike resource constraints, was not statistically significant (though the directionality was similar across the two moderators). It may be that psychological safety going into a crisis helps employees be creative in addressing material challenges but is not sufficient for reducing burnout if employees are extremely overworked and fatigued.

This study has limitations. First, despite the longitudinal nature of our data, which allows inclusion of independent and dependent variables measured in different years, we can only report associations, without causality. Second, we rely on self-report for all variables, which carries the possibility of bias, though having measures across different time points reduces the same-source bias concerns present in the cross-sectional models. Third, we were only able to examine one large health system with a relatively high level of psychological safety (mean: 4.15); this has implications for generalizability and requires future efforts to replicate these analyses elsewhere, particularly organizations with overall lower psychological safety or other important cultural differences. Finally, we used hierarchical linear regression models to ease the interpretation of our results. While there is support for the appropriateness of using linear models with ordinal survey data [35, 36], it is important to note that by applying linear regression models, the underlying assumption is that the distance between the response categories is equal (i.e., the distance between "Strongly disagree" and "Disagree" is equal to the distance between "Disagree" and "Neither agree nor disagree").

Conclusion- Implications for Practice and Future Research

Our findings make two primary contributions. First, leveraging longitudinal data we find that baseline psychological safety (prior to crisis) is associated with reductions in burnout and increased intent to stay in an organization undergoing a major disruption. This is a notable contribution, as the majority of the studies on psychological safety in the healthcare setting are cross-sectional [39]. Second, we find that psychological safety can mitigate the negative implications of staffing and resource constraints for burnout and intent to stay.

These results underscore the practical implications of our study, suggesting that psychological safety serves as a fundamental resource in retaining employees and protecting them against burnout. For healthcare organizations, this suggests that investing in efforts to spur psychological safety—well before moments of crisis and amidst crisis that bring on staffing shortages and other resource constraints—may help to establish resilience. For example, as healthcare organizations actively invest in emergency management systems, there may be untapped benefit in considering psychological safety as part of what emergency preparedness planning and emergency management systems address, measure and promote.

Periods of crisis, stress and material constraints are increasingly common in healthcare. Our findings suggest that future research on the interpersonal aspects of enduring and being resilient to these challenges is well warranted. For example, research drawing on multiple methods is needed to examine how employees' perceptions of the interpersonal climate evolve as constraints and uncertainty increase during more typical periods of staffing and resource constraints beyond the COVID-19 pandemic. For employee and patient wellbeing, an applied and comprehensive understanding of the interpersonal climate and its evolvement in real healthcare work contexts is needed.

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All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Economic Value of Peer Support Program in German Hospitals

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Objectives: Acknowledging peer support as the cornerstone in mitigating the psychosocial burden arising from the second victim phenomenon, this study assesses the economic benefits of a Peer Support Program (PSP), compared to data of the Resilience In Stressful Events (RISE) program in the US, within the acute inpatient care sector in Germany.

Methods: Employing a Markov model, this economic evaluation analyzes the cost benefits, including sick day and dropout costs, over a 1-year period, comparing scenarios with and without the Peer Support Program from a hospital perspective. The costs were calculated as an example based on a hospital with 1,000 employees. The estimations are considered conservative.

Results: The anticipated outcomes demonstrate an average cost saving of €6,672 per healthcare worker participating in the Peer Support Program, leading to an annual budgetary impact of approximately €6,67 Mio. for the studied hospital.

Conclusion: The integration of a PSP proves economically advantageous for German hospitals, not only preserving financial resources but also reducing absenteeism, and mitigating turnover, thereby enhancing overall patient care.

Keywords: patient safety, peer support program, second victim, health worker safety, economic impact

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INTRODUCTION

The healthcare profession inevitably exposes practitioners to highly stressful events. Healthcare providers involved in unanticipated adverse patient events, unintentional healthcare errors, or patient injuries, and who become negatively impacted, are defined as "second victims" [1]. Prevalence studies among German nurses and physicians revealed a 59%–60% prevalence of second victims, with a 12-month prevalence of 49% for nurses and 35% for physicians [2, 3]. Emotional reactions, coping strategies, and overall wellbeing post-event vary widely among individuals [4–6]. The resulting spectrum of psychological responses includes guilt, anxiety, diminished self-confidence, loss of trust in the healthcare system, absenteeism, turnover intentions, alcoholism, and, in extreme cases, suicide [7–9].

The second victim phenomenon not only negatively affects individuals but also has the potential to detrimentally impact the quality of future patient care [10]. This impact may manifest through defensive medical practices or an elevated incidence of medical errors following post-traumatic stress disorder development [11–14]. The recovery process may lead second victims down paths of dropping out, surviving, or thriving [15], with outcomes affecting work positivity, time off, or even departure from the profession [15, 16]. These outcomes not only harm individuals but also result in

financial losses for employing institutions. Nurse turnover, a significant challenge for the healthcare sector, leads to intellectual capital and productivity losses [17–19]. Supportive interventions can alleviate the negative consequences of the second victim phenomenon [20]. However, a lack of institutional support is reported by the majority of healthcare providers [15, 21]. The need for structured support programs is evident from surveys in Europe [22, 23] and the US [13, 15, 24, 25].

While other countries have established support program examples, such as RISE [21], the forYOU program [26] and the Medically Induced Trauma Support Service (MITSS) program [27] in the US, the open access online Second Victim support program MISE (Mitigating the Impact on Second Victims) [28] in Spain, Kollegiale Hilfe (KoHi) in an Austrian hospital [29], and a support program in Switzerland [30], Germany has only initial voluntary commitment-based approaches.

The Joint Commission as an independent, non-profit organization that accredits US health programs and organizations [31], recommends healthcare institutions establish structured peer support programs (PSP), emphasizing proactive peer support [32]. Healthcare workers seem to mostly rely on persons they are close with, and to a much lesser extend seek professional help [33]. Peer support is identified as the most desired form of support by second victims [2, 7, 25, 34–36], with evaluations of program effectiveness in various studies [34, 35, 37].

In addition to positive medical and psychological effects, support programs for second victims in Germany are anticipated to be cost-effective. Moran et al.'s study on the Resilience in Stressful Events (RISE) program revealed potential savings of $1.81 million within a healthcare institution when applied to a staff of 80 nurses [38]. The RISE program, designed to help hospital staff cope with stressful patient-related events [21], demonstrated cost benefits by comparing program costs to reduced financial losses due to healthcare worker absenteeism. However, the economic impact of a PSP in Germany remains unexplored. To address this gap, we investigated the economic cost benefits of implementing a PSP in the acute inpatient care sector in Germany.

METHODS

Design

To assess the economic cost benefits of a support program with consideration of macroeconomic effects, we employed health economic model calculations. This evaluation focused on support programs within the acute care nursing sector in Germany, specifically targeting an institution with 1,000 nursing staff, equivalent to a hospital with approximately 550–600 beds. Model parameters were derived from survey data from previous studies and expert judgement, if empirical evidence was unavailable or unconvincing. A Markov chain model based on single day cycles was developed, allowing to determine expectation values on a time horizon of 1 year, i.e. 365 daily cycles. Stochastic modeling allowed us to assess the model's sensitivity to parameter variations. Costs were reported in Euros, and the time horizon for the analysis was 1 year, concentrating on nursing staff for comparability with other studies. Direct costs such as the time off and worker replacement costs in acute inpatient care sector in Germany are considered, whereas indirect costs like employer productivity losses or quality impairments in the work of affected staff members were not considered.

Model

Building upon Moran et al.'s study [38], we constructed a Markov chain model (**Figure 1**). Markov chains describe a time series of events in discrete steps. The probability to reach a given state at time *t* depends only on the state in the previous time step *t-1*. To reach state *j*, after being in state *i* in the previous step, is referred to as $p_{ij.}$ The model describes the state of an individual as being one of three possibilities, that are (a) unaffected, (b) 1 day leave, (c) quit, the latter two of which being identified with financial losses. The transition between these states from day to day were conditioned on the random event of a stressful incident (high impact event, HIE). Every individual had each day an identical risk of being exposed to a HIE independently of previous occurrences. The model operated on a daily cycle, spanning 365 cycles in total. If nurses chose to quit, they permanently exited the modeling cycle. In contrast to Moran et al., we include the duration of HIE induced leaves by assuming that individuals return to the unaffected state with a reduced probability. The Markov chain allows a deterministic description of the expectation value of losses.

Assumptions

Our calculations assume that each employee faces an unforeseen incident daily, i.e., HIE, with a probability of 2.00%. Upon an HIE, the probability of a sick leave increases to 5.00% (compared to 0.03% without trauma). Likewise, the probability of resignation rises to 0.68% (compared to 0.03% without trauma). The introduction of a PSP program reduces the probability of a sick leave to 3.00% and the probability of resignation to 0.34%. The assumptions are based on Moran et al. (2020), but adapted to the present situation (**Tables 1**, **2**). In particular, we assume a far lower incidence rate and a lower probability to quit, but a higher probability of sick leaves with an average length of 7 days (corresponding to a recovery rate of 14.29% per day).

According to expert judgement, the loss of a 1-day leave is assumed to be €500 and the replacement of a nurse that quits accounts to €75,000. The estimated cost associated with participating in the support program is €550 per healthcare worker within 1 year.

The model ignores HIE effects on productivity of impaired staff members.

Sensitivity Analysis

To assess sensitivities, we run the model for 100,000 pairs of individual trajectories, each pair consisting of a PSP and non PSP variant, varying transition probabilities and expenditures for each pair such that the parameters were normally distributed around

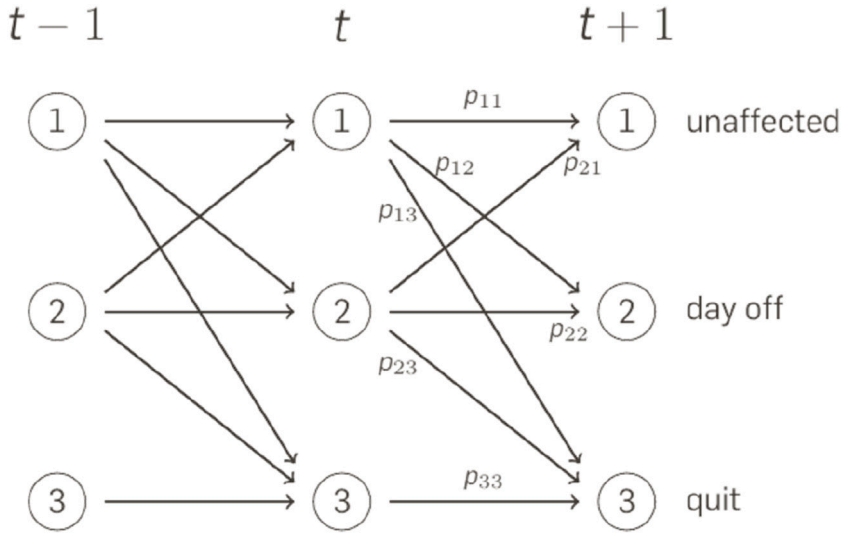

FIGURE 1 | Markov Chain Model: At every time step t, the individual is either [1] unaffected [2], takes a day off, or [3] quits the job. The pij define the transition probability from state i to state j in the subsequent time step. Economic Value of Peer Support Program in German Hospitals, Germany, 2024.

TABLE 1 | Probabilities of employees upon a critical event. Economic Value of Peer Support Program in German Hospitals, Germany, 2024.

State	Base case
Probabilities High-impact event	0.0200
No PSP	
- Day off (high impact)	0.0500
- Day off (low impact)	0.0020
- Quit (high impact)	0.0068
- Quit (low impact)	0.0003
PSP	
- Day off (high impact)	0.0300
- Day off (low impact)	0.0020
- Quit (high impact)	0.0034
- Quit (low impact)	0.0001

the base case values of the model with a standard deviation of 10% of the distribution's expectation value and a lower bound of zero.

RESULTS

The simulation encompassed direct costs per sick day for healthcare workers and recruitment costs for new employees approximated by annual salaries. In the course of 1 year 14.3% of the nursing staff quit the job, whereas the introduction of PSP reduced this figure to 5.8%. Sick days are moderately reduced from an expected value of 6.77 days without PSP to 6.14 days with PSP.

The economic model calculation for a healthcare facility in Germany, mirroring the RISE program at Johns Hopkins University, is presented in **Table 3**. These figures were calculated in consideration of the above event probabilities for

TABLE 2 | Transition probabilities greater zero, as obtained from combining the high impact event (HIE) incidence rate with the probabilities of taking a day off/quitting. Economic Value of Peer Support Program in German Hospitals, Germany, 2024.

	No PSP	With PSP
P_{11}	0.9966	0.9973
P_{12}	0.0030	0.0026
P_{13}	0.0004	0.0002
P_{21}	0.1429	0.1429
P_{22}	0.8571	0.8571
P_{33}	1.0000	1.0000

TABLE 3 | Effects in an Institution with 1,000 employees upon implementing a Peer Support Program (PSP). Economic Value of Peer Support Program in German Hospitals, Germany, 2024.

Information per year	Without PSP	With PSP
Sick days	6766	6141
Dropouts	143	58
Cost of sick days	3,383,230 €	3,070,470 €
Cost of dropouts	10,694,785 €	4,335,666 €
Total costs	14,078,015 €	7,406,136 €
Cost per Person	14,078 €	7,406 €

1,000 individuals. Introducing a support program in the simulation resulted in an increase in both the number and cost of sick days, attributable in part to the significantly reduced number of dropouts, leading to more employees remaining with the organization.

Considering the costs associated with participating in a PSP (approximately €550), the avoidance of sick days in specific cases (€500/day), and the costs of refilling a position in case of

dropout (€75,000), an average cost saving of €6,672 per healthcare worker participating in the support program was determined using a three-stage Markov model, compared to non-participation. Main reason for the reduction is the reduction of dropouts, whereas the costs of sick day leaves are only moderately affected. The expected annual budgetary impact of implementing the support program is estimated to be approximately €6,67 Mio in the considered hospital. Additionally, the anticipated benefits of the support program, apart from reduced absenteeism, stem from increased job satisfaction, and lower staff turnover, ultimately enhancing patient care and preserving the hospital's financial resources.

Sensitivity Analysis

A number 100,000 stochastic trajectories were generated of pairs (non-PSP, PSP) scenarios. 29.0% of the non-PSP trajectories remained without any HIE-related effects (no sick leaves, no dropout). The figure rose to 36.9% in the PSP case. The 95% quantile of HIE-related costs was €79,443 without PSP, whereas the PSP scenarios exhibit 95% quantile of €68,222.

To test the robustness of the result in light of the uncertainties of our model parameters, we performed a Wilcoxon sign-ranked test. We applied the test in the one-sided version, with the null hypothesis that costs are higher without PSP than with PSP implemented. The hypothesis is significantly violated ($p < 0.0001$). Even after shifting the costs of the PSP variant homogeneously by adding an additional amount of 1,358.50 EUR, the hypothesis still can be rejected significantly ($p = 0.0490$).

DISCUSSION

Healthcare professionals need to be supported in order to be able to provide quality care after a HIE. Beyond positive medical and psychological outcomes, the provision of support services in hospitals has the potential for cost-effectiveness, a facet not previously evaluated in Germany. This study represents the first investigation, to our knowledge, into the economic impact of a PSP in a European hospital. By adapting a Markov Chain Model for the implementation of a PSP in the acute inpatient care sector in Germany, our results demonstrate substantial cost savings for the hospital, constituting significant value.

We estimated that the existence of a PSP in a hospital with 1,000 nursing employees in Germany enables savings of €6,67 Mio annually. These findings align with a cost-analysis conducted at Johns Hopkins Hospital, revealing potential savings of $1.81 million from the RISE program in a smaller sample of 80 nurses [38]. The main driver of the above result is the reduction of the probability to quit the job. Our assumption of a reduction from 0.68% to 0.34% is considerably smaller than the one in Moran et al., who assumed a drop from 1.22% to 0.34%. Therefore, we consider our results to be conservative.

The expected budgetary impact within the institution indicates economic potential even in medium-sized companies with 1,000 employees, despite not considering subsequent costs arising from reduced performance and indirect costs associated with unsafe work, estimated at 13% of total healthcare expenditure according to the OECD's recent publication in "The Economics of Patient Safety" [39], in our approximate model.

The calculations of the Markov Model resulted in the assumption that 14.3% of nursing staff quit their job in the course of a year. According to the German Hospital Report 2021 [40], this is in line with the current figures for staff turnover in German hospitals, where one in six change jobs every year [41]. The implementation of a PSP within the simulation exhibited a reduction of dropouts by 8.5% and a notable rise in both the quantity and financial impact of sick days. This increase of sick days can be attributed partially to a marked reduction in the number of dropouts, consequently fostering greater retention of employees within the organization.

The implementation of psychosocial programs for healthcare workers in hospitals has been shown to have a positive impact on employee wellbeing and organizational outcomes [42]. The role of employee programs and psychological wellbeing are important factors influencing job satisfaction, ultimately contributing to employee retention. PSPs are likely to facilitate hospitals in reducing turnover rates, improve healthcare worker resilience and enhancing the quality of care [43–45]. For instance, the implementation of such programs could increase the probability of healthcare providers arriving at work in an optimal state of wellbeing, thereby fostering a positive work environment conducive to the delivery of high-quality, safe care. Furthermore, providers may exhibit greater engagement and a heightened commitment to the organization as a result.

Our findings align with prior studies suggesting that hospitals with peer support positively impact employee retention [46, 47] and hospitals with poor nurse retention spend more than those with high retention [48]. While improving employee wellbeing contributes to reducing healthcare expenditure by minimizing the cost of work-related harm by up to an estimated 2% of healthcare expenditure, it also contributes to minimizing patient harm by up to an estimated 12% [49].

The occurrence of events leading to second victims can have cascading effects, including burnout and elevated turnover rates among healthcare providers, ultimately exerting adverse influences on the quality of future patient care and financial impacts on the hospital. However, comprehensive and easily accessible support programs tailored to healthcare providers in Germany remain absent on a national scale. Our research contributes to the existing evidence endorsing the integration of institutional PSP for healthcare providers into hospitals. We demonstrate that such adoption may yield financial advantages for hospitals, thereby further strengthening the case for their implementation.

The absolute values presented in this study are specific to Germany but the model can be universally applied once relevant data on sickness absence rates and personnel replacement costs are available. This underscores the adaptability and versatility of the model in assessing the economic impact of PSP on hospitals worldwide. By accounting for local variations in wage structures and wage replacement modalities, policymakers, managers, and

businesses can utilize this model to adapt and tailor interventions and strategies aimed at mitigating the adverse effects of second victim phenomenon in their respective regions.

The implementation of a PSP presents a proactive approach in addressing the inevitability of medical errors within clinical practice. Through widespread adoption across German hospitals, healthcare professionals gain immediate access to support following HIE, enabling them to recover and maintain quality patient care delivery. While the introduction of such programs incurs costs, the strategic provision of targeted support services aids affected individuals in managing negative consequences, ultimately yielding long-term economic benefits for the institution. The findings of this research indicate that implementing a PSP for medical providers could yield a significant return on investment for hospitals, thereby representing a beneficial value proposition for the healthcare institution.

Limitations

This study has limitations. Examining the precise impact of adverse events on healthcare professionals' decision to leave their medical or nursing roles is challenging due to the multifaceted nature of underlying factors. Whilst this study is focused on second victims, the impacts and consequences on their working environment are not considered. Reliable isolation of the effects of adverse events necessitates large-scale and resource-intensive studies, which might be difficult to conduct. The scope of this study shows a simplified perspective due to the scarcity of comprehensive data. Our analysis draws from available data, existing literature, and expert opinions. Indirect costs are not taken into account in the calculation and our expectations concerning the positive impact of PSP are cautious, which makes our results a conservative estimate and thus potentially underestimates the final outcome. Also not accounted for in the calculation were other professional groups that would also benefit from a support program. Findings and conclusions should be interpreted with caution, as the context and effects of peer support in healthcare settings may vary considerably.

Conclusion

Using a three-stage Markov model, our study reveals an average cost saving of €6,672 per healthcare worker participating in the support program compared to non-participation. While the absolute values may vary, the underlying framework remains universally applicable, enabling cross-country comparisons and informed decision-making in assessing the economic effects of support programs and addressing healthcare worker safety related challenges. Hospital managers are encouraged to recognize the advantages of cost savings and reduced staff turnover associated with establishing PSP, thereby addressing the critical issue of the second victim phenomenon in healthcare and improving health worker and patient safety. Systematic support, particularly by healthcare organizations and institutions, is crucial. Therefore, further studies on effective and immediate supervision and support strategies, along with legal frameworks in Germany, are needed to mitigate the adverse effects of unforeseen incidents on a Second Victim.

AUTHOR CONTRIBUTIONS

HR conceptualization, methodology, validation, formal analysis, writing–original draft, writing–review and editing. TN conceptualization, methodology, validation, formal analysis. RS conceptualization, formal analysis, writing–review and editing. JM conceptualization, formal analysis, writing–review and editing, supervision. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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Second Victim Experience: A Dynamic Process Conditioned by the Environment. A Qualitative Research

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Objectives: When adverse events (AE) occur, there are different consequences for healthcare professionals. The environment in which professionals work can influence the experience. This study aims to explore the experiences of second victims (SV) among health professionals in Argentina.

Methods: A phenomenological study was used with in-depth interviews with healthcare professionals. Audio recordings and verbatim transcriptions were analyzed independently for themes, subthemes, and codes.

Results: Three main themes emerged from the analysis: navigating the experience, the environment, and the turning point. Subthemes were identified for navigating the experience to describe the process: receiving the impact, transition, and taking action.

Conclusion: SVs undergo a process after an AE. The environment is part of this experience. It is a turning point in SVs' professional and personal lives. Improving the psychological safety (PS) environment is essential for ensuring the safety of SVs.

Keywords: psychological safety, second victim, healthcare workers, patient safety incidents, patient safety

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INTRODUCTION

Global healthcare is threatened by a shortage of healthcare workers [1]. In 2023, the WHO warned that 55 countries have urgent needs for healthcare professionals [2] and developed the Global Health Workforce Strategy 2030. It suggests, among other actions, improving job security [3], both physically and psychologically, for healthcare personnel.

Psychological safety (PS) is defined as a work environment where team members engage in dialogue, express opinions, and request help [4]. Work relationships are perceived as supportive and trustworthy [4], and teamwork is encouraged [5, 6].

Moreover, PS is closely related to patient safety [4–6]. First, it promotes error reporting [4, 7]. Derickson et al. reported that 20% more professionals were willing to report an error in psychologically safe hospitals than in other hospitals [7]. Second, PS is an ally in the care of professionals involved in a safety incident–known as second victims (SVs) [8]. Various authors affirm that SV care programs in psychologically safe environments contribute to their recovery [8, 9].

In 2022, the European Researchers' Network Working on Second Victims (ERNST) Consortium presented a consensus on the definition of SVs, integrating existing evidence and clarifying previous concepts proposed by Wu and Scott [10]. Thus, a SV is defined as any healthcare worker who experiences a negative impact from direct or indirect involvement in an unexpected AE, unintentional medical error, or patient injury [10]. They often feel responsible for the patient's

outcome and perceived failure [10]. The prevalence varies between 13% and 78% according to different studies [11–13]. They experience emotional, physical, and/or professional disturbances and may desire to abandon the profession [8, 11–17]. For instance, Potura et al. demonstrated that 30.4% of Austrian pediatric reports exhibited self-doubt, 26.1% experienced flashbacks in similar professional settings, and 25.6% exhibited insomnia or an excessive need for sleep [12]. Furthermore, posttraumatic stress [18–21], suicide attempts [13, 22], and substance abuse [23, 24] have also been reported.

In addition, SVs greatly benefit from supportive measures [11, 25]. This support stems from various sources, including colleagues [11], supervisors [26, 27], and organizational channels [25, 28]. Research indicates that the extent of impact is negatively correlated with the perceived level of support, highlighting an inverse relationship [26]. Similarly, the safety culture within which professionals operate is significantly linked to the distress experienced by SVs [29].

For two decades, studies have shown the relevance of the SV phenomenon, mainly in Asia [15, 28, 30–32], the United States [14, 27, 33], and Europe [8, 11–13, 18, 34–37]. In 2009, Scott described the recovery trajectory of SVs through a qualitative study conducted with healthcare professionals in the United States [38]. Several factors influence the experience, such as the relationship between the patient and caregiver, past clinical experiences, and any perceived connection [38], all of which are influenced by work and sociocultural contexts.

In the Latin American context, there is less evidence of the SV phenomenon. It has been observed some quantitative studies in Argentina [26, 39], Brazil [40], Chile [25, 41], Colombia [42], and Mexico [43]. These studies suggest that the SV phenomenon is not uncommon in Latin American countries. However, no qualitative studies have been conducted that have allowed for a deeper understanding of the experiences of SVs in this socioeconomic, labor, and cultural context. Therefore, the objective of this study was to explore the experiences of SVs among healthcare professionals in Argentina.

METHODS

This phenomenological study was given access to the lived experience of healthcare professionals [44] who were involved in an AE to describe what the participants had in common regarding their SV experience [45]. The Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines [46] were used for this reporting.

Population

The participants were healthcare professionals directly involved in an AE. The inclusion criteria was they work in highly complex hospital. Professionals who were on leave of absence were excluded. The sampling was purposive, selecting typical cases related to the phenomenon and a heterogeneous sample in terms of the participants' professions. A minimum of 5 participants [45] were enrolled until theoretical data saturation was reached.

Phenomenological studies also take into account the context or situation in which the experience is lived to find the common denominator among the participants [45]. The professionals in this study worked in a private hospital that prioritizes patient safety in its mission. The hospital has international quality and safety accreditations in healthcare practices, voluntary incident reporting, and conducts morbidity-mortality meetings. While protocols are in place for the first victim, at the time of the study, there were no formal protocols described for SVs.

Data Collection and Analysis

To access the participants, a professional who follows SVs as part of his job contacted the professionals and invited them to participate in the study. Those who agreed to participate were contacted by the principal investigator. Subsequently in-depth and semi structured face-to-face interviews were conducted using a developed question guide (**Appendix**). The questions were grouped into two main inquiries: "What was your experience as an SV?" and "What context or situation influenced your experience?" This approach aimed to elicit data that would lead to a description of the experience [45], thus facilitating an integrated understanding of the participants' experiences.

The face-to-face interviews were audio recorded, and the data were transcribed verbatim, including field notes taken during the interviews.

Phenomenological studies typically involve two main movements: epoché and reduction [45]. Epoché is required to suspend personal beliefs [45]. Therefore, a written document was prepared beforehand to outline the researchers' personal assumptions about the phenomenon being studied. The purpose of this step was to ensure the researchers were aware of their concepts and beliefs about the topic and to exclude them from the data analysis. In the second step, the researchers engaged in reflexivity with respect to the data [45] to capture the meaning of the experience. This process included delineating the quotations and units of meaning (codes) and determining the central theme for the units of meaning. Finally, in accordance with phenomenological requirements, all the themes were integrated into a particular structure [45].

ATLAS.ti version 22 software was used. Triangulation of the data analysis was performed by two researchers who independently analyzed the data. They met to discuss their initial codes and to identify commonalities in their analyses. Next, they reanalyzed the data individually and, in the subsequent joint session, agreed on the final emergent codes, organizing them into subthemes and themes. Finally, this analysis was presented to two other researchers for validation.

The study received approval from the Institutional Review Board (No. 19–017). All participants provided prior consent before participating in the interview sessions, which were conducted in person and lasted approximately 50 min each.

RESULTS

Seven participants were interviewed, including individuals from various healthcare professions, such as nurses, physicians, and

TABLE 1 | Themes, subthemes and codes (Argentina, 2019).

Theme	Subtheme	Codes
Navigating the experience	Receiving the impact	Emotional response
		Physical response
		Professional insecurity
		Dispersion
		Paralysis
	Transition	Professional pause
		Rumination
		Dissociation
	Taking action	Learning
		Message protagonist
		Reference for others
Environment		Institutional culture
		Colleague support
		Supervisor support
		Institutional support
		Support outside of work
Turning point		

surgical technologists, with diverse specialties, including internal medicine, surgery, cardiology, and anesthesia. The time since the AE varied, ranging from 6 months to 10 years.

During the interview analysis, it was noted that despite the dynamic and personal nature of the SV experience, all participants went through a process within a specific context or environment. Subthemes and codes were identified within each of the three themes (**Table 1**).

Navigating the Experience

Navigating the experience encompasses the process that SVs go through. Three subthemes that make up this process delineate moments or stages: receiving the impact, transition, and taking action. Each subtheme includes various codes that define the states, actions, or characteristics of the participants. However, as noted above, the experience is dynamic and personal. Therefore, it is important to note that these moments are not rigid, and some codes are not limited to a single stage but may manifest across multiple stages or during the transition between them. Some quotes are shown in **Table 2**.

Receiving the Impact

The process begins when SVs express various emotions, thoughts, and experiences that indicate that they are receiving the impact. These expressions are often involuntary and intrusive.

The emotional response is a code of this initial stage. It involves the emotional state, which manifests as an emotional storm and is expressed as a manifestation of a number of simultaneous or nonsimultaneous emotions, without any one of them dominating, or when people find it difficult to name their emotions. For example, one participant expressed what he felt upon returning to work after the AE, stating, "*It's like being robbed at home and then going back in knowing the thief is not there, but it's a feeling...*" (P2). Terms such as "*devastating, terrible, unforgettable, could not do anything, was stunned, or could not believe it*" (P3) reflect the emotional state of the participants. In other cases, SVs are able to directly identify the emotion, using terms such as guilt, stigmatization and loneliness. Guilt emerges as a pervasive emotion among SVs. They struggle with feelings of culpability for the effects of the AE on the patient. In addition, SVs experience a sense of responsibility for their team, perceiving their inability to prevent the AE as a source of harm not only to the patient but also to the teamwork of their team. Additionally, perception of stigmatization the SVs perceive themselves as being scrutinized and judged, characterized by the label "*you made a medical error*" (P5). This phenomenon is particularly prevalent in the professional sphere but also extends to their family or social circles, where some professionals opt for silence out of fear of possible labeling or public exposure of their situation. Finally, feelings of loneliness are often present in SVs in response to a perceived lack of understanding of their environment.

Moreover, there are physical manifestations or consequences of receiving the impact. Participants mentioned cases of insomnia, nightmares, eating disorders, and even disease diagnoses, all of which are considered aftereffects of the traumatic event.

Furthermore, participants expressed a pervasive sense of professional insecurity. They harbor doubts about their ability to provide patient care, fear the possibility of repeating the error, and perceive themselves as inadequately equipped for their professional duties. These feelings persist not only in the immediate aftermath of the incident, when they are required to resume patient care, but also extends into the subsequent days and weeks following their return to the workplace.

Another code identified in this stage is dispersion. This code indicates that SVs demonstrated an inability to concentrate on tasks, making them more susceptible to new events.

Finally, another situation they experience when receiving the impact is paralysis, which hinders or prevents them from continuing with their tasks.

Transition

The transition state is characterized by the reactions that SVs exhibit as a means of coping with the situation. These include professional pauses, rumination, and dissociation.

A professional pause represents the desire to distance oneself from the environment in which the AE occurred.

In addition, SVs expressed that they experienced constant rumination in an intrusive and involuntary manner. This incessant rumination allowed them to replay, step-by-step, the actions they had taken before the AE. However, it also interfered with their ability to concentrate on other activities.

Finally, SVs may experience dissociation. Here, an analogy with a theater is drawn, comparing SVs with actors playing roles that are not real. In this way, the need to continue working does not allow them to acknowledge or express their feelings. Consequently, to continue their duties, they must assume a fictional persona because "*the show must go on*" (P7). At the same time, dissociation allows SVs to jump into action to persevere. This illustrates that some of the codes cannot be confined to a single moment in the process and that this is a dynamic process.

TABLE 2 | Quotes of process (Argentina, 2019).

Subthemes	Codes	Quotes
Navigating the experience	Emotional response	• "*Upon exiting, my immediate impulse was to seek forgiveness from my team, repeatedly expressing remorse. I was overwhelmed with a profound sense of guilt*" (P5) • *"And every time, I do not know, if I had a problem for any reason, I do not know, if I misplaced a chair, it was… 'no, because you made a mistake with a patient.' And it had nothing to do with it. […] even though I had made a mistake, I did not want to be reminded of it all the time. Or else, they could have just removed me from my position and placed me somewhere else if they did not believe I was capable of continuing to work. […] And still, I felt like I was walking down the hallway and people were staring at me. Maybe it was just my imagination. That they were pointing at me." (P5)*
	Physical response	• *"(…) Nightmare, you go to bed, you sleep well because sleep overcomes you but two hours later you wake up because you are having a nightmare. You are dreaming about the scalpel, the patient, the lawyer, the family; all this is (…)" (P2)*
	Professional insecurity	• *"All night [on guard], all night long. Then, I had to continue attending [to patients]. You know when your hands shake? You cannot think straight. I had no one to ask for help (…) My hands were shaking, I could not think, my whole body was shaking. I do not know who I asked for help, or if help even came. Honestly, I cannot tell you…*" (P7)
	Dispersion	• *"It's like (…) you keep thinking and you're there, absorbed in your thoughts, I do not know, you keep doing your tasks but with that in your mind."* (P1)
	Paralysis	• *"Honestly, I was blocked, frozen. You know when they put you in the freezer and you have no reaction, not to black, not to white, not to good, not to anything. Frozen. I struggle; if I do not refer to the medical records, I have difficulty recalling things, as if I have blanks from the episode itself." (P7)*
Transition	Professional pause	• *"And I told him that yes, that I also did not realize that day to say, 'Look, today I'm not here, I do not know, have me do something else.' Uh, I was not even aware of that, but I do remember it."* (P6)
	Rumination	• *"Everything. (…) It was like watching a movie a hundred times in my head, playing repeatedly. 'And what would I have done? And what would I have?' And honestly, there's not much I would have done differently." (P7)*
	Dissociation	• *"That's why I believe that […] you take everything else out of context, and I thought it could work, listen to me, it worked well, smoothly. Many times I thought, but it's like being a theater actor, you know? Because you say, okay, you may have a very painful family drama, but you get on stage and act, or the experience acts for you."* (P2)
Taking action	Learning	• *"After the event, what changed is that I do everything step by step (…) The pace at which we are pushed to work sometimes makes us do everything quickly and without thinking. So now, I put a brake on it. Even if my colleagues tell me to hurry up later, I do everything step by step. I do this, finish it, and then move on to the next thing. Because I notice a lot that happens, okay, hurry up, just write it down quickly and then move on. No, I do everything step by step, slowly. I'm not saying like a turtle, but I go at a pace, but I finish one thing and then do the next. That also helped me to slow down a bit, the rush we had while working."* (P5)
	Message protagonist	• *"Well, what happened, if anyone wants to know, they can ask me. I was able to speak about it. I never denied it, I talked about it. I think the people who found out from me did not make assumptions or guesses. To those who came to ask me, I explained: 'I do not feel good about it, it's not pleasant, it's not good for everyone to talk about it.' And in fact, what they recommended to me, I told them: 'Look, they do not want me to talk about this, they want it to stay quiet because then it turns into a big pot of gossip, and that's not good either' (…) At least I talked about it; my colleagues who came to ask me, I told them what the situation was." (P1)*
	Reference for others	• *"To help him, I would meet with him, ensure he has specialized counseling to see how he's managing this trauma because it is trauma (…) talking with the person, asking them what they want, dispelling clouds, uh-huh. And then (…) I would take him to a psychological interview where he could express many things in a comfortable environment and decide what he wants, and then the return has to be supervised, accompanied, that transition between being alone and being accompanied." (P2)*

Taking Action

Taking action represents the final stage of the process. It encompasses the internal and/or external actions experienced by SVs that indicate movement toward exiting the situation.

This stage is characterized by actions aimed at remedying the situation, learning from the event, and contributing insights gained from their experience. The codes that comprise this stage include learning, being a messenger, and striving to be a role model for others.

Learning occurs at two levels. First, there are lessons related to the incident itself (within the work environment). Second, there are lessons related to the lives of the participants that can be translated into attitudes or values they will adopt in the future. For example, empathy, humanity, understanding, and support for colleagues are among the lessons that SVs share in their narratives.

In addition, SVs express a desire to be protagonists of the message. In doing so, they hoped to be the ones to communicate the event to those around them. They wanted to avoid the stigmatization they felt they were subjected to and the misinformation surrounding the event.

Finally, the participants want to serve as a reference for others, especially for those who may have a similar experience. SVs feel that the incident provides them with valuable experience.

Environment

The experience of SVs is significantly influenced by their surrounding environment, including both their workplace and personal domains. Various factors within the professional setting

TABLE 3 | Quotes of environment (Argentina, 2019).

Codes	Quotes
Institutional culture	• *"[The patient was told that there had been a mistake] (. . .) the same day and the family was also told the same day (. . .) they told her what the possibilities were of what she could have. And (. . .) . . . the first thing the patient said the next day was that thanks for having told her the truth, that she was not lied to (. . .)* (P5) • *"What were the things that worked for me? The first is to reconstruct the event. Talking to all the members "[of the team] about why it happened. Secondly, not to look for people to blame. It is neither the place nor the moment nor the mood to do so (. . .) It is the moment to say what do we do? Which is different from. . . I mean, if I were on the Titanic I would not be worried about why the water got into. . . but, how do we save ourselves? (. . .) Third, (. . .) I would try to tell the truth (. . .) to the family. Because the family takes well a guy who tells the truth. (. . .)* (P4)
Colleague support	• *"Yes, and some colleagues also wanted to lend me a hand, reaffirming their trust in me. They would call me to work outside when I no longer wanted to work externally. Interviewer: Well, did that help you? Interviewee: Yes, the affection, the attitude."* (P2)
Supervisor support	• *"Yes, mm (. . .) we talked to the two afternoon coordinators (. . .) I felt very accused because one said 'I cannot believe that you're here all the time.' I do not know (. . .) 'That every mistake you come and tell us, I cannot believe you did not tell us anything (. . .).' I told her (. . .) it was not intentional to hide the information and cover it up (. . .) The feeling was one of accusation; that our intention was to cover it up, and it did not make sense to me to cover something like that. Um, I do not know (. . .) I remember both of us were crying (. . .); I felt that I did not have the support (. . .) it was like we were in the hot seat (. . .). It was a freezing office. Um (. . .) they made us go wash our faces and take some time and (. . .) then go back to work (silence). Horrible; horrible."* (P6)
Support outside of work	• *"Perhaps, I felt that my friend, sharing the same profession, could empathize with me at that moment and understand everything. And I think I was seeking fundamental emotional support. A comforting gesture, a soothing balm, a caress, a kiss (. . .) And with my husband, you see, he was first an instrument technician and now he's a dentist. And he tells me, 'Don't worry because I was a wreck during my first week.' (. . .) It was a torment, morning, noon, and night. I did not eat, I did not sleep, nothing. Until he says to me (. . .) you have to turn the page and be convinced. I know how you work, you did everything you had to do. Without being there inside, I know you did. Enough, he says to me. Enough. I think he gave me a wake-up call. Enough because we cannot go on like this as a family."* (P7)

TABLE 4 | Turing Point quotes (Argentina, 2019).

Turning Point	• *"(. . .) At one point [a colleague] was as dismayed as I was, and I remember a dialogue the next day, over the phone, where he spontaneously said to me, 'It's like the end of your career,' and he started to cry. Yes, generally when I mention my institutional proscription, it reflects that. It's very strong. But yes, this makes you rethink whether you are useful or not. For me, it was a before and after." (P2)* • *"I was devastated (. . .) a train ran over me. It was in my career (. . .) the worst thing I had, but by far. The worst thing I had. As far as, you know, when you feel like everything you have done is not enough? And then something happened that had never happened to me before."* (P7)

shape their experience, such as the institutional culture, support from colleagues and supervisors, and institutional backing. Meanwhile, in their personal lives, SVs may rely on support from family and friends. In both domains, the SV actively seek or passively receive support from individuals in their social circle. **Table 3** shows some quotes related to the environment codes.

The behaviors and responses of SV provide insight into the institutional culture in which they are embedded. In this regard, participants expressed an interest in prioritizing transparency in communication, not only among team members but also with patients and their families. Moreover, they sought to investigate the root causes of the AE, and in their speeches, the reporting of the event appears recurrently as a routine task they perform. In addition, the learning from the of experience that SVs expressed its a characteristics of a robust safety culture.

Colleague support played a crucial role in the SV experience. Some professionals viewed this support positively, especially when it reinforced their confidence in their professional abilities or when the team collectively assumed responsibility for the AE.

The SVs had varying perceptions of their supervisors' responses. In some cases, support from supervisors was perceived as lacking in empathy and understanding toward them as individuals. The participants did not indicate whether supervisors sought to analyze how the AE occurred but rather emphasized how they felt they were treated. Some viewed demands to continue working or imperative instructions to avoid repeating a situation as negative support. However, others valued supervisors who show concern for their wellbeing.

In a secondary role, institutional support comes into play, expressed at times through information provided about the AE and the institutional management offered to SVs (e.g., legal support and professional support). Institutional support was seen as the backing of various individuals within the institution (fulfilling management, commercial, or legal roles) who, although not previously known to them, are felt by the SV as having supported them.

Finally, but equally significant, is the support outside of work sought by the SV. Some individuals look for support talking with their family or friends.

Turning Point

Ultimately, the study results showed that the AE marked a before and after moment in the professional lives of the participants; it was a turning point. On the one hand, terms such as *'institutional proscription'* (P2), *'it's the end of my career'* (P2), and *'it was the worst thing that happened to me in my career'* (P7) indicate that the SVs feel it is the end of their professional development. On the other hand, they use metaphors for natural disasters (such as *earthquake, tsunami, upheaval*). (**Table 4**).

DISCUSSION

The professionals involved in an AE experience a pivotal moment in their personal and professional lives. They are going through a dynamic process influenced by their environment. PS is fundamental to the recovery of SVs.

The process consists of different stages that professionals go through. This journey is clear and distinct, yet at the same time unique and personal, as each participant may experience diverse ways of living through each stage in terms of intensity and the order in which different states occur. In a different cultural, social, and work context, Scott et al. identified stages in the recovery of SVs [38]. Although the stages found in this study are not identical to those presented by Scott, common characteristics can be identified. The environment plays a fundamental role in the recovery of SVs. When colleagues or supervisors do not provide support to professionals, coping becomes more difficult. As a result, communication and teamwork break down and PS is weakened [8].

As they experience the impact, they manifest an emotional storm that reflects not only an awareness of the gravity of the event but also a strong vocational sense. Precisely because the experience of the phenomenon and its impact are so profound, they cannot identify a single emotion but rather a mixture of them, and these emotions are sometimes contradictory. Similarly, Scott proposes emotional chaos [38] as the first stage, wherein professionals attempt to reflect on what occurred. Additionally, consistent with other studies [13, 17, 31], professionals exhibited profound guilt for the patient, expressing the professional commitment and responsibility they hold as a healthcare professional.

Negative feelings such as guilt and fear lead to the stigmatization experienced by professionals. It is important to consider that this stigma originates from the work environment (colleagues, supervisors, etc.) but also likely from the SVs themselves. That is, they feel the weight of their mistake, and it is highly possible that they will continue to reproach themselves for it, regardless of the reaction from their environment. In these cases, the attitudes of colleagues become even more important in mitigating stigmatization and fostering a psychologically safe environment for SVs [8, 47].

The loneliness experienced by professionals is closely linked to a lack of understanding or support in the work environment. Consistently, various studies have revealed a lack of empathy and understanding toward SVs [13, 19, 47]. Bass et al., in a quantitative study, argued that the majority of professionals reported not having received training in emotional strategies to support colleagues. However, these same participants had sought support from their colleagues when they were involved in an AE [19]. In this context, the experience of loneliness may be intensified by the expectation of increased empathy and support from individuals who have experienced similar adversity. Therefore, it is necessary to train professionals to provide emotional first aid. Undoubtedly, the implementation of these training programs contributes to psychologically safe work environments [4, 47, 48].

Professional pauses and rumination mark a transition stage in which professionals seem to need space for reflection to understand and analyze what happened and reflecting a significant impact of the AE on the SV. In these transitions appears that after the initial shock wears off, as SVs consciously or unconsciously seek strategies to navigate the event. In these sense, in many situations, work demands and brief times of attention to respond to economic imperatives, among others, clash with this need of SVs and consequently with patient safety. Conversely, when organizations promote PS interventions, such as debriefing spaces [11, 48], they have a significant impact on SVs [16].

Additionally, the learning process and the desire to offer recommendations (in clinical practice to prevent future AEs or for colleagues going through the same situation) indicate that SVs are taking action. Now, they can serve as a reference by making recommendations on how to handle SVs. This finding is similar to that of Scott et al. who, in their final stage [38], found that SVs had three possible final outcomes. One of them was able to give new meaning to the experience [38]. Also learning is an intervention that contributes to creating a psychologically safe environment [48] and facilitates the recovery of SVs [38].

Research into the environment is a constant concern in the recovery process of healthcare professionals encompassing both the workplace (institutional culture and support from colleagues, supervisors, and the institution) and extralaboral factors.

From the environment, the SVs expect to receive support from colleagues and supervisors. Peer support fosters teamwork, which is critical for patient safety and psychological safety [5]. They also expect their immediate superiors to demonstrate humanity, understanding, and support. If healthcare professionals are not supported by their colleagues and supervisors, they rarely perceive that they are in a psychologically safe environment. Consequently, they lack confidence, avoid dialogue, and refrain from expressing their opinions. This breakdown in communication and teamwork leads to a loss of PS [5, 6, 8].

Finally, the inclination to seek assistance from family or social circles underscores the SV's aspiration to avoid judgment and find solace in environments characterized by stronger interpersonal bonds. This tendency may stem from the profound uncertainty engendered by the experience, prompting professionals to seek refuge in environments reminiscent of prevent normalcy. Additionally, this underscores the paramount importance of emotional support, as evidenced by the spontaneous expression of this theme by the majority of the participants, without direct questions about this aspect.

This study has several limitations. First, generalizing the findings may be limited due to the specific context in which the study was conducted. Additionally, while efforts were made to

conduct comprehensive interviews, participants may have withheld or forgotten some of their experiences.

Despite these limitations, this study provides a comprehensive understanding of the experiences of SVs in a Latin American culture. These findings enables the implementation of actions aimed at strengthening the PS of the workplace. Specifically, educational interventions focused on improving teamwork through simulation and debriefing; promoting interproffessional communication, trust, and support for SVs; and designing institutional-level SV response programs involving colleagues, supervisors, patient safety committees, and legal entities are important actions for strengthening workplace PS. Furthermore, it highlights the need for further research to determine how psychologically safe environments contribute to SVs recovery.

In conclusion, SVs undergo a process following an AE that is influenced by the workplace environment. This experience represents a turning point not only in their professional lives but also in their personal lives.

ETHICS STATEMENT

The studies involving humans were approved by the Comité Institucional de Evaluación, Universidad Austral. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

All authors contributed to the article and approved the submitted version. MB, MG conducted the interviews. MB, MG and MM did the analysis. MB, MM and MG wrote the manuscript.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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APPENDIX: SECOND VICTIM QUESTION GUIDE

What was your experience as an SV?

What was your participation in the event/How did you feel about your participation?

What was the outcome of the event for the patient?

Do you remember how you felt immediately after the event?

Did you have any needs (emotional, physical, professional)?

Did you express or tell anyone about these needs, and did you receive a response?

If you had a response: What response did you get, from whom, and did the response meet your need?

Did you express a need that was not met at the time? What happened to it?

Do you think the incident had an impact on your professional life? Did anything change in you? What? How?

If you perceive a change: Do you think this change is good, bad, or neutral?

On a professional level, when you returned to see patients after the incident, did you feel different (sometimes people feel fear, insecurity, embarrassment, inability to continue seeing patients, desire not to return to work)? Did this happen to you? Have you experienced any other feelings related to your professional performance that we have not discussed?

Can you identify three feelings or emotions you experienced at the time? How long did they last?

What context or situation influenced your experience?

How did you perceive your colleagues' reactions? How did this reaction affect you (did it create positive or negative feelings?) Were you able to express it to them?

If you discussed the incident with a supervisor/coordinator or boss: How did you perceive your supervisor's reaction to you? How did this reaction affect you (did it create positive or negative feelings?) Were you able to express it to them?

If you could go back in time, how would you have liked to have been treated by your colleagues? And by your supervisor/boss/coordinator?

Do you think the work environment would be different for you today? If so, how? Why do you think this change has occurred? How do you perceive it?

Do you highlight any behavior that was useful to you at the time?

If you are worried or stressed about a work-related problem, how do you usually handle this type of situation?

Whom do you usually turn to for advice or support in work-related situations?

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Speaking Up About Patient Safety, Withholding Voice and Safety Climate in Clinical Settings: a Cross-Sectional Study Among Ibero-American Healthcare Students

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Objectives: To explore speaking up behaviours, barriers to openly expressing patient safety concerns, and perceived psychological safety climate in the clinical setting in which healthcare trainees from Ibero-America were receiving their practical training.

Methods: Cross-sectional survey of healthcare trainees from Colombia, Mexico, and Spain (N = 1,152). Before the field study, the Speaking Up About Patient Safety Questionnaire (SUPS-Q) was translated into Spanish and assessed for face validity. A confirmatory factor analysis was conducted to establish the construct validity of the instrument, and the reliability was assessed. The SUPS-Q was used to evaluate voice behaviours and the perceived psychological safety climate among Ibero-American trainees. Descriptive and frequency analyses, tests for contrasting means and proportions, and logistic regression analyses were performed.

Results: Seven hundred and seventy-one trainees had experience in clinical settings. In the previous month, 88.3% had experienced patient safety concerns, and 68.9% had prevented a colleague from making an error. More than a third had remained silent in a risky situation. Perceiving concerns, being male or nursing student, and higher scores on the encouraging environment scale were associated with speaking up.

Conclusion: Patient safety concerns were frequent among Ibero-American healthcare trainees and often silenced by personal and cultural barriers. Training in speaking up and fostering safe interprofessional spaces is crucial.

Keywords: speaking up, patient safety, psychological safety, students, survey

INTRODUCTION

Patient safety education for healthcare students has been recognised by national and international accreditation bodies and agencies as a priority [1] because of the frequency with which patients suffer harm derived from healthcare [2]. Different approaches to working on patient safety competencies [3, 4] and tools for their implementation and assessment in curricula have been developed in response to this need [5, 6].

Healthcare students and residents (hereafter "trainees") are inevitably involved in patient safety incidents, either as subjects or observers, making them valuable sources of information and agents of change [7]. Between 76% and 92% of medical students acknowledge witnessing an error during their clerkships, whereas 18%–25% admit to being responsible for an error [8–10]. The likelihood of making an error increase during residency [11].

Despite the countless guidelines and proposals developed to incorporate patient safety into undergraduate and graduate healthcare education levels [1, 3, 4], their widespread implementation remains a challenging issue of varying intensity, depending on the country and speciality [12, 13]. In Europe, several studies show that the patient safety subject as an independent entity is the exception in nursing and medical curricula [14, 15]. In low- and middle-income countries, while the adoption of patient safety curricula is under consideration or planning, implementation remains challenging [16]. There is hardly any literature that analyses the differences in patient safety training of healthcare students between Spanish-speaking countries in the Americas and Europe. However, the few studies available suggest that, since patient safety education is still far from being homogeneous at the national level, differences between countries may be due to multiple factors [14–16]. In a study with medical and nursing students from different Ibero-American countries, Colombian students showed better patient safety attitudes and knowledge than Spanish students [17]. However, these results cannot be generalised. Possible differences between countries may be due to variations in curricula. However, the Americas and Europe generally include clinical internships from the third or fourth year onward. From a cultural point of view, in countries such as Colombia and Mexico, traditional medicine practices are still present in rural and indigenous areas, which poses an additional challenge in guaranteeing patient safety [18, 19], compared to Spain, where these practices are less widespread. Formal patient safety training is still pending in most Ibero-American countries, although most have reported isolated institutional initiatives [18, 20].

Studies show that trainees can be trained to effectively detect and report adverse events and contribute to improving patient safety and quality of care [21]. To this end, they must be allowed to express their concerns and suggestions in a climate of trust and respect. Psychological safety is an interpersonal construct that refers to the consensus in individuals' perceptions of the consequences of taking interpersonal risks (like speaking up or asking for help) in their work environment [22] or to the belief that one can express oneself without fear of criticism from others or negative consequences to self-image, status, or career [23]. In healthcare contexts, psychological safety contributes to patient safety and quality of care through speaking up behaviours [24].

Speaking up has been defined as assertive communication of patient safety concerns through information, questions, or opinions where immediate action is needed to avoid patient harm [25]. Despite the proven positive effects of this behaviour, multiple factors lead to individuals' withholding voice. Some of these barriers to speaking up behaviour are hierarchy, perceived lack of knowledge, dominant or shy personalities, authoritarian leadership, and fear of unpredictable or negative reactions from others [26, 27].

To the authors' knowledge, the frequency with which future generations of healthcare professionals in Ibero-America engage in speaking up and withholding voice behaviours and their perception of the work climate and barriers to psychological

TABLE 1 | Characteristics of the study sample (Colombia, Mexico, and Spain, 2021–2022).

	Without practice (*n* = 381)	With practice (*n* = 771)	Total (*n* = 1152)
Sex, n (%)			
Female	266 (70.1)	565 (73.3)	832 (72.2)
Male	114 (29.9)	206 (26.7)	320 (27.8)
Age, M (SD)	20.7 (4.1)	25.0 (5.5)	23.6 (5.5)
17–21 years, n (%)	308 (80.8)	206 (26.7)	514 (44.6)
22–24 years, n (%)	40 (10.5)	273 (35.4)	313 (27.2)
25–30 years, n (%)	20 (5.2)	198 (25.7)	218 (18.9)
31–40 years, n (%)	8 (2.1)	73 (9.5)	81 (7.0)
> 40 years, n (%)	5 (1.3)	21 (2.7)	26 (2.3)
Country			
Colombia	33 (8.7)	294 (38.1)	327 (28.4)
Mexico	322 (84.5)	264 (34.2)	586 (50.9)
Spain	6 (1.6)	101 (13.1)	107 (9.3)
Other	20 (5.2)	112 (14.5)	132 (11.5)
Profile or study discipline			
Nursing student or nurse resident	43 (11.3)	305 (39.6)	348 (30.2)
Medical student or medical resident	304 (79.8)	374 (48.5)	678 (58.9)
Psychology student or psychologist resident	34 (8.9)	92 (11.9)	126 (10.9)

TABLE 2 | Frequencies of reporting perceived concerns (PC), withholding voice (WV), speaking up behaviours (SU) and perceived barriers (PB) to speaking up, % (n)[a] (Colombia, Mexico, and Spain, 2021–2022).

Perceived concerns *(Cronbach's α = 0.74; McDonald's ω = 0.74)* *Over the last 4 weeks, how often…*	**Never**	**Rarely**	**Sometimes**	**Often**	**Very often**	**At least once[b]**
PC1 … have you had specific concerns about patient safety?	11.7 (90)	24.9 (192)	32.6 (251)	21.1 (163)	9.7 (75)	88.3 (681)
PC2 … have you observed a failure/error that, if uncaptured timely, could be harmful to patients?	37.5 (289)	31.3 (241)	22.7 (175)	6.7 (52)	1.8 (14)	62.5 (482)
PC3 … have you noticed that a professional in the unit or service in which you are training has not followed important patient safety rules or standards?	36.7 (283)	30.5 (235)	18.8 (145)	9.2 (71)	4.8 (37)	63.3 (488)
Withholding voice *(Cronbach's α = 0.79; McDonald's ω = 0.80)* *Over the last 4 weeks, how often…*	**Never**	**Rarely**	**Sometimes**	**Often**	**Very often**	**At least once[b]**
WV1 … have you kept ideas that could improve patient safety in the unit or department where you are training?	35.7 (275)	29.4 (227)	19.6 (151)	11.2 (86)	4.2 (32)	64.3 (496)
WV2 … have you chosen to remain silent and not say anything when witnessing a risky situation for a patient?	62.1 (479)	21.4 (165)	9.7 (75)	5.2 (40)	1.6 (12)	37.9 (292)
WV3 … have you remained silent despite having information that could have prevented a safety incident in the unit or service where you are training?	72.2 (557)	17.3 (133)	7.4 (57)	1.9 (15)	1.2 (9)	27.8 (214)
WV4 … have you avoided warning any professional in the unit or service where you are training that they were overlooking important patient safety rules/standards?	59.5 (459)	22.6 (174)	12.6 (97)	4.0 (31)	1.3 (10)	40.5 (321)
Speaking up *(Cronbach's α = 0.85; McDonald's ω = 0.85)* *Over the last 4 weeks, how often…*	**Never**	**Rarely**	**Sometimes**	**Often**	**Very often**	**At least once[b]**
SU1 … have you explicitly shared your patient safety concerns with your supervisor, mentor, or other professionals on the unit or service?	21.1 (163)	25.0 (193)	23.3 (180)	21.9 (169)	8.6 (66)	78.9 (608)
SU2 … have you helped prevent another professional from making an error that could have caused harm to a patient?	31.1 (240)	29.1 (224)	24.4 (188)	12.7 (98)	2.7 (21)	68.9 (531)
SU3 … have you warned a professional in the unit or department where you are training that they were overlooking important patient safety rules/standards?	40.7 (314)	30.6 (236)	18.2 (140)	8.3 (64)	2.2 (17)	59.3 (457)
SU4 … have you prevented an incident from occurring by making concrete proposals to increase patient safety?	39.7 (306)	29.2 (225)	21.0 (162)	8.3 (64)	1.8 (14)	60.3 (465)
Perceived barriers *(Cronbach's α = 0.86; McDonald's ω = 0.86)*	**Not at all**	**Partially**	**Moderately**	**Completely**		
PB1. It is not clear that the situation represents a risk for a patient	34.2 (264)	48.4 (373)	12.5 (96)	4.9 (38)		
PB2. Fear of a negative reaction from professionals or teachers/mentors	30.4 (234)	30.2 (233)	23.1 (178)	16.3 (126)		
PB3. The presence of patients at that moment	30.5 (235)	38.5 (297)	20.4 (157)	10.6 (82)		
PB4. Doubts about how best to say it	24.4 (188)	42.3 (326)	23.7 (183)	9.6 (74)		
PB5. Feel that one lacks sufficient social and communication skills to talk about it	38.1 (294)	39.2 (302)	16.1 (124)	6.6 (51)		
PB6. The unpredictable reaction of the service or unit manager	31.4 (242)	36.6 (282)	18.5 (143)	13.5 (104)		
PB7. Lack of self-confidence to discuss these issues with mentors or professionals	39.9 (308)	36.4 (281)	16.2 (125)	7.4 (57)		
PB8. Believe that talking about these issues will negatively impact my current and future involvement with the centre	34.1 (263)	36.2 (279)	16.1 (124)	23.6 (105)		

N = 771.

[a]*For perceived concerns (PC), withholding voice (WV), speaking up (SU) categories were presented as: "never" (0 times in the last 4 weeks), "rarely" (1-2 times in the last 4 weeks), "sometimes" (3–5 times in the last 4 weeks), "often" (6–10 times in the last 4 weeks), and "very often" (more than 10 times in the last 4 weeks).*

[b]*The sum of the categories "rarely," "sometimes," "often" and "very often."*

safety have not been studied. The aim of this study was twofold: on the one hand, to adapt and validate the Speaking Up About Patient Safety Questionnaire (SUPS-Q) [28] in Spanish native healthcare trainees from Ibero-America and, on the other hand, to explore their speaking up behaviours, barriers to openly expressing their patient safety concerns, and perceived psychological safety climate in the clinical setting in which they were receiving their practical training.

METHODS

Study Population and Procedure

A cross-sectional survey-based study among healthcare trainees doing clinical internships at one Ibero-American academic teaching healthcare centre was conducted. Specifically, the survey was disseminated through a convenience sample from academic and healthcare institutions in Colombia,

TABLE 3 | Mean (SD) responses to perceived concerns (PC), withholding voice (WV), speaking up behaviours (SU) and perceived barriers (PB) to speaking up by student profile and sex[a,b] (Colombia, Mexico, and Spain, 2021–2022).

Perceived concerns *(Cronbach's α = 0.74; McDonald's ω = 0.74)* *Over the last 4 weeks, how often…*	**Total[c] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
PC1 … have you had specific concerns about patient safety?	1.9 (1.1)	1.9 (1.2)	2.1 (1.1)	0.003	0.43	2.0 (1.2)	2.0 (1.1)	0.888	0.50
PC2 … have you observed a failure/error that, if uncaptured timely, could be harmful to patients?	1.0 (1.0)	1.0 (1.0)	1.2 (1.0)	0.046	0.46	1.0 (1.0)	1.1 (1.1)	0.391	0.48
PC3 … have you noticed that a professional in the unit or service in which you are training has not followed important patient safety rules or standards?	1.1 (1.2)	1.1 (1.2)	1.2 (1.1)	0.214	0.47	1.2 (1.2)	1.1 (1.1)	0.456	0.48
Total perceived concerns[d]	7.2 (4.7)	7.0 (4.7)	7.9 (4.6)	0.007	0.44	7.3 (4.6)	7.3 (4.8)	0.976	0.50
Withholding voice *(Cronbach's α = 0.79; McDonald's ω = 0.80)* *Over the last 4 weeks, how often…*	**Total[c] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
WV1 … have you kept ideas that could improve patient safety in the unit or department where you are training?	1.2 (1.2)	1.2 (1.2)	1.3 (1.1)	0.174	0.47	1.1 (1.2)	1.2 (1.2)	0.217	0.47
WV2 … have you chosen to remain silent and not say anything when witnessing a risky situation for a patient?	0.6 (1.0)	0.6 (0.9)	0.7 (1.0)	0.087	0.47	0.5 (0.9)	0.7 (1.0)	0.004	0.44
WV3 … have you remained silent despite having information that could have prevented a safety incident in the unit or service where you are training?	0.4 (0.8)	0.4 (0.8)	0.4 (0.9)	0.916	0.50	0.4 (0.7)	0.5 (0.8)	0.117	0.47
WV4 … have you avoided warning any professional in the unit or service where you are training that they were overlooking important patient safety rules/standards?	0.6 (0.9)	0.6 (0.9)	0.7 (1.0)	0.176	0.47	0.7 (1.0)	0.6 (0.9)	0.636	0.49
Total withholding voice[d]	5.1 (5.4)	4.9 (5.3)	5.6 (5.5)	0.065	0.46	4.8 (5.1)	5.4 (5.6)	0.235	0.47
Speaking up *(Cronbach's α = 0.85; McDonald's ω = 0.85)* *Over the last 4 weeks, how often…*	**Total[c] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
SU1 … have you explicitly shared your patient safety concerns with your supervisor, mentor, or other professionals on the unit or service?	1.7 (1.3)	1.7 (1.3)	1.8 (1.3)	0.130	0.47	1.9 (1.2)	1.6 (1.2)	0.001	0.43
SU2 … have you helped prevent another professional from making an error that could have caused harm to a patient?	1.3 (1.1)	1.2 (1.1)	1.4 (1.2)	0.010	0.44	1.4 (1.2)	1.2 (1.1)	0.003	0.44
SU3 … have you warned a professional in the unit or department where you are training that they were overlooking important patient safety rules/standards?	1.0 (1.1)	0.9 (1.0)	1.2 (1.1)	0.003	0.43	1.1 (1.1)	0.9 (1.0)	0.007	0.44
SU4 … have you prevented an incident from occurring by making concrete proposals to increase patient safety?	1.0 (1.1)	1.0 (1.0)	1.2 (1.0)	0.001	0.43	1.2 (1.1)	0.9 (1.0)	0.002	0.44
Total speaking up[d]	8.8 (6.5)	8.4 (6.4)	9.9 (6.8)	0.003	0.43	9.9 (6.6)	8.1 (6.3)	<0.001	0.42
Perceived barriers *(Cronbach's α = 0.86; McDonald's ω = 0.86)*	**Total[c] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
PB1. It is not clear that the situation represents a risk for a patient	0.9 (0.8)	0.9 (0.8)	0.9 (0.8)	0.512	0.49	0.8 (0.8)	0.9 (0.8)	0.406	0.48
PB2. Fear of a negative reaction from professionals or teachers/mentors	1.3 (1.1)	1.3 (1.0)	1.2 (1.1)	0.127	0.47	1.1 (1.0)	1.4 (1.1)	0.001	0.43
PB3. The presence of patients at that moment	1.1 (1.0)	1.2 (1.0)	1.0 (0.9)	0.060	0.46	1.0 (0.9)	1.2 (1.0)	<0.001	0.42
PB4. Doubts about how best to say it	1.2 (0.9)	1.2 (0.9)	1.1 (0.9)	0.035	0.45	1.1 (0.9)	1.2 (0.9)	0.025	0.45
PB5. Feel that one lacks sufficient social and communication skills to talk about it	0.9 (0.9)	1.0 (0.9)	0.8 (0.9)	0.002	0.43	0.8 (0.8)	1.0 (0.9)	0.009	0.45
PB6. The unpredictable reaction of the service or unit manager	1.1 (1.0)	1.2 (1.0)	1.0 (1.0)	0.057	0.46	1.0 (0.9)	1.2 (1.0)	0.003	0.44
PB7. Lack of self-confidence to discuss these issues with mentors or professionals	0.9 (0.9)	1.0 (0.9)	0.8 (0.9)	0.002	0.43	0.8 (0.8)	1.0 (1.0)	0.003	0.44
PB8. Believe that talking about these issues will negatively impact my current and future involvement with the centre	1.1 (1.0)	1.1 (1.0)	1.0 (1.0)	0.102	0.46	1.0 (0.9)	1.1 (1.0)	0.112	0.47
Total perceived barriers[d]	19.8 (12.6)	20.5 (12.6)	17.9 (12.4)	0.011	0.44	17.5 (11.7)	21.0 (12.7)	<0.001	0.42

[a]*For perceived concerns (PC), withholding voice (WV), speaking up (SU) categories were presented as: "never" (0 times in the last 4 weeks), "rarely" (1-2 times in the last 4 weeks), "sometimes" (3–5 times in the last 4 weeks), "often" (6–10 times in the last 4 weeks), and "very often" (more than 10 times in the last 4 weeks).*

[b]*For PB, categories were presented as: "not at all" (0), "partially" (1), "moderately" (2), and "completely" (4).*

[c]*Total column includes psychology students.*

[d]*Ranges of total scores for the scales: perceived concerns (PC) (0–12), withholding voice (WV) (0–16), speaking up (SU) (0–16), PB (0–24).*

TABLE 4 | Mean (SD) responses to climate survey items (psychological safety for speaking up -PSS-, encouraging environment for speaking up -EES-, and resignation towards speaking up -RES) by sex and student profile[a] (Colombia, Mexico, and Spain, 2021–2022).

Psychological safety for speaking up *(Cronbach's α = 0.83; McDonald's ω = 0.83)*	**Total[b] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
PSS1. I can rely on my colleagues (other trainees) whenever I encounter difficulties in my work	5.4 (1.8)	5.4 (1.8)	5.3 (1.7)	0.179	0.47	5.3 (1.9)	5.4 (1.7)	0.974	0.50
PSS2. I can rely on my mentor whenever I encounter difficulties in my work as a trainee	5.6 (1.6)	5.7 (1.6)	5.5 (1.7)	0.475	0.48	5.7 (1.6)	5.5 (1.6)	0.003	0.44
PSS3. The culture (explicit and implicit norms and values) existing in the unit or service where I am training makes it easy to speak up about patient safety concerns	4.9 (1.9)	5.0 (1.9)	4.9 (1.9)	0.520	0.49	5.3 (1.7)	4.7 (1.9)	<0.001	0.40
PSS4. My colleagues (other trainees) react appropriately when I speak up about my patient safety concerns	5.3 (1.8)	5.4 (1.7)	5.1 (1.9)	0.042	0.45	5.3 (1.8)	5.2 (1.8)	0.292	0.48
PSS5. My professors or mentor react appropriately when I speak up about my patient safety concerns	5.3 (1.8)	5.3 (1.8)	5.3 (1.7)	0.508	0.49	5.5 (1.7)	5.1 (1.8)	<0.001	0.41
Total psychological safety for speaking up[c]	26.6 (6.8)	26.8 (6.7)	26.1 (7.1)	0.309	0.48	27.2 (7.0)	25.9 (6.6)	<0.001	0.42
Encouraging Environment for Speaking up *(Cronbach's α = 0.86; McDonald's ω = 0.87)*	**Total[b] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
EES1. In the unit or service where I am training, I notice that professionals naturally speak up about their patient safety concerns	4.9 (1.9)	4.8 (2.0)	4.9 (1.9)	0.778	0.49	4.9 (2.0)	4.9 (1.8)	0.464	0.48
EES2. Professionals in the service or unit where I am training encourage me to speak up about my patient safety concerns	4.6 (2.1)	4.6 (2.0)	4.5 (2.1)	0.862	0.50	4.8 (2.0)	4.4 (2.0)	0.002	0.43
EES3. My professors or mentor encourage me to speak up about my patient safety concerns	5.0 (1.9)	5.0 (1.9)	4.8 (2.0)	0.129	0.47	5.2 (1.8)	4.7 (1.9)	<0.001	0.40
Total encouraging environment for speaking up[c]	14.4 (5.2)	14.5 (5.2)	14.3 (5.3)	0.628	0.49	15.0 (5.3)	14.0 (5.0)	0.001	0.43
Resignation towards Speaking up[d]	**Total[b] (*N* = 771)**	**Female (*n* = 565)**	**Male (*n* = 206)**	***p***	**PS**	**Nursing (*n* = 305)**	**Medicine (*n* = 374)**	***p***	**PS**
RES1. Suggesting changes to improve patient safety and no one listens to me is frustrating	3.3 (2.3)	3.3 (2.4)	3.4 (2.2)	0.833	0.50	3.4 (2.4)	3.3 (2.3)	0.702	0.49
RES2. I find it challenging to bring up my concerns about patient safety with professors and mentors	3.2 (2.1)	3.3 (2.2)	3.2 (2.1)	0.619	0.49	3.2 (2.2)	3.3 (2.1)	0.352	0.48
Total resignation towards speaking up[c]	6.6 (4.0)	6.6 (4.0)	6.5 (3.8)	0.838	0.50	6.6 (4.1)	6.7 (3.9)	0.741	0.49

[a]For psychological safety for speaking up (PSS), encouraging environment for speaking up (EES) and resignation towards speaking up (RES) categories were presented as: "not applicable" (0), "strongly disagree" (1), "disagree" (2), "slightly disagree" (3), "neutral" (4), "slightly agree" (5), "agree" (6), and "strongly agree" (7).
[b]Total column includes psychology students.
[c]Ranges of total scores for the scales: psychological safety for speaking up (PSS) (0-35), encouraging environment for speaking up (EES) (0-21), resignation towards speaking up (RES) (0-14). Negatively worded items were reverse coded for the total score on the scales.
[d]Reliability coefficients cannot be estimated because the number of items is less than 3.

TABLE 5 | Mean (SD) vignette ratings by sex and student profile (Colombia, Mexico, and Spain, 2021–2022).

	Realistic	**Risk of harm**	**Likelihood to speak up**	**Discomfort**
Total	3.9 (1.9)	5.8 (1.4)	5.4 (1.7)	4.0 (1.9)
Sex				
Female	3.9 (1.9)	5.8 (1.4)	5.4 (1.7)	3.9 (1.9)
Male	3.7 (1.9)	5.7 (1.4)	5.3 (1.8)	4.1 (1.9)
p	0.192	0.166	0.661	0.261
PS	0.47	0.47	0.49	0.47
Student profile				
Nursing	4.2 (2.0)	5.7 (1.4)	5.6 (1.7)	4.3 (1.9)
Medicine	3.8 (1.8)	5.7 (1.3)	5.2 (1.7)	3.7 (1.9)
p	0.002	0.468	<0.001	<0.001
PS	0.43	0.48	0.42	0.42

All ratings measured on a seven-point scale. Realistic (1 = not at all, 7 = very realistic), Risk of harm (1 = not dangerous at all, 7 = extremely dangerous), Likelihood to speak up (1 = very unlikely, 7 = highly likely), and Discomfort (1 = not at all uncomfortable, 7 = extremely comfortable).

Mexico, and Spain. However, mobility conditions during training were considered, so that trainees from other Ibero-American countries who were in one of the three dissemination countries at the time of the survey were also included. Given the variability in the timing of internship periods in the curricula between countries, recruitment of

TABLE 6 | Results of binary logistic regression analysis with frequent speak up and frequent withholding voice as dependent variables (Colombia, Mexico, and Spain, 2021–2022).

Frequent speaking up	Or (95% CI)	*p*
Sex (0: male)	0.501 (0.328–0.765)	0.001
Age	1.008 (0.974–1.044)	0.632
Student profile (0: nursing)	0.606 (0.419–0.875)	0.008
Perceived concerns	1.282 (1.218–1.350)	<0.001
Perceived barriers	1.001 (0.985–1.018)	0.889
Psychological safety for speaking up	1.021 (0.985–1.058)	0.264
Encouraging environment for speaking up	1.082 (1.029–1.138)	0.002
Resignation towards speaking up	1.006 (0.959–1.054)	0.817
Frequent withholding voice	**OR (95% CI)**	***p***
Sex (0: male)	0.727 (0.483–1.095)	0.127
Age	1.031 (0.995–1.068)	0.088
Student profile (0: nursing)	0.952 (0.661–1.373)	0.794
Perceived concerns	1.190 (1.135–1.248)	<0.001
Perceived barriers	1.046 (1.028–1.064)	<0.001
Psychological safety for speaking up	0.959 (0.924–0.995)	0.026
Encouraging environment for speaking up	0.993 (0.943–1.045)	0.776
Resignation towards speaking up	1.074 (1.024–1.126)	0.003

participants was not based on a specific term in the study programme. To determine if respondents had completed an internship in a health or socio-health centre during their training, they were asked to indicate this information in the survey.

The survey was disseminated by the collaborating professors to a convenience subgroup of students from participant universities. An online invitation message with information about the study's purpose and the voluntary and anonymous nature of participation was sent to the trainees. They were informed that they were agreeing to participate in the study by responding to the survey. The online survey was open from April 2021 to February 2022. Three reminders were scheduled to increase the response rate. There was no sample size estimation as the study had an explorative character.

Survey Instrument

The SUPS-Q, originally developed and validated by Richard et al. [28] in healthcare professionals in Switzerland, was adapted to Spanish. This questionnaire was designed to assess healthcare workers' perceived patient safety concerns, past speaking up behaviours, perceived barriers to speaking up, evaluations of the speaking up climate at their workplace, and their anticipated speaking up behaviour. Three researchers independently carried out the back-translation of the questionnaire. Discrepancies were resolved through joint discussion and consensus building. Respecting the structure of the original questionnaire, the authors agreed on some modifications in the wording and content of the items, as well as the incorporation of new questions considered relevant to the cultural context of the application of the instrument in this study. The authors approved the final translation of the questionnaire into Spanish. Five undergraduate students from each participating country assessed the face validity of the instrument. Overall, the students found the questionnaire content easy to understand and relevant. Minor adjustments were made to the wording of the items based on the students' suggestions.

Respecting the structure of the SUPS-Q, the instrument consisted of three behaviour scales (perceived concerns -PC-, withholding voice -WV-, and speaking up -SU-), three climate sub-scales (psychological safety for speaking up -PSS-, encouraging environment for speaking up -EES-, and resignation toward speaking up -RES-), a predefined list of barriers to speaking up and a vignette describing a generic situation requiring speaking up.

Speaking up behaviours were assessed with 11 items, addressing the frequency of perceived safety concerns due to errors and non-compliance rules (PC1-3), withholding voice behaviours (WV1-4) (choose not to speak up in specified situations), and speaking up behaviours (SU1-4) over the past 4 weeks. A 5-point Likert scale was used for PC, WV, and SU, whose response options were "never" (0 times in the last 4 weeks), "rarely" (1-2 times), "sometimes" (3-5 times), "often" (6–10 times), and "very often" (more than 10 times in the last 4 weeks). Thus, higher mean scale values indicated higher frequencies of past speaking up and withholding voice behaviours.

Speak up-related climate was assessed with 10 items that explore whether healthcare trainees perceive their environment, colleagues, and supervisors/mentors as supportive to speaking up (EES1-3), their level of resignation with speaking up (RES1-2), and psychological safety (PSS1-5). The answers to the EES, RES and PSS items were coded in a 7-point Likert scale from "strongly disagree" to "strongly agree," including a "not applicable" response option.

A predefined list of eight factors (PB1-8) and a 4-point Likert scale were used to identify those aspects that trainees perceived as barriers to bringing up patient safety concerns (from "not at all" to "completely").

A clinical vignette describing a hypothetical situation was used to assess trainees anticipated speaking up behaviours. The vignette reads "You are observing how a specific procedure is applied to a patient. A professional is about to examine the surgical wound of the patient. However, he/she does not put on gloves and has not hygienised their hands." Trainees were asked to complete four questions assessing the realism of the situation, the potential for patient harm, their discomfort with and likelihood of speaking up. These questions each used a 7-point Likert response scale with specifically labelled poles.

Additionally, the following sociodemographic variables were recorded: sex, age, profile, or healthcare discipline (nursing, medicine, psychology or other), year of beginning of studies and performance of an internship in a health or social care centre.

Statistical Analysis

Descriptive and frequency analyses were performed for items and subscales. Comparative analyses were performed according to the level of training (with vs. without practice), the profile or health discipline (nursing vs. medicine) and the sex (female vs. male) of

the respondents. Participants who indicated that they had no practice at the time of the survey were only considered as a control group for the comparative analysis according to the level of training. These participants were discarded for the rest of the analysis as they did not meet the inclusion criteria. Non-parametric Mann-Whitney U and Chi-Square tests were used to contrast means and proportions, respectively. The probability of superiority (PS) for the Mann-Whitney U test (0.53 very small, 0.56 small, 0.64 medium, 0.71 large, 0.80 very large and 0.92 huge) [29] and Cramér's V for the Chi-Square test (≤0.10 negligible, >0.10 to ≤0.20 weak, >0.20 to ≤0.40 moderate, >0.40 to ≤0.60 relatively strong, >0.60 to ≤0.80 strong, and >0.80 very strong) [30] were used to calculate the effect size. In both cases, the value ranges from 0-1, indicating a larger effect size as the values approach 1.

A binary logistic regression using the enter method was conducted to describe the association between two response variables (likelihood of speaking up -SU- and withholding voice behaviours -WV-) and the following independent variables: sex, age, student profile, PC, PB, PSS, EES and RES. For these analyses, the dependent variables (behaviour scales SU and WV) were dichotomised, where 0 = absence of SU and WV behaviours in the last 4 weeks (responses "never" or "rarely"), and 1 = presence of at least one SU or WV behaviour 3 or more times in the last month.

Regarding instrument reliability, Cronbach's alpha and the McDonald's omega coefficients were calculated to assessed internal consistency of scales with values >0.7 [31] and >0.6 [32] indicating acceptable consistency, respectively.

A confirmatory factor analysis (CFA) was conducted using maximum likelihood estimation methods to test the defined six-scale structure of the SUPS-Q to which the perceived barriers' items were added. Model fit was assessed using Chi-square statistic (χ^2), Chi-square divided by degrees of freedom (χ^2/df) (acceptable fit ≤5, good fit <2), Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) (acceptable fit 0.90-0.95, good fit ≥0.95), Root Mean Square Error of Approximation (RMSEA) (good fit ≤0.05), Standardized Root Mean Squared Residual (SRMR) (acceptable fit <0.10, good fit ≤0.05), Adjusted Goodness-of-Fit Index (AGFI) (acceptable fit 0.85–0.90, good fit >0.90) [33, 34].

Data analyses were performed with IBM SPSS Statistics and IBM SPSS Amos 28.0.0.

Ethical Approval

The study was approved by the Research Integrity and Ethics Committee of the Miguel Hernández University of Elche (record code: 2021/52945) and the Research Commission of the University Hospital San Juan de Alicante (27 April 2021), Spain.

RESULTS

Using a convenience sample, 1,152 students from healthcare disciplines in Ibero-American countries completed the questionnaire. Of these, 771 (66.9%) had done internships in clinical or socio-health contexts. Further sample characteristics are provided in **Table 1**.

Confirmatory Factor Analysis and Reliability of the Instrument

The results of the confirmatory factor analysis conducted using the data from the students with clinical experience (n = 771) revealed an acceptable to good model fit. χ^2/df (2.26), TLI (0.95) and SRMR (0.09) showed acceptable fit, while the CFI (0.96), AGFI (0.92), and RMSEA (0.04) values indicated a good fit. The standardized coefficients for the seven-factor model of SUPS-Q are represented in **Supplementary Material S1**. Cronbach's alpha and McDonald's omega for the behaviour and climate scales ranged from 0.74 to 0.87, indicating acceptable to good internal consistencies (**Tables 2–4**).

Differences Between Healthcare Students With and Without Practical Experience in Clinical or Social-Healthcare Settings

On both the behavioural and climate scales, students with practice (wp) scored significantly higher compared to those who had not yet undertaken practice in clinical or health and social care settings (w/op) (**Supplementary Material S2**).

In the 4 weeks before the survey, students with practice reported a higher frequency of perceived concerns about patient safety (wp M = 7.2, SD = 4.7 vs. w/op M = 5.5, SD = 4.4; $p < 0.001$, PS = 0.40) and of withholding voice behaviours (wp M = 5.1, SD = 5.4 vs. w/op M = 2.9, SD = 4.1; $p < 0.001$, PS = 0.36). This group also showed a higher attitude of resignation toward speaking up (wp M = 6.6, SD = 4.0 vs. w/op M = 4.8, SD = 4.4; $p < 0.001$, PS = 0.38). In contrast, no differences were observed in perceived barriers to openly discussing risks and issues affecting patient safety (wp M = 19.8, SD = 12.6 vs. w/op M = 19.6, SD = 13.8; $p = 0.560$), except the presence of patients (wp M = 1.1, SD = 1.0 vs. w/op M = 0.9, SD = 0.9; $p = 0.003$, PS = 0.45) and the lack of social and communication skills (wp M = 0.9, SD = 0.9 vs. w/op M = 1.1, SD = 1.0; $p = 0.020$, PS = 0.46).

Students with previous experience also reported a higher frequency of speaking up about patient safety behaviours during the 4 weeks before completing the questionnaire and the perception of a more encouraging and psychologically safe environment for speaking up.

In the responses to the vignette, no differences were observed according to experience in terms of the realism and riskiness of the situation described, nor in terms of the discomfort of asking the professional to follow safety rules ($p > 0.05$). However, students who had not been in practice reported a higher likelihood of warning the professional to sanitise their hands before caring for another patient (wp M = 5.4, SD = 1.7 vs. w/op M = 5.8, SD 1.5; $p < 0.001$, PS = 0.43).

Safety Concerns, Barriers for Speaking Up, and Speaking Up Behaviours

Responses to the three behavioural scales (PC, WV, and SU) and perceived barriers (PB) to speaking up are showed in **Table 2**. In

the experienced group, 88.3% of the students had been concerned about patient safety at least once during the previous 4 weeks. These concerns were accompanied by speaking up behaviours, i.e. 68.9% of respondents had prevented a colleague from making an error that could have harmed a patient. However, about four out of 10 students acknowledged that they had remained silent when witnessing a risky situation for patients. The most common barriers to speaking up about patient safety were, in order, fear of bad reactions from professionals or mentors, doubts about the best way to say it, uncertainty about the response of the unit manager, and the presence of patients when the risky practice is detected.

Table 3 shows the mean comparisons by sex (women vs. men) and student profile (nursing vs. medicine) on the behavioural scales and perceived barriers. Overall, men reported a higher frequency of patient safety concerns and speaking up behaviours compared to women. In contrast, women scored higher than men on perceived barriers to speaking up about patient safety, especially about internal factors (competence, skill, and self-confidence). However, the effect size of the observed differences was very small, with PS values between 0.42 and 0.50. No gender differences were observed in the frequency of withholding voice behaviours. In terms of student profile, doctors perceived more barriers than nurses to expressing patient safety concerns and initiatives, and 25.4% (n = 95) of doctors versus 16.7% (n = 51) of nurses reported having kept silent in situations of patient risk at least once during the last month (Chi-square = 14.233, df = 4; p = 0.007, Cramer's V = 0.14). Consistently, nursing students reported a higher frequency of speaking up behaviours during the last 4 weeks compared to medical students.

Speaking Up Related Climate

The responses to the climate items are shown in **Table 4**. Five hundred and twenty-nine (68.6%) students with clinical experience said they relied on their mentor when difficulties arose in their work as a trainee and 52.1% (n = 402) agreed that their professors or mentors encouraged them to speak up about their patient safety concerns. However, 17.5% (n = 135) acknowledged that bringing up such concerns with their supervisors was perceived as challenging. In terms of sex comparison, 65.9% (n = 372) of women versus 58.3% (n = 120) of men agreed that peers reacted well when expressing their patient safety concerns (Chi-square = 15.394, df = 7; p = 0.031, Cramer's V = 0.14). No other differences were observed between men and women in perceived climate. Regarding differences by student profile, in general, nurses perceived a more encouraging and psychologically safe climate for speaking up compared to doctors. However, the effect size of these differences was very small, with PS values between 0.40 and 0.50.

Evaluation of the Hand Hygiene Error Vignette

Table 5 shows the students' assessments of the vignette. In general, students did not rate the hand hygiene error as a very realistic situation. However, they considered the situation to be quite dangerous for the patients. The speaking up behaviour was rated as probable, and the discomfort associated with risk communication as neutral. Men and women rated the situation similarly. Compared to physicians, nurses considered the vignette more realistic and reported a higher likelihood of speaking up despite feeling more uncomfortable, although the effect size of these differences was very small (PS values < 0.50).

Factors Associated With Speaking Up and Withholding Voice Behaviours

The results of the binary logistic regression with the frequency of speaking up and withholding voice as dependent variables are shown in **Table 6**. Perceived patient safety concerns were associated with speaking up and withholding voice behaviours (p < 0.001). Being male, a nursing student and reporting higher scores on the encouraging environment scale were also associated with a greater likelihood of frequently reporting speaking up (p < 0.01). Higher levels of resignation towards speaking up and perceived barriers were associated with higher frequencies of voice withholding (p < 0.01). In contrast, a higher level of psychological safety in expressing the behaviours was associated with a lower likelihood of reporting high frequencies of speaking up (p = 0.001).

DISCUSSION

This study shows that patient safety concerns and the observation of non-compliance with safety standards during the care process are frequent experiences among Ibero-American students of healthcare disciplines.

Of the participants in our study, nine out ten stated they had specific concerns about patient safety in the month before the survey. This finding is consistent with the experience reported by healthcare professionals in Switzerland [35], although somewhat higher than the frequency observed among medical students in Austria [27]. These similarities and differences held for speaking up behaviours when avoiding an error that could have harmed patients, with the only difference being that, in this case, the frequency was higher among Ibero-American students (68%) than among Austrian students (44%). This difference in speaking up frequency could be explained by the lower frequency with which Austrians experienced patient safety concerns.

Withholding voice behaviours were also relatively frequent among Ibero-American students. The figures were similar to those of Austrian medical students, although higher than those observed among health professionals [27, 35]. Our study showed that the main barriers to speaking up identified by Ibero-American students were social (reaction of others) and personal (lack of ability). Fear of damaging relationships as a result of this type of communication, the unpredictability of others' reactions, the personality of senior staff (e.g., grumpy or stubborn), hierarchical and power differences, fear of

punishment and the desire not to break unwritten rules or to preserve a good team climate are some of the most frequently reported reasons in clinical settings for withholding voice behaviours [27, 36–39].

In our study, men reported a higher frequency of safety concerns and speaking up behaviours compared to women. This finding may be related to women perceiving more barriers to expressing patient safety concerns. Along these lines, female students reported more frequently than their male peers that their misgivings about speaking up were associated with their lack of skill, denoting lower self-confidence. A similar result was obtained by Chen et al. (2023) [40] in a speaking up simulation course, where male medical students showed higher rates of speaking up than their female peers in life-threatening error scenarios. Analysing these sex differences from a gender perspective might suggest the existence of a bias in the treatment and attributed competence that women receive in clinical contexts versus that received by men [41, 42]. When analysed the data by the healthcare discipline, nursing students reported a higher frequency of speaking up behaviours compared to physicians who perceived more barriers to expressing patient safety concerns and initiatives. No differences were found in the frequency of concerns and withholding voice behaviours by student profile.

Regarding perceived climate, Ibero-American students showed intermediate average scores, suggesting that the working environment was neither perceived as extremely favourable nor unfavourable for speaking up. However, ratings were slightly more positive on the scales of psychological safety and encouraging environment for speaking up as opposed to resignation, suggesting a slightly favourable perception of the working environment. The analysis results by student profile are consistent with findings in samples of professionals, where nursing reported a more positive and encouraging psychological safety climate for speaking up compared to medicine. Differences between nursing and medicine in aspects related to patient safety, although not universal, are observed with some frequency [15, 17].

The logistic regression results were in line with what has been observed in other studies, as perceived worries were strongly associated with speaking up and withholding voice. These two voice behaviours, although antagonistic in their direction, are common and coexist. Also, being a nurse and perceiving an encouraging environment were more strongly associated with openly expressing concerns [35]. Other motivating factors that seem to explain speaking up behaviours are the existence of a positive (non-judgemental, non-punitive) safety culture, supportive unit manager and role models, positive reactions from others, familiarity with team members, high-risk situations for patients and staff and some personal characteristics and beliefs (assertiveness, confidence, etc.) [40].

As expected, students with experience in clinical settings scored higher than those without experience on all scales of the questionnaire, both those that are positively related to speaking up and those that inhibit it. This aspect is explained by the fact that practicing students have direct exposure to care activities, actual patients, cultural and climate factors, and the working dynamics of a particular healthcare institution and are assumed to have a greater awareness of risks, while the perception of students who have not yet undertaken practice is mediated by a more indirect, theoretical experience and developed under controlled learning conditions. This result is like the one found in other studies comparing students in their first and last years [27]. Along these lines, our untrained students reported a higher likelihood of warning the practitioner to sanitise their hands when analysing the error vignette. This possible overestimation of their willingness to speak up could be due to the difficulty in realistically analysing the situation. In contrast, trainees with practice are more likely to approach this exercise with a specific personalisation of the actors and the context.

Strengths and Limitations

Our study is the first to analyse speaking up behaviours in students of health disciplines in Ibero-America. To this end, a version of the SUPS-Q has been successfully adapted to Spanish. These results provide insights for planning actions to foster safe clinical environments for patients and the learning of future healthcare professionals. However, our study also has significant limitations. The main objective of this study was to explore speaking up behaviours, barriers to openly expressing patient safety concerns, and perceived psychological safety climate in Ibero-American healthcare trainees, and not the validation of the measurement instrument. However, it was necessary to analyse the face and construct validity of the questionnaire when first translated into Spanish to verify whether the data confirmed the original factor structure. Future studies should address the analysis of the psychometric properties of the SUPS-Q in its Spanish version, including the determination of discriminant, convergent and criterion validity. The sample size may have had a paradoxical effect on the results regarding generalisability and significance. The small sample size relative to the study population and possible response bias limited the results' generalisability. Conversely, the large sample size in absolute terms may have been behind the statistically significant differences observed, which would explain the small effect size values obtained. Responses may have been affected by social desirability and recall biases as the questionnaire included retrospective questions. The study period coincided with the COVID-19 pandemic, so many students had their opportunities for clinical internships restricted or postponed. Also, the cross-sectional study design did not allow for establishing cause-effect relationships between the variables of interest. The international nature of the study, although valuable in its scope, adds limitations associated with differences between countries regarding curricula, timing of clinical practices, cultural factors, and the nature of healthcare systems. However, intra-institutional variability between units is sometimes equally high. The decision not to conduct cross-country analyses was based on the above reasons, along with

the impossibility of determining the cultural invariance of the instrument and the commitment to researchers in the different participating countries to adopt a joint learning approach rather than a comparison or stratification focus. The need to progress in patient safety and psychological safety is still a common challenge for most countries. Finally, psychology students were excluded from the comparative analyses by discipline. However, this decision was made considering Schwappach and Niederhauser's (2019) [43] findings that psychologists' responses systematically deviated from other professional groups due to their lower exposure to errors or non-compliance with safety rules and familiarity with clinical standards of care.

Implications for Practice and Future Research

Patient safety concerns and observation of risky practices in clinical settings are opportunities to learn about and provide safer care for patients. Ibero-American students experience such situations with some frequency, but they are not always speaking up about their concerns. It is a challenge to create clinical settings that facilitate the open expression of these concerns, even more so among students, despite evidence that they can be a valid information source for improving patient safety [44].

We have not found interventions to encourage speaking up among students specifically developed in Latin America. However, in other regions, several educational programmes have been developed that have shown good results in mitigating barriers to speaking up and improving attitudes towards voicing opinions in healthcare teams [45, 46]. Other timely measures include involving preceptors in creating safe clinical learning environments [47] and appointing trusted role models to advise and support students in raising a concern along the lines of the Freedom To Speak Up Guardian and Confidential Contacts in the United Kingdom National Health Service [48]. Interestingly, initiatives have begun emerging that recognise the interdependence of sender and receiver roles in speaking up behaviours and consequently train healthcare professionals in speaking up skills and responding strategies [49]. This training should be extended to mentors, middle managers, and managers in healthcare institutions to mitigate the hierarchical barrier.

Future research should explore the experience of Ibero-American students as recipients of speaking up behaviours. Also, speaking up training in the early stages of training promotes higher commitment to patient safety in later practice in the healthcare profession. When designing interventions, differences by gender and professional profile should be considered. Research is also needed to measure the impact of speaking up initiatives on patient-level safety outcomes.

Conclusion

This study revealed that Ibero-American students in healthcare disciplines often experience patient safety concerns that they need to express openly to peers or superiors. However, this communication is often constrained by several personal and cultural barriers present in clinical settings. These findings suggest the need for action to train students in communication and teamwork skills that support confidence for speaking up and to create safe spaces for patients and professionals. The results also encourage ongoing learning and continuous improvement challenges in healthcare institutions with a greater focus on interprofessional and intergenerational work.

ETHICS STATEMENT

The studies involving humans were approved by the Research Integrity and Ethics Committee of the Miguel Hernández University of Elche (record code: 2021/52945) and the Research Commission of the University Hospital San Juan de Alicante (27 April 2021), Spain. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin because completion of the survey implied consent to participate in the study. Participants had an email address to contact if they wished to withdraw from the study.

AUTHOR CONTRIBUTIONS

IC and JJM conceptualised and designed the study. PS, EL-R, MG, YG-A, and AL-P recruited participants and collected data. IC conducted the data analysis, and JJM contributed to interpreting the results. IC drafted the manuscript, which was critically reviewed by PS, EL-R, MG, YG-A, AL-P, and JJM for important intellectual content. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.ssph-journal.org/articles/10.3389/ijph.2024.1607406/full#supplementary-material

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Medical Professionals' Responses to a Patient Safety Incident in Healthcare

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Objectives: Patient safety incidents (PSIs) are common in healthcare. Open communication facilitated by psychological safety in healthcare could contribute to the prevention of PSIs and enhance patient safety. The aim of the study was to explore medical professionals' responses to a PSI in relation to psychological safety in Slovak healthcare.

Methods: Sixteen individual semi-structured interviews with Slovak medical professionals were performed. Obtained qualitative data were transcribed verbatim and analysed using the conventional content analysis method and the consensual qualitative research method.

Results: We identified eight responses to a PSI from medical professionals themselves as well as their colleagues, many of which were active and with regard to ensuring patient safety (e.g., notification), but some of them were passive and ultimately threatening patients' safety (e.g., silence). Five superiors' responses to the PSI were identified, both positive (e.g., supportive) and negative (e.g., exaggerated, sharp).

Conclusion: Medical professionals' responses to a PSI are diverse, indicating a potential for enhancing psychological safety in healthcare.

Keywords: patient safety incidents, medical professionals, healthcare, psychological safety, patient safety

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INTRODUCTION

Providing healthcare entails significant risks of patient safety incidents (PSIs), which are defined as events that "could have resulted, or did result, in unnecessary harm to a patient" [1, p. 15]. WHO (2009) differentiates four types of PSIs that are caused by errors or violations: reportable circumstances, near misses, no-harm incidents and adverse events [1]. Although the number of PSIs in the United States appears to have declined significantly over the past decade [2], it does not seem to be a global trend [3, 4]. Recent systematic reviews and meta-analyses show that PSIs still represent a significant threat to patient safety worldwide: approximately one in twenty patients is exposed to a preventable adverse event [5] and one in thirty patients has experience with a preventable medication adverse event [6]. In Slovakia, the recent study conducted during COVID-19 found that one-third of medical professionals had witnessed or heard of PSI in the past year [7]. Therefore, the global goal is to strengthen patient safety in healthcare and ensure a reduction in preventable PSIs [8].

Each healthcare provider in Slovakia have to implement a quality management system, which includes regular clinical audit [9]. Clinical audit includes the verification of compliance with the

internal patient safety assessment system and the fulfilment of the minimum requirements for the internal patient safety assessment system [9]. The minimum requirements for the internal patient safety assessment system are set out in the Decree of the Ministry of Health of the Slovak Republic no. 444/2019, which is effective as of 1 January 2020 [10].

Besides that, Healthcare Surveillance Authority issued the methodological guideline in 2014, which differentiate two PSI reporting systems in institutional healthcare facilities [11]. As part of the mandatory reporting system, medical professionals are required to report the occurrence of a serious adverse event and fill out a standard protocol about it [11]. The voluntary reporting system is for medical professionals to voluntarily and informally report errors and near-misses in order to learn from them [11]. However, recent studies indicate that reporting of PSIs in Slovakia is insufficient [7, 12]. In addition, root-cause analysis of adverse events does not seem to be a standard practice in Slovakia [7].

Patient safety could be endorsed by medical professionals' open communication about patient safety concerns [13] and about PSIs [14]. Additionally, open and transparent communication serves as an organisational factor that supports PSI reporting in healthcare [15]. The reporting of PSIs further allows for root cause analysis to take place, enabling medical professionals to learn from incorrect practices, to find preventive solutions and to implement them in practice [8]—all of which contribute to the safety of patients.

In an organisational context, voice behaviour is facilitated by psychological safety [16] that is defined as a work climate in which it is safe to express opinions or concerns without subsequently having to face negative reactions and consequences from superiors or colleagues [17, 18]. Specifically in healthcare, the perceived safety of speaking up is an important factor involved in medical professionals' decision to speak up [19]. Psychological safety in a clinical workplace is associated with open and respectful interpersonal communication and medical professionals' ability to draw the attention of their colleagues or superiors to PSIs [13]. According to O'Donovan and McAuliffe's (2020) systematic review, psychological safety in healthcare is facilitated mostly by support from organisation, leaders and peers and by the emphasis on patient safety [20].

An unproductive form of speaking up also occurs in an organisational context, which could negatively affect the psychological safety and the ability to speak up [21]. Irrelevant comments, outbursts of anger, insults, or even threats can have harmful effects not only on those who are the target of communication, but also on other employees who witness the situation or only hear about it [21]. The research study showed that medical professionals working in clinical workplaces with low psychological safety had experiences with inappropriate and negative tone of communication from superiors, and felt less safe to speak up [13].

In this sense, medical professionals' immediate responses in the aftermath of a PSI might reflect a level of psychological safety in their workplace. However, the previous research studies focused either on the experiences of medical professionals after a PSI [22], or on psychological safety in speaking up about patient safety concerns [13], whereas we perceived a lack of research studies that would link these two topics. Therefore, the aim of the present study was to explore Slovak medical professionals' responses to a PSI in the context of psychological safety. The study was focused on medical professionals' own responses and perceived responses of their colleagues and superiors to a PSI that occurred at their workplace in the past.

METHODS

Study Design

To gain insight into medical professionals' individual experiences and perceptions following PSIs and into their perceived level of psychological safety, we chose qualitative design of the research and method of individual semi-structured interview. Firstly, we prepared a research schedule for the interview, and then performed a pilot interview to test the intelligibility of the interview questions. One medical professional participated in a pilot interview. Interview schedule proved to be reliable, thus possible for use in research. Subsequently, from November 2022 to January 2023, we conducted individual interviews with medical professionals. Obtained data were recorded with the consent of respondents, transcribed verbatim and analysed by using conventional content analysis method and consensual qualitative research method.

Sampling and Participants

Respondent selection was carried out using purposive and snowball sampling techniques. The main criterion for selection included the respondent working as a medical professional or that they had recent working experience at a healthcare facility at the time of conducting research. We selected predominantly medical professionals working in clinical workplaces exposed to a higher risk of PSI occurrence (surgery, oncology, etc.). Additionally, we ensured that our sample has an approximately equal representation of men and women and included were also participants with diverse lengths of clinical practice. After an interview, each respondent was asked to provide contact information on colleagues who could be approached to participate in the research.

Procedure and Measures

Prior to the interview, each respondent received informed consent which specified the purpose of the research, terms of participation and the areas which the interview will be focused on. Respondents were assured that research is anonymous and voluntary. If respondents agreed to participate, they signed the informed consent. Interviews were conducted by the main author of this study. Individual interviews lasted approximately between 14 and 64 min and took place in person in various settings, mostly at a medical professional's own workplace (at a specific healthcare facility) or in university settings.

During the interview, we asked respondents to provide socio-demographic information such as gender, age, highest educational level, current or last work position and length of

TABLE 1 | Socio-demographic characteristics of the sample (Psychological Safety in Healthcare study, Bratislava, Slovakia, 2024).

Characteristics	N	%
Age (mean/SD)	38.38	11.74
Length of clinical practice (mean/SD)	14.22	12.20
Gender		
Male	6	37.50
Female	10	62.50
Highest educational level		
The first degree of higher education (bachelor)	1	6.25
The second degree of higher education (master, MD)	7	43.75
The third degree of higher education (PhD)	8	50.00
Work position		
Physician	12	75.00
Senior physician	1	6.25
Head nurse	1	6.25
Nurse	1	6.25
Radiology technician	1	6.25

clinical practice. Research schedule contained questions regarding medical professionals' responses after an occurrence of a PSI: 1) respondents' own responses or perceived responses of their colleagues (e.g., "How do you or your colleagues react if you witness that your colleague or superior is ignoring important safety rules, which could result in endangering patient safety?"), 2) perceived superiors' responses (e.g., "If there was a PSI at your workplace, how did you perceive the response of your superiors to the given event?").

Data Analysis

In line with the qualitative design of the research, analysis was carried out using conventional content analysis method and consensual qualitative research method. Conventional content analysis is used in study designs focused on describing a complex phenomenon by gaining knowledge directly from participants' perspectives [23], therefore it appeared to be a suitable approach for describing medical professionals' individual responses and perceptions after a PSI. We also used elements of consensual qualitative research method, which included independent dual coding of the collected data by two coders and finding a common consensus about the meaning of the data between the coders [24]. Firstly, we performed the transcription of the data and uploaded the data into the MAXQDA software, version 2022. We familiarised ourselves with the data in order to enable the start of the analysis.

We created codes for each meaningful part of all the transcripts that captured the essence of the text. The data were independently dual coded by two members of the research team (LK and IS) in order to reach greater accuracy of the data. During the analysis later on, we consensually clustered similar codes into sub-categories and main categories. We repeatedly checked the consistency of sub-categories, as it was important that the sub-categories accurately describe codes assigned to them. The final list of categories and sub-categories was created based on a consensus of two research members (LK and IS). We also used diagram software to create a thematic map to depict the final categories and sub-categories of the data.

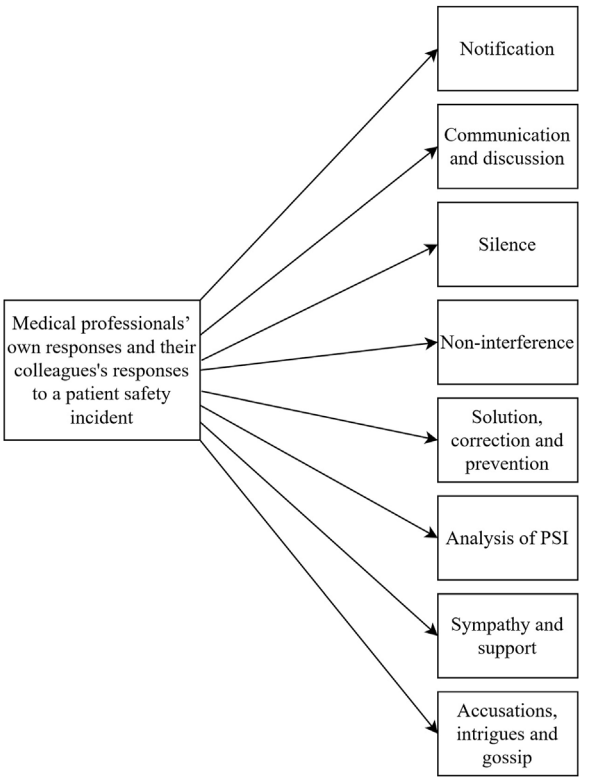

FIGURE 1 | Diagram depicting the identified sub-categories of medical professionals' own responses and their colleagues' responses to a patient safety incident (Psychological Safety in Healthcare study, Bratislava, Slovakia, 2024).

RESULTS

Research sample consisted of 16 medical professionals from Slovakia (62.5% females), specifically 12 physicians, 1 head of the unit, 1 head nurse, 1 nurse and 1 radiology technician. The average age of respondents was 38 years (SD = 11.74). The respondents' length of clinical practice ranged between 4 months and 40 years. All respondents had completed higher level of education. Specifically, half of the respondents had completed the third degree of higher education (PhD), eight respondents have completed the second degree of higher education (master, MD) and 1 respondent had completed the first degree of higher education (bachelor). Socio-demographic characteristics of the sample are shown in **Table 1**.

Across the data, we differentiated two categories of medical professionals' responses to a PSI: 1) medical professionals' own responses and their colleagues' responses; and 2) superiors' responses.

Medical Professionals' Own Responses and Their Colleagues' Responses to a PSI

Medical professionals respond in a variety of ways when they come across a PSI in their workplace. Some responses relate to

TABLE 2 | Medical professionals' own responses and their colleagues' responses to a patient safety incident and illustrative quotations (Psychological Safety in Healthcare study, Bratislava, Slovakia, 2024).

Sub-categories	Quotations
Notification	"… in any case we will point out, we will point out the danger …"
Communication and discussion	"… I really try, if something like that happens, whether with a colleague or a superior, uh, I try to have a private conversation."
Non-interference	"Someone would say that he/she didn't see it, he/she will not interfere."
Silence	"… we have people in the team who keep silent, cover up, pretend that nothing is happening."
Solution, correction and prevention	"… there is really an effort, whether it's to prevent some worse complications or to arrange a remedy, to correct what has already happened."
Analysis of PSI	"The given situation is discussed, it is said what could have been done differently or could potentially lead to a different result, … there's a lot of talk about it and talk about whether something could have changed with the treatment or our intervention …"
Sympathy and support	"… we cry, we talk, we say to each other that 'why' (this has to happen), and we also deal with it over and over again, dissecting how it could happen …"
	"And it's actually, uhm, very good that the older colleagues calm down the younger, less experienced one, and say that 'it's not as terrible as it looks, you have to do this, this and that, and it will simply be fine', so …"
Accusations, intrigues and gossip	"There are colleagues who promptly point the finger (at someone), 'it was him/her', and it may not even be true …"

the PSI itself, others relate to a specific medical professional involved in the PSI (either they were responsible for the occurrence of the PSI or were present when the PSI occurred). Eight sub-categories were identified (**Figure 1**): a) notification, b) communication and discussion, c) silence, d) non-interference; e) solution, correction and prevention, f) analysis of PSI, g) sympathy and support, h) accusations, intrigues and gossip. **Table 2** shows the quotations representing each sub-category.

When medical professionals become aware of the risk of a PSI, they verbally *notify* someone about their patient safety concerns, whether in a direct or an indirect way. As an indirect notification, respondents mentioned expressing concerns in the form of a proposal or in the form of a naive question. The notification is followed by an open *communication and discussion* about the PSI. Respondents described they had private discussions with involved colleagues or superiors as well as joint discussions. However, medical professionals reported they have colleagues that do not talk about the PSI they have seen, or that they have personally caused it, they tried to cover it up (*silence*), or chose *not to interfere* in the PSI.

After a PSI happened, medical professionals reported that they try to do their best to find *a solution* and a way to *correct* what has been done for the patient's benefit. Moreover, medical professionals talked about employing a *prevention* of similar situations in the future. *Analysis of PSI* as a standard practice to prevent PSIs in the future also occurred in the respondents' statements.

According to the respondents, medical professionals who were responsible for a PSI—or were involved in a situation when a PSI happened—encountered mostly two types of responses from their colleagues. They received *sympathy and support* which included verbal support such as reassurance and encouragement to continue working as a medical professional, or practical support in the form of getting advice, or both. However, respondents also experienced *accusations, intrigues* and *gossip* in their workplace after a PSI.

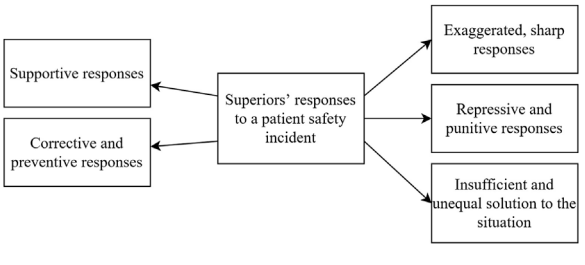

FIGURE 2 | Diagram portraying the identified sub-categories of superiors' responses to a patient safety incident (Psychological Safety in Healthcare study, Bratislava, Slovakia, 2024).

Superiors' Responses to a Patient Safety Incident

In our sample, medical professionals described superiors' constructive responses as well as negative responses after a PSI had occurred in their workplace. Five sub-categories were identified (**Figure 2**): a) exaggerated, sharp responses; b) repressive and punitive responses; c) insufficient and unequal solution to the situation; d) supportive responses; e) corrective and preventative responses. **Table 3** presents quotations representing each sub-category.

Medical professionals described *exaggerated, sharp superiors' responses* which included being reprimanded or being criticised. Respondents felt that these responses were inappropriate and unjustified given the situation and that they would expect a more supportive response, as the involved medical professional did everything in their power. Respondents had also experienced *repressive and punitive responses* in a sense that the superior was trying to find and punish the individual who they perceived as guilty. Respondents mentioned a few kinds of punishments–for example, the superior temporarily transferred the responsible person to another workplace or the superior actively pointed out the responsible one in front of others which led to a damaged reputation of that person. *Superiors'*

TABLE 3 | Superiors' responses to a patient safety incident and illustrative quotations (Psychological Safety in Healthcare study, Bratislava, Slovakia, 2024).

Sub-categories	Quotations
Exaggerated, sharp responses	"... it was very offensive, yes, (...) of course, things like that shouldn't happen, but on the other hand, maybe you would expect a little support. ... but it was pushed to such extreme conditions that (...) I don't think these were adequate responses, downright implying that I can leave when I don't like it here, when I can't do it and so on ..."
Repressive and punitive responses	"... the boss is trying to find the one to blame and make him feel it at least (...) That he is trying to find that one and draw attention to him in front of everyone."
Superiors' insufficient and unequal solution to the situation	"Uhm, some equality or, uh, I would say some absolutely fair approach, that whether it's person A or person B, they, uh, communicate the same way or act the same way, that doesn't, unfortunately, doesn't work like that here."
Supportive responses	"... there are superiors, who are partners, who will support you, who will appreciate, who will appreciate the very thing that others do not even see. For example, they'll appreciate that, uh ... 'It's great that you were there at that moment, because it could have happened (something) worse.'"
Corrective and preventative responses	(about the superior) "He, in turn, took it into his own hands from such a structural matter and changed the procedure that led to what happened. He simply changed those recommendations to avoid it ..."

insufficient and unequal solution to the situation included the perceived insufficient drawing of consequences for the individual who was responsible for the PSI and an unequal approach from superiors regarding dealing with PSIs.

On the contrary, medical professionals described *supportive responses* from their superiors. This included getting verbal support (e.g., reassurance that PSIs happen to every medical professional or getting recognition for handling the PSI) or receiving practical support in the form of finding the right solution to the PSI. Medical professionals also acknowledged that when a PSI happened, their superiors made every effort to redress the situation and take action to prevent a similar situation from happening again (*corrective and preventive responses*).

DISCUSSION

In the present study, we explored psychological safety manifested in medical professionals' responses to PSIs occurring in Slovak healthcare facilities.

Our results captured the medical professionals' efforts to act for the benefit of patients by openly communicating about the PSI with other people or by taking steps to resolve and prevent the PSI. However, passive responses to a PSI which threaten patient safety were captured as well. Research studies show that perceived risk of patient harm is often the motivation for healthcare workers to speak up or report a PSI [19, 25]. Notification as one of our identified responses to a PSI is similar to what Tarrant et al. (2017) described as "pre-emptions" in their study—a safe way to point out risky behaviour and prevent patient harm [26]. Therefore, open or assertive communication leads to better patient safety outcomes [13, 14, 27]. Despite the evident motivation to help the patient, episodes of silence after a PSI occurred as a sub-category in our study, most likely due to fear of expected negative consequences [25, 28]—e.g., fear of being blamed [28], fear of punitive measures [29], or fear of conflicts [19]. Occurrence of silence after a PSI could imply insufficient psychological safety, as a high level of perceived psychological safety reduces the tendency to remain silent [30]. Our results also show that the occurrence of a PSI requires an immediate corrective action by medical professionals followed by analysis of PSI. Previous study indicated that root-cause analysis of PSIs seems to receive insufficient attention from the hospital management [7]. However, it is the analysis that is crucial for eliminating the systemic causes of PSIs and improving patient safety [31]. Following a PSI, medical professionals involved in the incident tend to seek support from people they trust [32], and as our results show, they mainly turn to colleagues for help. Receiving immediate support will allow the medical professionals to effectively cope with a PSI [33]. On the contrary, we discovered that medical professionals experienced accusations or gossip from their colleagues, which is in line with a recent Slovak study concluding that experiencing a PSI is related to conflicts among colleagues [7]. Non-supportive responses from coworkers could ultimately have a negative impact on responsible medical professionals—for example, in the form of experiencing self-doubt or loss of clinical confidence [32].

Medical professionals in our sample experienced or witnessed both positive and negative responses from superiors after a PSI, which is also reflected in previous research studies [22, 26, 33–35]. Regarding negative responses, medical professionals responsible for a PSI or involved in a PSI experience unfair treatment [34, 35], being blamed [22, 34, 35], punished [22, 26], scolded [26] or denounced by their superiors [22, 26]. Experiencing or merely witnessing superiors' negative responses after a PSI could reinforce fear to speak up about PSIs [14, 17, 21], thus seem to be detrimental to the perception of psychological safety in the workplace [13]. Nevertheless, medical professionals in our sample received emotional or practical support from superiors after a PSI, and these types of support align with findings from previous research studies [22, 33, 34]. Additionally, our study depicted preventive measures taken by superiors to prevent a PSI in the future, allowing change in clinical practice and learning from a PSI [8, 31]. Both positive and negative responses to a PSI occurred in our interviews. Therefore, it is important to note that inability to predict the superior's response to speaking up—uncertainty whether they will receive support or a negative response—may lead to episodes of silence as well [25].

Strength and Limitations

Present study has several strengths. The use of individual interviews allowed us to explore Slovak medical professionals' experiences with PSIs during their clinical practice, while shedding light on some similarities and differences in medical professionals' behaviours towards a colleague in comparison to a superior. Moreover, we contributed to the current knowledge by outlining a connection between medical professionals' responses after a PSI and a climate of psychological safety in the workplace.

Limitations of the study should be carefully considered, as well. The small sample size is the primary limitation of the study, despite the fact that we achieved sufficient saturation of categories and sub-categories of the data. Secondly, the descriptive nature of the study limited the interpretative power of the results. It is also important to remember that PSIs are a sensitive issue, which might initiate social desirability and ultimately result in censored information provided by respondents. However, we tried to create a safe environment during the interviews and assured the respondents about the anonymity of the research in order to reduce these tendencies. Last but not least, despite the researchers' efforts, our research sample was not diverse in terms of the hierarchical position of medical professionals. Therefore, more research studies focusing on perspectives of nurses, head nurses, senior physicians and other medical professionals are needed.

Implications for Practice and Future Research

In terms of implications for practice, results of this study pointed to the poor interpersonal communication mostly between superiors and medical professionals involved in a PSI. Therefore, the focus should be on moving beyond a culture of blame and promoting open and supportive communication [36]. In order to foster an atmosphere of psychological safety, it is important that superiors normalise PSIs in healthcare and frame them as learning opportunities for medical professionals rather than viewing them as an act of individual failure [17]. It is equally important that retrospective analysis of PSIs would be a standard practice in the clinical departments. Using a systems approach to the analysis of PSIs demonstrated in the study by Leveson et al. would also prevent negative responses to medical professionals involved in a PSI [31]. Future research could focus on exploring responses to PSIs and psychological safety in specific groups of medical professionals (among nurses, physicians, etc.) to gain insight into the differences between these groups. This could help to design future interventions aiming to enhance psychological safety and open communication about PSIs better tailored to needs of specific groups of medical professionals.

Conclusion

Medical professionals' responses to PSIs occurring in healthcare facilities are diverse, which implies the potential for fostering and enhancing the climate of psychological safety, so that all medical professionals feel safe to openly communicate about PSIs with their coworkers regardless of their position in the medical hierarchy.

ETHICS STATEMENT

The studies involving humans were approved by Ethics Committee of the Faculty of Social and Economic Sciences, Comenius University, Bratislava, Slovakia (FSEV 1646-7/2022). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IS, ZD, and LK prepared the design of the study. AM helped with approaching respondents, while LK conducted the interviews with them. LK and IS consensually analysed the data and consulted the final categories and sub-categories with ZD. LK wrote the first draft of the manuscript and IS, ZD, and AM made a critical revision of the manuscript. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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Developing Core Indicators for Evaluating Second Victim Programs: An International Consensus Approach

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Objectives: To establish a consensus for evaluating second victims (SV) support interventions to facilitate comparison over time and across different organizations.

Methods: A three-phase qualitative study was conducted from June 2023 to March 2024. This consensus approach engaged members of the European Researchers Network Working on Second Victims. A nominal group technique and insights from a scoping review were used to create a questionnaire for Delphi Rounds. Indicators were rated 1–5, aiming for agreement if over 70% of participants rated an indicator as feasible and sensitive with scores above 4, followed by a consensus conference.

Results: From an initial set of 113 indicators, 59 were assessed online, with 35 advancing to the Delphi rounds. Two Delphi rounds were conducted, achieving response rates of over 60% and 80% respectively, resulting in consensus on 11 indicators for evaluating SV support programs. These indicators encompass awareness and activation, outcomes of SV support programs, as well as training offered by the institution.

Conclusion: This study presents a scoreboard for designing and monitoring SV support programs, as well as measuring standardized outcomes in future research.

Keywords: patient safety, second victim, programs, evaluation, indicators

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INTRODUCTION

Healthcare workers (HCWs) frequently encounter potential traumatizing events resulting from the process of care within healthcare settings. These type of events have been associated with unexpected patient harm or death resulting from the care process (adverse events) [1, 2]. Evidence suggest that this type of events affect 1 in 10 patients [3].

Moreover, healthcare incidents that create potential risks to the system without directly affecting patient wellbeing (near misses) can still have psychological and emotional impacts on HCWs [4].

In 2000, Albert Wu introduced the term "second victim" (SV) to describe healthcare providers who experience emotional distress, guilt, or trauma following an adverse event involving a patient, such as a medical error or an unexpected patient outcome [5]. Recently, the European Researchers' Network Working on Second Victims (ERNST) has refined the SV definition to include "any healthcare worker, directly or indirectly involved in an unanticipated adverse patient event,

unintentional healthcare error, or patient injury, and who becomes victimized in the sense that they are also negatively impacted" [6].

It is well established that 60%–92% of HCWs experience the Second Victim Phenomenon (SVP) at least once in their careers [1, 7–13]. This phenomenon can have significant medium to long-term psychological and physical effects that impact their professional and personal lives [2, 7, 8, 10].

While this phenomenon is not new, health authorities increasingly recognizing the importance of providing support to HCWs following highly stressful events and enhancing the psychological safety within healthcare organizations.

Evidence refers that supporting HCWs after a stressful event improves patient safety [14, 15] and reduces avoidable costs [4]. Thus the importance of creating psychological safe environments, by strengthening the sense of safety to take interpersonal risks at work [16], will encourage supportive interactions such as SV programs [17].

In recent years there has been growing investment in SV support programs worldwide. Most of these programs have been developed in hospital settings, tailored to respond to healthcare needs following stressful events [18]. Most of the implemented programs are based on peer support, with the primary goals of increasing HCWs' wellbeing, decreasing their emotional stress in work and ensuring patient safety [19, 20].

The support programs vary in format, including the use of hotlines, individual and groups sessions [18]. The ForYOU [21] and the RISE [22] programs were the pioneers in this field and have been adopted in various institutions across Europe [23, 24]. They have demonstrated that peer support is the most accepted and desired method for aiding SVs in healthcare [25].

The majority of published information regarding SV support programs in Europe and beyond indicates that they were successfully implemented [18]. However there is still a gap regarding the evaluation process of these types of interventions, particularly over longer periods [18].

A scoping review identified and organized the indicators used to evaluate SV support programs in five main categories: outcomes related to support services utilization, evaluation of the program by the peer supporters perspective, evaluation of the program by the user perspective (HCWs involved in PSIs/SV), health-related and work-related outcomes [18]. However, there is no consensus on the most appropriate indicators for evaluating SV programs or on which indicators should be prioritized. Reaching an agreement on the most suitable indicators to measure this type of intervention is urgent. Such an agreement could facilitate the comparison of SV programs and guide the implementation and adjustment of future interventions.

The regular evaluation (monitorization) involving the application of appropriate indicators in a timely manner is highly useful for healthcare organization [26]. Evaluating programs provides crucial information that helps decision-makers and health organizations understand the impact of healthcare interventions and make informed decisions [26–28]. In this sense, the indicator should serve an intended function that supports a decision-making ("*fit for purpose*") and it should deliver the information to the "right" place at the right time ("fit for use") [29]. Moreover, indicators allow for adjustments based on the needs of the services, and enable comparison of observed outcomes [27].

The criteria for selecting indicators highly depends on the purpose, type of sources, the availability of the data, and its practical value [26]. This is closely related to the feasibility of the indicator. Evidence has been shown the importance of creating feasible indicators which refers to the facility with which the quality indicator can be measured in accurate way [30]. This is highly related with their validity, which refers to the true condition of the event being measured [30, 31] and reliability ("the level of reproducibility and consistency between two or more measurements") [32]. Also the indicators should be sensitive (how well a test can classify subjects who truly have the condition of interest [33]).

Given the widespread adoption of SV' support programs, it seems urgent to agree on a minimal set of indicators to assess them over-time. The creation of these indicators should be guided by evidence-based information combined with clinical expertise and in some cases incorporating patient perspectives [34].

Considering the various organizational models and social aspects related to the conceptualization of human fallibility across countries, it is advisable to developed this set of indicators from an international perspective [35].

Purpose of the Study

The aim of this study is to establish a consensus of indicators to evaluate the SV support interventions in order to facilitate their comparison over time and with other healthcare services. This will enable to define a minimal set of indicators to prove the useful application of SV support interventions in healthcare organizations, to ensure their rigor and evaluate their quality.

METHODS

A three-phase qualitative study was conducted from June 2023 to March 2024 to define an international consensus on a set of indicators to evaluate SV support programs. A Consensus Executive Board (CEB) was created to make decisions at each stage of the study. The CEB was created by four researchers (JM, PS, IC, SGP), all of whom had background in health management, quality improvement, patient safety, and SVP.

The Phase 0 brought insights gained from a scoping review, providing evidence-based starting point for the study. The scoping review aimed to identify the key factors for the effective implementation of SV support programs, including the metrics necessary to measure this type of interventions. In this phase, a collection of indicators that had been used was gathered.

Following Phase 0, in the phase 1 a nominal group technique was applied. This group, comprising invited experts from the ERNST (COST Action 19113), was tasked with generating and prioritizing a set of indicators based on their validity and reliability. Their empirical knowledge and expertise facilitated the construction of Questionnaire 0 composed by the final list of indicators to be scored in the next phase.

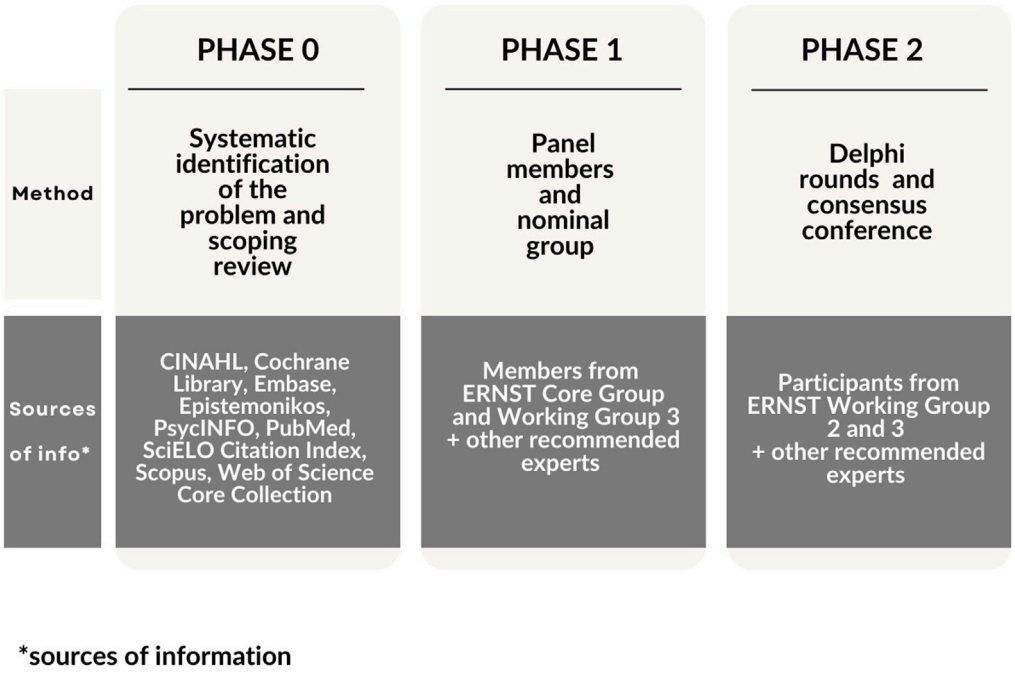

FIGURE 1 | Phases of the study to find a consensus of second victim support interventions indicators (online and Lisbon, Portugal, 2024).

In Phase 2, the Delphi technique was applied. The goal here was to reach a consensus on the most feasible and sensitive indicators for evaluating SV programs. This consensus was based on the set of indicators defined in the earlier phases of the study.

The methodology for this study was guided by the recommendations of Nasa, Jain, and Juneja for Delphi studies, as well as the Standards for Reporting Qualitative Research (SRQR).

Population of the Study and Sources of Information

The study population consisted of a multicultural group of ERNST members, representing organizations at different stages of addressing the SVP, spanning from early stages to those already seasoned in SV support programs.

The sources of information included the results of a published scoping review [18], designed phase 0 of the study. The scoping review encompasses a comprehensive search in nine different databases (CINAHL, Cochrane Library, Embase, Epistemonikos, PsycINFO, PubMed, SciELO Citation Index, Scopus, Web of Science Core Collection). Relevant websites were consulted, and reference lists of the studies included in the full-text screening were checked to identify any other potential articles to include. The search strategy applied in the scoping review is described in **Supplementary Table 1**. The search did not restrict the period of time or language of the included studies to ensure the most comprehensive overview of the existing literature and to reduce the selection bias. Editorials, letters to the editor, case series, case reports, narrative reviews and commentaries were excluded in this study.

In phase 1 of this study, we invited academics and research experts actively involved in the ERNST activities, and other suggested ERNST members with deep knowledge on quality improvement, patient safety and SVP to participate in the nominal group. All the participants had a clinical and academic background and research profile. This group was responsible to generate new indicators, complementing the collected data from the literature.

In the phase 2 of the study, the participant scope was expanded to encompass a wider array of experts, including HCWs, researchers, managers, and academics. In total, 81 individuals were invited to participate in the Delphi study. All of them had previously collaborated on SVP research, undergone intensive training, or possessed experience with SV support programs. All the members of Working groups 2 and 3 as well as Core group members of ERNST, were invited to participate in phase 2. All these members had previous experience in SV support programs or have been involved in research/training on SVP and patient safety. Additionally, we included some extra participants recommended by the initial group, who possessed expertise in SVP. In this study we aimed to achieve the gold standard of 60%–80% for survey response rates [36].

The phases of this study and detailed information about the sources of information and participants of each phase to define a set of indicators to evaluate SV programs are depicted in **Figure 1**.

In the following sections we will describe the different phases of the study in more detail.

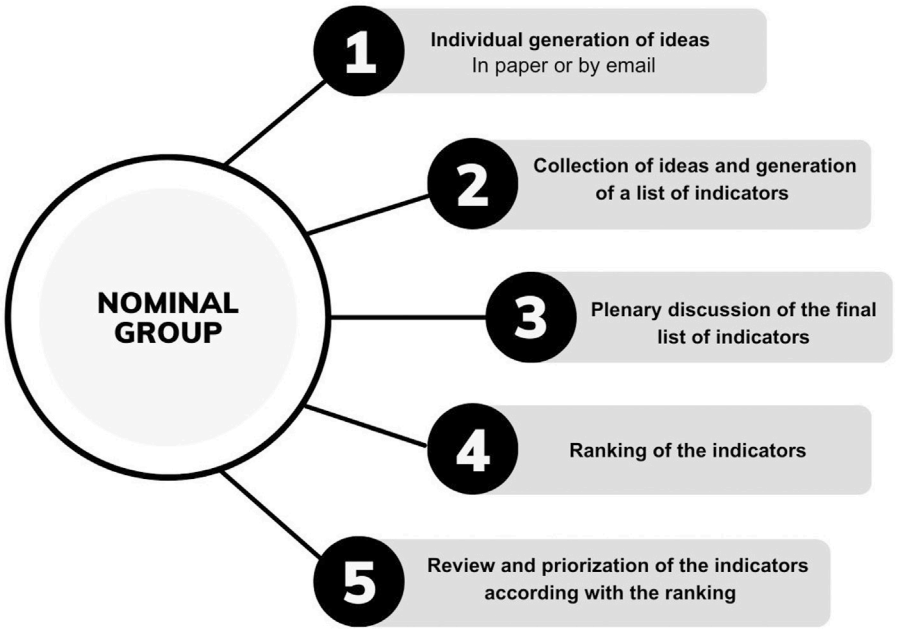

FIGURE 2 | Stages of nominal group application (Lisbon, Portugal, 2024).

Phase 0 – Identification of the Problem

Prior to the qualitative study, the research team conducted a scoping review that collected metrics used to evaluate SV programs elsewhere. We used this information to complement the collected data retrieved from the phase 1 and 2 with previous evidence-based information. This is the reason why we defined this phase as point 0.

The scoping review was focused on a comprehensive understanding what existing organizational factors, relevant actors, contextual factors, operational attributes are present in interventions successfully implemented in health organizations to support second victims. The Joanna Briggs Institute [37] criteria were employed to conduct the scoping review.

In this study, 9,708 records were retrieved from the 9 databases, 43 articles were retrieved from the reference lists of the included articles, 11 from websites and 4 were collected from stakeholders' group inputs. The detailed information of data collection, screening process, duplicates removed and reasons for exclusion is exhibited in the flow chart in line with the original Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. This can be consulted in the **Supplementary Table 2**.

Since our aim was focused on collecting the metrics to evaluate SV programs, we only focused on the section "Organizational factors" of the scoping review.

Phase 1 – Definition of a List of Indicators

In the phase 1, a nominal group technique was applied during a 2-day hybrid meeting of ERNST that was held in Lisbon in June 2023.

On the first day, the group focused on stages 1 and 2 of the method. The second session saw the application of stages 3, 4 and 5. All the five stages are detailed in **Figure 2**.

The conclusions of this phase led to the construction of questionnaire 0, incorporating a set of indicators to be ranked in phase 2 of the study using the Delphi technique.

Recruitment of Participants

Participants from the ERNST Consortium were invited based, firstly, on their experience in support interventions and, secondly, on their willingness to engage in the study. The ERNST members were prioritized to join the meeting, since it was funded by European Cooperation in Science and Technology (COST), in the scope of Cost Action 19113- ERNST.

Only ERNST members with clinical and academic profile along with previous research experience on quality improvement, patient safety and SVP were included in this phase of the study. The recruitment technique was based on the available information about the members of the ERNST consortium. We asked the leaders of the working groups and successful experiences in Europe that were part of the consortium if they would be willing to participate or if they could recommend someone from their teams to participate in this study.

The snowball sampling technique was employed to ensure that the experience and profile of the participants met the aims of the study. This is described as the process in which participants who are part of the study recommend at least one more potential ERNST member who meet the inclusion criteria and that were available to participate in the meeting. As each new members were added, they in turn suggest additional participants, allow in the sample to grow. This process was carried out consecutively as new members were added. In this way, the sample progressively increased [38].

Stage 1- Individual Generation of Ideas

Researchers agreed upon a script to facilitate this process, which included a main question: "What metrics are feasible and sensitive to evaluate SV support interventions?" This was supplemented by cluster questions targeting:

- hospital with previous experience on SV programs;
- hospital without previous experience on SV programs;
- non-hospital settings (primary care settings and long-term settings) in this type of interventions.

The metrics were required to be both valid (measuring what they are intended to) and reliable (providing consistent measurements across different populations and contexts). The participant were invited to suggest indicators based on the elements proposed in Donabedian's model for measuring improvement and quality of care: structural, process, and outcome [39].

Stage 2 – Collection of the Ideas and Generation of a Final List of Indicators

The generated data was collected and organized by four researchers of the CEB (SGP, JF, IC, EGH) who reviewed the proposed indicators, identified similarities, and removed repetitions. A final list of indicators was defined, which included a group of indicators for further discussion and evaluation in subsequent stages of the nominal group.

Stage 3 – Plenary Discussion

The final list of indicators defined from stage 2 was discussed by all the participants of this phase in a plenary session. During this session, participants reviewed and potentially expanded the list of indicators.

Stage 4 – Ranking and Prioritization of the Indicators

The final list of indicators was ranked using the platform Quizizz [40]. Each indicator was evaluated individually and anonymously by all participants simultaneously using an electronic device. The evaluation employed a 5-point Likert scale ranging from hardly feasible, partially feasible, feasible, feasible and sensitive, and excellent for all settings.

Stage 5 – Review and Priorization of the Indicators

The evaluation of the indicators was coordinated online by IC and EGH. The collected data was organized in an Excel document, and the research team discussed the final group of indicators to be included in the Delphi technique.

Phase 2 – Priority Setting and Analysis of Consensus

In this phase, a Delphi technique and a consensus conference were applied to score a group of indicators defined in the previous phases of this study.

The entire Delphi study was conducted from 20th September, 2023 to 27th March 2024. The first round ran from 20th September to 24th November 2023. During this period, two reminders were sent by email to the invited group of participants (10th October and 10th November). The second round was conducted from 12th December 2023 to 7th March 2024. In this round, three reminders were sent during this round (on 10th January, 15th February, and 27th February), with extended accounting for holiday breaks.

The detailed timeline of the Delphi rounds and sent reminders is the illustrated in **Figure 3**.

The Delphi rounds were focused on scoring the 35 indicators defined in phase 1. The scoring enabled priority setting and guided the inclusion and exclusion of the indicators through the different Delphi rounds. The indicators were scored using an electronic platform, specifically costumized for conducting the Delphi Study. This platform was hosted on the secure servers of the Miguel Hernández University of Elche (Spain) (available in https://calite.umh.es/delphis/en/).

Application of the Delphi Technique

The application of the Delphi technique is characterized by anonymity, iteration, controlled feedback, and statistical aggregation of the group responses [41]. This method proves particularly effective in situations requiring priority setting [42].

As recommended by Nasa, Jain and Juneja [43], for the criteria for the panel included the homogeneity of the panel, labelling members as "experts," and maintaining a panel size between 30 and 60 to reflect the diversity of European experiences.

We employed an online platform for individual and anonymous evaluation of the indicators included in the Delphi questionnaire.

The evaluation of the indicators was summarized in two main categories to decrease the level of burden of the questionnaire applied to the Delphi panel and avoid high dropout rates:

- The degree in which the indicator can be easily measured in an accurate way (feasibility) [30]: the proposed indicator is valid (can be measured and reflects the truth), reliable ("always in the same way") and is pertinent to the objective of the measure (to evaluate interventions to support SVs).
- The extent to which the indicator accurately reflects changes in implementation [44] (sensitivity/responsiveness): the proposed indicator represents an improvement in the implementation process, performance, or results of an intervention supporting SVs.

In the first category, we have grouped three different components of quality measure (reliability, validity and pertinence) as these are essential elements to ensure the feasibility of the indicator (the degree in which the indicator can be easily measured in an accurate way).

In the second category, we pretend to analyze the extent in which the indicator can reflect the reality. We aimed to evaluate if the collected data is meaningful and effectively detects small changes during the measurement. This will ensure to collect the accurate data and will provide appropriate feedback to enhance the intervention over time.

The participants were notified via email to respond to an online survey on a scale from 1 to 5. In this scale the minimum

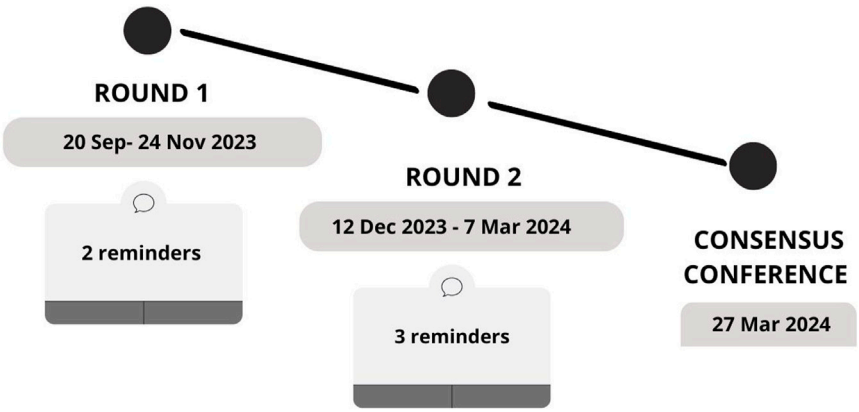

FIGURE 3 | Timeline of the Delphi rounds (online, 2024).

score (rated as 1) indicated difficulty in measurement (not feasible)/low sensitivity to changes (not sensitive), and the highest score (rated as 5) indicated ease of measurement (very feasible)/high sensitivity to changes (very sensitive). The inclusion and exclusion of the indicators in the different rounds were determined by the mean scores of the total panel participants.

Round 1

In round 1, indicators scoring ≤3.5 in either feasibility or sensitivity during the initial round were excluded. Those scoring >3.5 but <4.0 in at least one of these domains were retained for further assessment in the subsequent round. The indicators that scored ≥4 were directly included to integrate the consensus conference.

Round 2

In round 2, participants had the option to adjust their scores based on the provided summary information or to retain their original evaluations. During the second round, indicators submitted for reassessment were accompanied by both the group's average score and the individual participant's score for each element from round 1. Additionally, participants could identify priority indicators by ticking a checkbox. For inclusion in the consensus conference discussion, indicators needed to be prioritized by more than 50% of the participants (n = 20) and achieve an agreement score of ≥4 from over 70% of the participants.

In summary the criteria applied in the second round were as follows:

- Considered a priority by more than 20 participants;
- Score >4 in feasibility and sensitivity by at least 70% of the participants.

After submitting the scores for each round, the collated data was automatically analyzed to determine a consensus on a set of indicators for evaluating SV programs. The final consensus was reached upon meeting a predefined minimum agreement on the indicators needed to assess these programs.

Consensus Conference

After completion of the Delphi rounds, the final results were deliberated upon by the CEB during a consensus conference. The aim of this conference was to achieve agreement among the research team regarding the selection of indicators for evaluating SV support programs. During the conference, the CEB reviewed the aggregated responses from the Delphi rounds, considered any divergent viewpoints, and engaged in thorough discussions to define the final list of indicators. This collaborative process ensured that the selected indicators reflected the collective agreement reached by the expert panel.

RESULTS

Phase 0

A total of 22 indicators to evaluate SV support programs were selected by the CEB based on the scoping review data. The selection of the indicators was based on the discussion of what were the most adequate indicators to evaluate SV programs evaluation. These indicators were organized into nine main domains by the CEB members.

The collected indicators and respective literature are detailed in **Supplementary Table 3**.

Phase 1

Fifteen participants took part in the nominal group, with eleven attending in person and four participating online using the Zoom platform. This was a multidisciplinary group from 12 different countries, all of whom were academics, clinicians, and researchers with previous background in health management and patient safety, actively working on SVP initiatives. Detailed information about the participants is available in **Supplementary Table 4**.

During the initial phase of the nominal group, 91 indicators were independently generated by the 15 participants, supplementing the

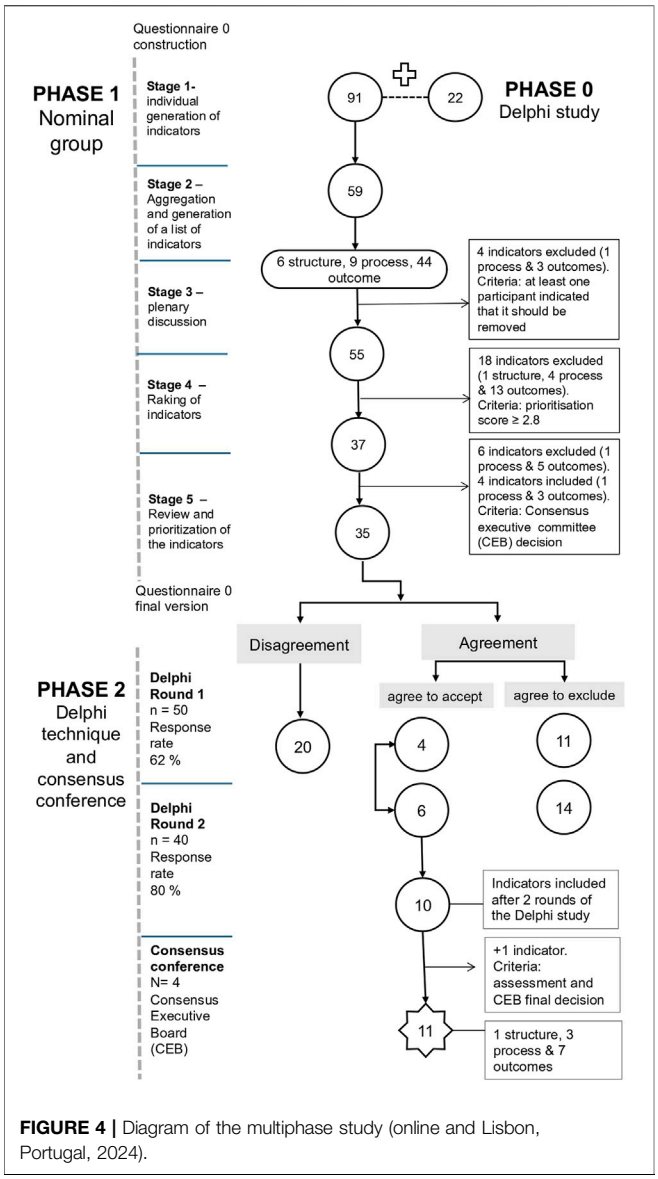

FIGURE 4 | Diagram of the multiphase study (online and Lisbon, Portugal, 2024).

22 indicators gathered from the scoping review (phase 0). In the second stage two researchers synthesized and consolidated these into a final list of 59 items (the rating can be consulted in **Supplementary Table 5**). During the subsequent plenary session (stage 3), four indicators were excluded after thorough debate. After rating the indicators using an online platform (stage 4) and further CEB review (stage 5), a refined set of 35 indicators was selected for integration into the questionnaire 0. The 35 indicators were organized in four main domains:

- indicators related to the SV program (outcome indicators);
- indicators related to the intervention process and structure;
- indicators related to the SV experience the SV experience;
- indicators related to the healthcare organization and culture;

This classification of the indicators contributed to organize the questionnaire 0 that was applied in the second phase of this study.

Given that in this study the structural indicators received lower scores comparing with other indicators, the cutoff point was adjusted to ≥2.8 to ensure the inclusion of a comprehensive range of indicators in the subsequent phase of the study (Delphi rounds). Furthermore, six indicators were excluded after deliberation by the CEB due to their lack of clarity and robustness for evaluation in phase 2. A summary of the results from the various stages of the nominal group is presented in **Figure 4**.

The final rating of the 35 indicators can be consulted in **Supplementary Table 6**.

Phase 2

First Round

In total, 81 participants were contacted to answer the first round of the Delphi technique. Out of these, 50 participants responded in the first round, resulting in a response rate of 61%. The profile of the participants can be consulted in **Supplementary Table 7**.

In the first round of the Delphi Study, the 35 indicators identified in the nominal group were evaluated based of the two main criteria: feasibility and sensitivity.

After the first round, four indicators had mean scores of ≥4.0 for both feasibility and sensitivity parameters. The included indicators were directly selected to be evaluated in the consensus conference. Conversely, 11 indicators were excluded based on the mean score of the responses ≤3.5 in at least one of the criteria (feasibility or sensitivity), which mean that in at least on the criteria there not considered to be feasible or sensible. In total, 20 indicators were selected to be evaluated in second round.

Second Round

In the second round,a response rate of 80% was achieved (40/50 initial participants).

In the second round, 20 indicators were scored. In this round, 6 indicators were prioritized according with the inclusion criteria defined to this round. Although two indicators were not considered a priority by more than 50% of the participants, these indicators were rated over 4 by over 70% of participants in both feasibility and sensitivity. In this sense we have included them for discussion in the consensus conference.

The excluded indicators across the different phases of the study can be consulted in **Supplementary Table 8**.

Final Group of Indicators

The results of the two rounds were summarized by the researchers and assessed for consensus across the expert group. In total, 10 indicators were selected for discussion in the consensus conference from the round 1 and 2.

Additionally, one indicator was included in the final list of indicators. Although this indicator was not prioritized by more than 50% of the participants in the second round neither received score ≥4.0 in the first round, it presented good feasibility and sensitivity rates.

A total of 11 indicators reached consensus across the CEB members. Given that the Delphi technique is an exploratory qualitative research, initially the questionnaire 0 was organized in 4 main domains (as detailed in **Supplementary Table 6**). However, based on the panel's evaluation and prioritization of

TABLE 1 | Final consensus indicators for assessing second victim support programs (online, 2024).

Indicators	Type of indicator	Total number of respondents	Feasibility Rated over 4 (%)	Sensitivity Rated over 4 (%)
Awareness and activation of the second victim support program				
1. Number of provided support/number of activation requests	Outcome	50	98.0	70.0
2. Number of provided support/Number of SV[a] identified from the reporting system [new]	Outcome	40	100.0	100.0
3. Number of HCWs aware of the SV program/Total number of HCWs[b]	Outcome	40	100.0	100.0
Process and Structures of second victim support Programs				
4. Average time elapsed from the incident to the first encounter [new]	Process	50	75.0	68.8
5. Existence of a policy strategy for SV support approved by the institution [new]	Structure	40	92.5	97.5
6. Number of peers supporters receiving training or trained/Total of peer supporters integrating the program	Process	40	100.0	100.0
7. Number of HCWs receiving training on the SV topic/Total of HCWs of the service/unit/institution [new]	Process	50	88.0	74.0
Impact of second victim support program				
8. Level of psychological distress before and after the program	Outcome	40	95.0	95.0
9. SV's perceived benefit after the encounter with the peer supporter	Outcome	40	100	100.0
10. SV experience (after attending the program) – qualitative feedback	Outcome	50	78.0	82.0
11. Number of working days lost due to emotional distress in HCWs that attended the SV program/total number of working days lost due to emotional distress [new]	Outcome	40	97.5	97.5

new–new outcome generated from the study (to the best of our knowledge, these indicator was not used to evaluate other SV, intervention).
[a]*SV, second victim.*
[b]*HCW, healthcare worker.*

the indicators, the CEB members reclassified these domains according with the new results as follows: awareness and activation of the SV support program, process and structures of SV support programs, impact of SV support program.

The final diagram of the three phases can be consulted in **Figure 4**.

The final scoreboard of indicators is available in **Table 1**.

More detailed information about the rating of the indicators is provided in **Supplementary File 9**. For further information on the description of each indicator, please consult **Supplementary File 10**. For a detailed explanation of the purpose and measurement method for each indicator, consult **Supplementary File 11**.

DISCUSSION

In this study, a multiphase approach was employed to develop a scoreboard of indicators for evaluating SV programs in healthcare institutions. The agreed-upon set of indicators represents an initial effort to establish a common group of feasible and sensitive/responsive metrics for evaluating SV support programs, facilitating the comparison of results over-time and across various contexts. These indicators are critical success factors for the design of SV support programs. Indirectly, these metrics also provide a useful assessment of the level of psychological safety within the institution, gauging the openness of interprofessional risk-taking of seeking support, and evaluating institution readiness to provide necessary training, structures, and process for SV support systems [22, 45–47].

In the design and development of the final 11 indicators, we focused on the scientific rigor recommended by the literature [48], aiming to define measures that are meaningful, generalizable, and interpretable [48].

We have found that seven out of eleven final proposed indicators were already utilized in existing SV programs. This not only reinforces the adequacy of the suggested indicators, but also confirms their applicability and alignment with the evidence-based practices, emphasizing the need to support providers [49]. Another strong point was the high-level participation in the Delphi rounds which included multi-professional and international perspective, incorporating professionals who work directly or indirectly on the SVP, and representing diverse organizational cultures and healthcare system. This increased the robustness and comprehensiveness of the obtained results. Moreover, the expertise and diversity of the participants contributed to the credibility and validity of the data.

In this study we found that outcome indicators are the most valued for SV program evaluation, however we highlight the importance of considering the structural and process indicators to provide a comprehensive view of the program's effectiveness and ensure that all relevant aspects of the program are being assessed.

We believe that these indicators hold significant potential in guiding program managers towards strategic decisions. These indicators not only can provide key information about programs' acceptability, but also enlighten about the pivotal factors contributing to the success of these programs. Additionally, all the indicators have low calculation cost which facilitates their practical implementation.

It is crucial to highlight that we prioritized defining a restrict number of indicators that are suitable for various healthcare contexts and levels of implementation and do not overburden health services in terms of time and resources. Our goal is to provide common metrics that enable comparable outcome measures for SV support programs. This approach sets a foundation for future research and the potential inclusion of additional structural and process indicators to better support the implementation of SV programs across diverse healthcare settings.

Limitations

This study had some limitations. It's important to acknowledge that the findings were generated and evaluated based on a subjective perception of a selected group of invited experts. This subjectivity may limit the generalizability of the findings (also known as transferability), to different settings and the reliability of the data.

Moreover, generation of indicators was restricted to phases 0 and 1 (literature review and nominal group), limiting interaction among participants who joined during the Delphi rounds. To mitigate these limitations, we employed more adaptable criteria early in the study to expand the range of possibilities for subsequent Delphi rounds, facilitating a broader consensus among participants involved in both the nominal group and Delphi techniques.

According with the multidimensional model of Seys et al, there 5 levels of support that can be provided to the second victims [50]. The final group of defined indicators primarily applies to levels 3 to 5 of this multilevel approach [50], which means that only focus on measuring formal support interventions that provide a reaction after adverse events or other distressing situations happen. We recommend that future research will need to reach a consensus on indicators to evaluate levels 1 and 2 (prevention and self-care) areas, where fewer experiences are reported in health organizations. These dimensions include actions such as trying to understand what happened and how to avoid future similar situations, education on the SV topic and promotion of non-punitive responses to error [50].

Additionally, we identified a lack of prioritization of structural outcomes throughout the different stages of the study. This type of indicators received less attention and only the existence of a policy strategy for SV support, approved by the institution, was prioritized by the majority of the participants. Due to their intangible and less quantifiable nature structural aspects may not receive the same level of attention and accountability, which could diminish the incentive for prioritizing structural enhancements. On the other hand, these indicators are crucial in all stages of implementation, including planning and ongoing adjustments over time [51].

An important aspect missing from this study is the inclusion of indicators that measure the long-term impact and sustainability of SV support programs. We strongly recommend employing a rigorous method to identify the most suitable indicators for assessing this type of programs over time.

Conclusion

This study has successfully delineated a comprehensive set of 11 indicators crucial for evaluating SV support programs within healthcare services. Achieved through a rigorous consensus method, this scoreboard of indicators integrates both evidence-based findings and empirical insights from a multidisciplinary panel of international experts.

To our knowledge, this is the first study to identify a set of indicators applicable across different healthcare contexts and different settings. Moreover, the applicability of these findings extends beyond healthcare facilities and can be generalized to other institutions that provide care.

This study aims to guide future SV programs by enhancing decision-making in key areas: awareness and activation of the SV program, structural and process improvements, and the impact of these programs. There is, however, a need for further research to establish consensus on indicators for evaluating self-care and prevention strategies in healthcare, particularly in areas where initiatives are currently sparse.

By establishing this common set of indicators, we encourage future research to enrich and expand the application of structural and process indicators, which will enhance the implementation and effectiveness of future SV programs across various healthcare settings.

AUTHOR CONTRIBUTIONS

SG-P was involved in the writing of the article and is responsible for the overall content as guarantor. SG-P, IC, JM, and PS have been involved in the conceptualization of the study and were part of Consensus Executive Board of the study. SG-P, IC, and JM participated in design of the study. SG-P and IC have been involved in the coordination of the data collection and analysis of the data in the different phases of the study. JF and EG-H have supported the coordination of the nominal group and summary of the data collected in phase 1 of the study. RS revised all the article critically. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.ssph-journal.org/articles/10.3389/ijph.2024.1607428/full#supplementary-material

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Patient Safety Culture and Safety Attitudes in the Estonian Context: Simultaneous Bilingual Cultural Adaptation and Validation of Instruments

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Objectives: This study aimed to simultaneously and bilingually validate the Hospital Survey on Patient Safety Culture (HSOPSC 2.0) and the Safety Attitudes Questionnaire (SAQ).

Methods: The validation included translation, cultural adaptation, and assessment of validity and consistency. Data were collected in three hospitals in 2022 via online and paper surveys, with Estonian- and Russian-speaking employees participating.

Results: In total, 579 (30%) participants from the three hospitals completed both questionnaires. Among them, 293 (51%) were Russian-speaking and 286 (49%) were Estonian-speaking. Cronbach's αhy for HSOPSC 2.0 was ≥0.60, except in the Russian version for the three dimensions. Cronbach's α for SAQ was ≥0.60, except in the Russian version for one dimension. Pearson's correlations of the Estonian HSOPSC 2.0 ranged from 0.26 to 0.60 and in the Russian version from 0.18 to 0.47.

Conclusion: The validity of the HSOPSC 2.0 and SAQ questionnaires was confirmed in the Estonian versions. Minor corrections were recommended for the Russian. Both versions are considered suitable for assessing PSC in Estonian hospitals.

Keywords: attitude, healthcare surveys, organizational culture, patient safety, validation study

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INTRODUCTION

Patient safety culture (PSC) in hospitals is fundamental to ensuring patient wellbeing, improving the quality of care, and engaging healthcare professionals in fostering an environment conducive to continuous improvement [1–3]. PSC is defined as an individual and organizational behavior pattern based on shared beliefs, attitudes, and values aimed at consistently minimizing patient harm [4]. PSC assessments are crucial for identifying areas of improvement and ensuring safe treatment for hospital patients. Implementing safety attitudes surveys enables organizations to proactively assess employees' perceptions of safety culture. Addressing identified concerns promptly demonstrates a commitment to fostering a positive safety culture, thereby gaining employee buy-in and support for safety initiatives [1, 2, 5].

Various tools have been developed to assess PSC and attitudes [2]. The Hospital Survey on Patient Safety Culture (HSOPSC) and the Safety Attitudes Questionnaire (SAQ) capture aspects of safety

culture within healthcare settings, such as communication openness, teamwork, and leadership support for safety initiatives. The HSOPSC, developed in 2004, has been validated in over 95 countries in different clinical contexts. The SAQ was developed in 2006 and a short version of SAQ is accessible, quick to complete, and available in multiple languages. Both questionnaires stand out as the most widely used and evaluated tools for measuring safety culture in healthcare comparisons and enable the monitoring of changes over time [4, 6].

In Estonia, patient safety in hospitals has been guided by two documents: the Patient Safety Research and Development Strategy (2022–2026) and the Health Development Plan (2020–2030). Prioritizing PSC activities in healthcare, as well as emphasizing their importance, are crucial steps to enhance the quality of healthcare systems [7, 8]. However, there has been a lack of opportunities to assess PSC in the absence of validated measurement instruments. By introducing validated tools such as the HSOPSC 2.0 and SAQ, it becomes possible to evaluate the PSC in Estonian hospitals from the perspective of employees. This assessment is needed to identify organizational weaknesses, plan systemic changes to promote a positive PSC, and contribute to improving patient safety in Estonian hospitals [1, 5, 7].

The use of two different validated instruments broadens the ability to measure various dimensions of PSC comprehensively and enables in-depth exploration of the phenomenon under investigation [2, 9]. Despite Estonian being Estonia's official language, the country also has a significant number of employees who prefer Russian. It was thus considered necessary to validate the instruments in both languages. Therefore, the research aimed to simultaneously and bilingually culturally adapt and validate the HSOPSC 2.0 and SAQ questionnaires in the Estonian context.

METHODS

The study consisted of three phases: questionnaire translation, adaptation, and validation. The first phase included the initial review of the instruments (face validity), followed by the translation of the instruments from the original English version into Estonian and Russian. The second phase involved cultural adaptation, where the clarity and relevance of each questionnaire were assessed, also known as content validity. In the third phase, cross-sectional data were collected to evaluate the internal consistency and construct validity, including the structural and convergent validity of the instruments [10–13]. The methodological quality of the study was assessed using the adapted COSMIN checklist [14]. The study was approved by the Research Ethics Committee of the University of Tartu (decision 347/T-3).

Instruments in This Study

The Hospital Survey on Patient Safety Culture (HSOPSC) version 1.0, compiled by the Agency for Healthcare Research and Quality (AHRQ) in 2004, has a revised version, the HSOPSC 2.0 (2019). The aim of the HSOPSC 2.0 is to measure the current state of the organization's safety culture, identify strengths and areas in need of development in safety culture, and thereby increase employee awareness of patient safety. The HSOPSC 2.0 questionnaire consists of 32 items divided into 10 different subscales and has been reported to have good internal consistency and psychometric properties. Item responses were measured with 5-point agreement scales ranging from 1 = strongly disagree to 5 = strongly agree, or frequency from 1 = never to 5 = always. Written consent was obtained for use of the HSOPSC 2.0 instrument [4, 10, 15].

The Safety Attitudes Questionnaire (SAQ) short-form was developed by Sexton et al. to measure organizational culture factors that influence how employees manage situations involving a risk of defective or erroneous action: safety climate, teamwork climate, working conditions, job satisfaction, stress recognition, and perceptions of safety management [6]. The full version comprises 60 items and the short version contains 30 core items, with four of them answered separately for both hospital and unit levels, resulting in a total of 36 items. The questionnaire applies a 5-point Likert-type scale that ranges from 1 = disagree strongly to 5 = agree strongly for all items and is freely available [16–18].

Phase I: Face Validity and Translations of Instruments

In the first phase, the research team evaluated that the selected instruments were suitable for cultural adaptation and validation in the Estonian healthcare context [12, 15]. Afterward, a professional translation company translated instruments from English to Estonian and Russian. Translated versions were then evaluated by experts: the Estonian versions were evaluated with three experts proficient in English, including a nursing director, medical director, and two physiotherapists. The Russian versions were assessed by two native Russian speakers, a nursing director, and a medical doctor/university teacher. The research team reviewed and adjusted translated questionnaires according to the expert feedback (**Figure 1**).

Phase II: Cultural Adaptation and Content Validity of Instruments

The content validity of the instruments was evaluated by an extended expert group, translation editors, and focus group interviews including speakers of both Estonian and Russian. First, an extended expert group was convened to assess the clarity of the questions and provide recommendations for any necessary wording adjustments. The two expert groups in Estonian (n = 8) and Russian (n = 8) consisted of representatives from the target audience, working in the three involved hospitals. In the Estonian-speaking extended expert group (n = 8), the members included: one physician, one midwife, three healthcare support specialists, one nursing assistant, one administrative worker, and one cleaning service worker. The Russian-speaking expert group (n = 8) comprised: two physicians, one nurse, three nursing assistants, one healthcare support specialist, and one administrative worker. The phrasing of instruments was revised based on the feedback from the extended expert group.

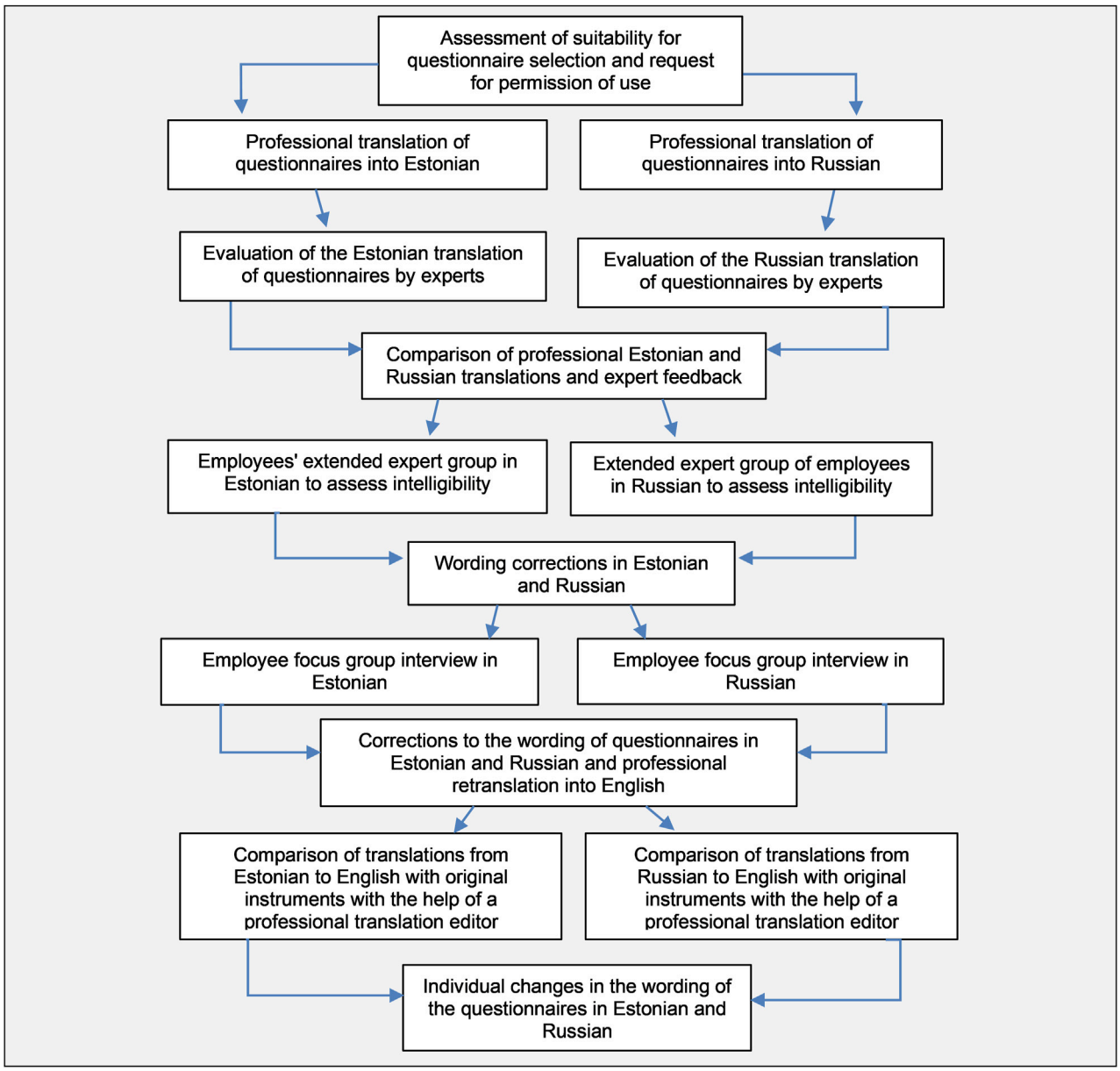

FIGURE 1 | Face validity, translations, cultural adaptation, and content validity of the Hospital Survey on Patient Safety Culture 2.0 and Safety Attitudes Questionnaire (Simultaneous bilingual cultural adaptation and validation of patient safety culture instruments, Estonia, 2021–2022).

Second, the focus group interviews were carried out to evaluate cultural relevance and linguistic appropriateness. Participants provided feedback on the clarity, understandability, and appropriateness of the language and cultural references used in the items. In the Russian-speaking focus group interview, six employees participated: two nursing assistants, two nurses, a nurse manager, and a social worker. The Estonian-speaking focus group consisted of a social worker, a nurse, a nursing assistant, and an administrative worker. Interviews were carried out online because of the COVID-19 pandemic. Based on feedback from the focus group interviews, four corrections on phrasing were made to the Estonian version, and five corrections were made to the Russian version.

Finally, the instruments were back-translated into English by a translation agency. A comparison between the original instruments and the Estonian and Russian versions involved two professional language editors. After final adjustments and sentence corrections, the cultural adaptation of the instruments was completed (**Figure 1**).

Phase III: Internal Consistency and Construct Validity of Instruments

Data Collection

Internal consistency and construct validity were tested in a cross-sectional study assessment. Data was collected in three hospitals in the year 2022. During the data collection period, there were altogether 1,948 employees working in the hospitals, including healthcare staff such as physicians, nurses, nursing assistants, radiologists, laboratory technicians, and physiotherapists. In addition, there were also social workers, cleaning personnel, transportation and administrative staff, and middle-level managers.

Data were collected in collaboration with hospital contact persons using electronic and paper instruments. The hospital contact person shared an electronic link of instruments for employees, using the REDCap program. Paper questionnaires (altogether 1,200, including 635 in Estonian and 565 in Russian) were delivered to the departments by the contact person and participants were asked to put filled questionnaires in sealed envelopes placed in designated boxes within departments. Data collection was conducted in two periods, first in April 2022 and again from November to December 2022. Data were collected using the HSOPSC 2.0 and SAQ questionnaires and supplemented with background information, including personal professional background and workplace characteristics.

Data Analysis

The data were analyzed by descriptive and advanced statistics and performed using the SPSS 29.0 statistical software for Windows. Background variables were analyzed by descriptive methods using percentages for frequency distributions and associations were found between background data and the gap in respondents' scores. For analysis, responses to negatively worded questions were reversed. High safety culture levels were "Agree" or "Strongly Agree" in HSOPSC and "Agree Slightly" or "Agree Strongly" in SAQ. Lower levels were indicated by "Strongly Disagree" or "Disagree" in HSOPSC and "Disagree Strongly" or "Disagree Slightly" in SAQ [4, 6, 12, 19].

Internal consistency, determined by Cronbach's α coefficient, targeted values of ≥0.6, which are considered acceptable. Construct validity of the instruments was assessed to ensure they accurately measure the intended concepts, focusing on both structural and convergent validity measures. Structural validity was evaluated using confirmatory factor analysis (CFA) conducted with SAS 9.4. Convergent validity was assessed using the Pearson correlation coefficient. Mean scores, standard deviation (SD), and response rates were calculated based on the received questionnaires [20, 21].

RESULTS

In total, there were 579 (30%) respondents from the three hospitals, of which 293 (51%) completed the questionnaire in Russian and 286 (49%) in Estonian. For the HSOPSC 2.0, there were 293 in Russian languages and 286 respondents in Estonian, while for the SAQ, 241 respondents completed it in Russian, and 227 in Estonian (**Table 1**).

Inadequately Responded Items

The highest non-response rates were observed in the HSOPSC 2.0-EST instrument for questions D1 (44%) "When a mistake is caught and corrected before reaching the patient, how often is this reported?," D2 (42%) "When a mistake reaches the patient and could have harmed the patient, but did not, how often is this reported?," and C5 (39%) "When staff in this unit see someone with more authority doing something unsafe for patients, they speak up," and in the Russian version same items for C5 (29%), D2 (26%), and D1 (25%). In the SAQ-EST, the highest non-response rates were for questions saq34 (59%) "I experience good collaboration with staff physicians in this clinical area," saq8 (29%) "Medical errors are handled appropriately in this clinical area," and saq31 (29%) "Problem personnel are dealt with constructively by our: unit management/hospital management," and in the Russian version for saq34 (44%) "I experience good collaboration with staff physicians in this clinical area," saq31 (24%) "All the necessary information for diagnostic and therapeutic decisions is routinely available to me," and saq2 (23%) "In this clinical area, it is difficult to speak up if I perceive a problem with patient care."

Internal Consistency of Instruments

The Cronbach's α values (**Table 2**) were 0.60 or higher for all HSOPSC 2.0 dimensions, except for the Russian-language version (HSOPSC 2.0-RUS) dimensions Teamwork (α = 0.42), Staffing and Work Pace dimension (α = 0.27), and Organizational Learning—Continuous Improvement (α = 0.59). Similarly, Cronbach's α values for the SAQ were ≥0.60, except for the Safety Climate dimension in the Russian-language version (SAQ-RUS) (α = 0.57).

Construct Validity of Instruments

To study the construct validity, we calculated the mean scores per dimension. The mean scores of the two instruments ranged from 3.56 to 4.42 for the SAQ and from 3.21 to 4.17 for the HSOPSC 2.0 (**Table 3**).

Pearson correlation coefficients for the Estonian HSOPSC 2.0 (HSOPSC 2.0-EST) ranged from 0.26 to 0.60 ($p < 0.05$). The strongest correlation was in the Organizational Learning—Continuous Improvement dimension (r = 0.60), while the weakest correlation was found in Staffing and Work Pace (r = 0.26). In the HSOPSC 2.0-RUS, correlations ranged from 0.18 to 0.47. The highest correlation was also found in Organizational Learning—Continuous Improvement (r = 0.47), and the lowest was in the Staffing and Work Pace dimension (r = 0.18). In the SAQ-RUS instrument, the highest correlation was observed in the Perceptions of Management dimension (r = 0.40), while in the Estonian-language instrument, it was in the Teamwork Climate dimension (r = 0.12).

Furthermore, correlations were calculated between each dimension of the instrument and the question, "How would you rate your unit/department in terms of patient safety?" For all dimensions of HSOPSC 2.0, except for the Staffing and Work

TABLE 1 | Participants' background characteristics (Simultaneous bilingual cultural adaptation and validation of patient safety culture instruments, Estonia, 2021–2022).

	Characteristics of the responders	n (%)
Profession positions	Nurses and midwives	205 (36%)
	Nursing assistants	109 (19%)
	Healthcare support specialists (physiotherapist, radiology technician, etc.)	71 (12%)
	Support and administrative staff (quality service, financial service, office, etc.)	69 (12%)
	Physicians	54 (9%)
	Other positions (security, transport, etc.)	46 (8%)
	Interns and volunteers	1 (0%)
	Missing information	24 (4%)
Working unit	Psychiatry	90 (16%)
	Rehabilitation	89 (15%)
	Support and administrative services (quality, financial service, office, etc.)	29 (5%)
	Department of internal medicine	26 (4%)
	Non-medical support services (security, transport)	21 (4%)
	Outpatient care unit	20 (3%)
	Medical-support services (laboratory, radiology)	17 (3%)
	Working in multiple departments	12 (2%)
	Women's health and maternity	9 (2%)
	Nursing care	7 (1%)
	Vaccination and infection control center	3 (1%)
	Intensive care unit	2 (0%)
	Pediatrics	1 (0%)
	Missing information	253 (44%)
Leading position	In a non-leading position	458 (79%)
	In a leading position	79 (14%)
	Missing information	42 (7%)
Number of years in hospital	Less than a year	59 (10%)
	1–5 years	137 (24%)
	6–10 years	86 (15%)
	11 or more years	262 (45%)
	Missing information	35 (6%)
Number of years in department	Less than a year	83 (10%)
	1–5 years	157 (24%)
	6–10 years	92 (15%)
	11 or more years	212 (45%)
	Did not respond	35 (6%)
Working hours per week	Full-time (40 h per week)	334 (57%)
	More than full-time	109 (19%)
	Part-time (less than 40 h per week)	79 (14%)
	Full time plus additional employment elsewhere	21 (4%)
	Missing information	36 (6%)
Direct communication with the patient	Direct communication with the patient	431 (75%)
	No direct communication with the patient	111 (19%)
	Missing information	37 (6%)
Concerning age	Patients of different ages	259 (45%)
	Adults	102 (18%)
	Elderly	63 (11%)
	Children	21 (4%)
	No contact with the patients	69 (12%)
	Missing information	65 (10%)

Pace dimension (r = 0.17), the relationship with the overall rating ranged from 0.3 to 0.6.

Based on correlations between the HSOPSC 2.0 and SAQ questionnaires (**Table 4**), statistically significant correlations were observed between Teamwork/Teamwork Climate in HSOPSC 2.0 and Safety climate/Organizational Learning—Continuous Improvement (r = 0.30), Hospital Management Support for Patient Safety/Perceptions of Management (r = 0.41), Communication Openness/Safety Climate (r = 0.42), Communication Openness/Perceptions of Management (r = 0.39), and Supervisor, Manager, or Clinical Leader Support for Patient Safety/Perceptions of Management (r = 0.37).

Correlations between similar dimensions of the two instruments ranged from 0.30 to 0.42. HSOPSC 2.0 dimensions such as Response to Error, Communication Openness, and Hospital Management Support for Patient Safety correlated with dimensions in the SAQ questionnaire such as Teamwork Climate, Safety Climate, and Perceptions of Management.

The construct validity is supported by factor analysis, and the goodness-of-fit indices show that the data fit the intended 10-

TABLE 2 | Cronbach's α coefficient of the Hospital Survey on Patient Safety Culture 2.0 and the Safety Attitudes Questionnaire in Estonian and Russian compared to the original version [4, 6] and previous studies [10, 11, 15–18, 21] (Simultaneous bilingual cultural adaptation and validation of patient safety culture instruments, Estonia, 2021–2022).

	Estonian version	Russian version	Original version	Previous studies
HSOPSC 2.0 dimensions				
Teamwork	0.63	0.42	0.76	0.68–0.77
Staffing and work pace	0.67	0.27	0.67	0.47–0.74
Organizational learning — continuous improvement	0.72	0.59	0.76	0.60–0.76
Response to error	0.78	0.70	0.83	0.68–0.81
Supervisor, manager, or clinical leader support for patient safety	0.71	0.67	0.77	0.71–0.77
Communication about error	0.86	0.80	0.89	0.73–0.87
Communication openness	0.76	0.78	0.83	0.67–0.82
Reporting patient safety event	0.76	0.81	0.75	0.73–0.81
Hospital management support for patient safety	0.83	0.77	0.77	0.62–0.76
Handoffs and information exchange	0.67	0.68	0.72	0.50–0.76
SAQ dimensions				
Teamwork climate	0.83	0.77	0.70	0.69–0.76
Safety climate	0.65	0.57	0.73	0.76–0.87
Job satisfaction	0.83	0.89	0.86	0.84–0.87
Stress recognition	0.89	0.85	0.82	0.78–0.86
Perceptions of management	0.88	0.90	0.88	0.86–0.93
Working conditions	0.62	0.69	0.71	0.72–0.80

TABLE 3 | Mean scores, standard deviation, and response rates for the domains of the Hospital Survey on Patient Safety Culture 2.0 and the Safety Attitudes Questionnaire (Simultaneous bilingual cultural adaptation and validation of patient safety culture instruments, Estonia, 2021–2022).

	Respondents (n)		Mean		SD	
	Estonia	Russia	Estonia	Russia	Estonia	Russia
HSOPSC 2.0 (score range 3.21–4.17)						
Teamwork	261	258	4.03	3.60	0.65	0.62
Staffing and work pace	235	249	3.54	3.18	0.77	0.54
Organizational learning—continuous improvement	187	243	3.21	3.55	0.81	0.65
Response to error	191	252	3.37	3.41	0.81	0.68
Supervisor, manager, or clinical leader support for patient safety	225	258	3.82	3.73	0.71	0.62
Communication about error	209	248	3.83	4.17	1.02	0.88
Communication openness	155	183	3.89	3.87	0.80	0.86
Reporting patient safety event	145	207	3.57	4.06	1.11	1.02
Hospital management support for patient safety	178	249	3.55	3.73	0.84	0.68
Handoffs and information exchange	154	223	3.59	3.61	0.76	0.68
SAQ (score range 3.56–4.42)						
Teamwork climate	153	164	4.12	4.01	0.76	0.6
Safety climate	129	173	3.86	3.87	0.86	0.68
Job satisfaction	210	217	4.42	4.31	0.65	0.71
Stress recognition	157	189	4.15	3.56	0.96	0.98
Perceptions of management	106	150	3.81	3.89	0.77	0.64
Working conditions	140	165	3.76	3.61	0.79	0.71

TABLE 4 | Summary of confirmatory factor analysis results for the hospital survey on patient safety culture 2.0 and the safety attitudes questionnaire in Estonian and Russian (Simultaneous bilingual cultural adaptation and validation of patient safety culture instruments, Estonia, 2021–2022).

Index	Index threshold values	HSOPSC 2.0 (Estonian and Russian)	SAQ (Estonian and Russian)
/df		1.8	1.66
RMSEA (95% CI)	<0.08	0.0649 (0.0574–0.0723)	0.0585 (0.0507–0.0662)
SRMR	<0.08	0.0698	0.0620
GFI	>0.8	0.8038	0.8159

factor model. In the confirmatory factor analysis (CFA) of HSOPSC (**Table 4**), $\chi 2/df = 1.8$, RMSEA = 0.06, and SRMR = 0.07. In the SAQ instrument, $\chi 2/df = 1.66$, RMSEA = 0.06, and SRMR = 0.06. RMSEA (Root Mean Square Error of Approximation) values of 0.06 for both HSOPSC and SAQ are below the recommended threshold of 0.08, indicating a good fit.

SRMR (Standardized Root Mean Square Residual) reported values of 0.07 for HSOPSC and 0.06 for SAQ are below the threshold of 0.08.

DISCUSSION

This study validated the HSOPSC 2.0 and SAQ instruments in the Estonian healthcare context and assessed the psychometric properties of developed Estonian and Russian versions. Findings indicated strong internal consistency and validity, suggesting these instruments effectively capture employees' perceptions of PSC in Estonian hospitals with diverse linguistic backgrounds.

Translations, Cultural Adaptation, and Content Validity of Instruments

In this study, instruments were selected and simultaneously translated into two languages, a practice not documented in previous studies. While instruments have been concurrently validated before [9], this has not been done in different languages simultaneously, a method that proved effective in minimizing differences and enhancing reliability and validity. Based on the adapted COSMIN checklist [14], and drawing from other validation studies, all recommended stages of translation and cultural adaptation were carried out. The inclusion of diverse professional fields was crucial for assessing content validity, as varied perspectives significantly contribute to refining questions and increasing comprehensibility. Various specialists in Russian and Estonian, as well as experts and language editors, participated in the process, providing a strong assurance of the adequacy of the translations. The analysis of the collected research data indicated that most participants were nurses and midwives, followed by nursing assistants, healthcare support specialists, support and administrative staff, and physicians. This reflects the general staff composition, where nurses make up the largest proportion of hospital staff. In various countries, the samples of adapted and validated instruments differed both in size and profession. For instance, Suryani et al. [10], Filiz et al. [11], and Lee et al. [15] conducted a psychometric study exclusively among nurses, excluding the rest of hospital staff from the validation process.

As patient safety culture in Estonia is still nascent, this could have influenced inadequately answered items during cultural adaptation. To determine why certain questions in both the Estonian and Russian instruments were left unanswered, a qualitative study should be conducted. For instance, in the HSOPSC 2.0-EST and RUS, section D, where the questions were about reporting incidents, they were repeatedly rephrased based on the recommendations of the expert group and language editors, and important information was highlighted for better understanding, following a suggestion made during the extended focus group but had the highest non-response rate.

The SAQ-RUS and EST had the highest non-response rate for the item regarding collaboration with pharmacists, which suggests that collaboration with pharmacists in the department or unit is uncommon. Also, the items asking whether problems are dealt with constructively by unit management or hospital management had a high non-response rate, as well as an item indicating that management does not knowingly compromise patient safety in the hospital. This suggests that employees may not be very aware of the hospital management's activities related to patient safety. The same problem appears in Skjeggestad et al. [18], where the highest percentage of missing items was related to perceptions of management. In European hospitals, the predominant hierarchical structure, particularly the top-down management model, may hinder unit staff from raising concerns or engaging in discussions with the management, as mentioned by Nguyen et al. [13].

Internal Consistency of Instruments

Cronbach's α coefficients demonstrated satisfactory internal consistency (equal to or greater than 0.60) across all dimensions of the HSOPSC 2.0. Excluding low Cronbach α results in the HSOPSC 2.0-RUS for Teamwork, Staffing and Work Pace, and Organizational Learning—Continuous Improvement dimensions, overall Cronbach α scores were considered satisfactory. Notably, discrepancies were observed in those dimensions, attributable to variations in the translation of the HSOPSC 2.0-RUS. Specifically, within the Estonian adaptation, the dimension of Teamwork in a statement, addressing the elongation of workdays and its impact on patient safety, diverged in content from its Russian counterpart "The staff works for longer hours to improve patient safety" while the original version is "Staff in this unit work longer hours than is best for patient care." This dissimilarity was substantiated by a notably low Cronbach's α value of 0.27 calculated for the Staffing and Work Pace dimension of the HSOPSC 2.0-RUS. In the same section, statement A5, examining the dependency on temporary, float, or PRN staff, remained unclear in both the Russian version focus and expert group interviews because, in the Estonian context, the prevalence of temporary staff in the Estonian healthcare system is uncommon. Interestingly, in the Estonian version, this item was not problematic. The same issue appears in Lee et al. where A5 was deleted because it does not fit with the national context and this item may seem confusing or irrelevant in Korean healthcare systems [15]. If questions A3 and A5 are excluded from the HSOPSC 2.0-RUS in the Staffing and Work Pace dimensions, the Cronbach's alpha coefficient increases to 0.42. The Indonesian HSOPSC 2.0, validated by Suryani et al. [10] with factor loads ranging from 0.47 to 0.65, except for Communication Openness ($\alpha = 0.67$) and Response to Error ($\alpha = 0.68$). Lee et al. [15] designed the Korean version, removing an inapplicable item. Cronbach's α values for nine composites ranged between 0.71 and 0.83, except for Staffing and Work Pace ($\alpha = 0.61$). The Turkish HSOPSC 2.0 had Cronbach α values between 0.72 and 0.82 [11] and Brazilian 0.47–0.87 [21].

In the SAQ, Cronbach's α values of the dimensions were ≥0.6, indicating satisfactory validity, except for the safety climate dimension in the SAQ-RUS. There is a slight translation

difference in the item "I am encouraged by my colleagues to report any patient safety concerns I may have" In Estonian, it was translated as "Colleagues encourage me to report all patient safety-related issues," and in Russian as "My colleagues encourage me to report any patient safety concerns that may arise for me." This may seem broader in meaning in Estonian than in Russian, but data analysis did not reveal significant differences in responses to these items. In the SAQ-RUS Cronbach's alpha values ranged 0.57–0.90. Additionally, excluding the low result in the Safety Climate dimension of the SAQ-RUS ($\alpha = 0.57$), Cronbach's alpha scores were satisfactory. In other studies, Cronbach alphas ranged from 0.73 to 0.87 [18], conducted by Skjeggestad et al., and in a study conducted in Denmark, the range was from 0.70 to 0.86 [16].

Construct Validity of Instruments

The Pearson correlation coefficients for both the HSOPSC 2.0-EST and SAQ-EST indicated sufficient independence between the sub-scales and provided evidence of the validity of the instruments. Exceptionally high correlations were not observed. Correlations between similar dimensions of the two instruments ranged from 0.30 to 0.42, indicating a good correlation between the subscales as hypothesized. However, these correlations remained lower than expected in terms of statistically significant relationships. The dimensions of HSOPSC 2.0 were correlated with the SAQ dimensions. Similar results were identified in the study by De Carvalho et al. [9] where the Teamwork Climate (SAQ) domain was significantly correlated with five HSOPSC domains.

The construct validity, measured by structural and convergent validity, was confirmed after hypotheses testing. Construct validity was confirmed through factor analysis, and the fit indices indicated that the data matched the proposed 10-factor model. The summary of confirmatory factor analysis results for HSOPSC 2.0 and SAQ Estonian and Russian language questionnaires confirms a good fit and correlation between dimensions.

Strengths and Limitations

The study had some limitations and strengths. The first limitation was the low participation rate, caused by fatigue among workers due to the COVID-19 pandemic. Therefore, additional data collection was conducted in the fall of 2022, which did not significantly increase the number of participants. Additionally, the low participation rate may also be associated with the absence of an option to save partially completed questionnaires in REDCap, or because filling out the questionnaires was too time-consuming. The second limitation was the novelty and the sensitivity of the topic, which was highlighted in both the focus group interviews and the extended expert group discussions. Additionally, if respondents do not consider the research topic important or do not understand the usefulness of the collected data, their motivation to participate may have been lower. This emphasizes the need for further training and clarification of patient safety issues for both medical and non-medical hospital staff.

The strength of the study was that the research team followed the adapted COSMIN guideline, ensuring strong methodological quality. Another strength was certainly the simultaneous validation of two patient safety culture instruments, which, on the one hand, was more complex but, on the other hand, allowing for the concurrent execution of data collection and analysis stages, resulting in significant time and resource savings, and enhancing reliability and validity.

IMPLICATIONS FOR CLINICAL PRACTICE AND FURTHER RESEARCH

In the Estonian context, two validated questionnaires for assessing PSC enable conducting a comprehensive national study to understand the current state of safety culture in Estonian hospitals. This study would involve collecting data from various hospitals across the country and comparing it with data from other countries. Additionally, if deficiencies in safety culture were identified through the safety culture study, effective intervention strategies could be developed and implemented.

Conclusion

As a result of the validation process, there is evidence supporting the clarity, relevance, internal consistency, and construct validity of the Estonian and Russian versions of the HSOPSC 2.0 and SAQ questionnaires. These conclusions are based on data collected from medical and non-medical staff in three hospitals. Therefore, the validity of the HSOPSC 2.0 and SAQ questionnaires in Estonian was confirmed. However, minor adjustments were recommended for the Russian version, including the deletion or rewording of items A3 "Staff in this unit work longer hours than is best for patient care" and A5 "This unit relies too much on temporary, float, or PRN staff" from the HSOPSC 2.0 and saq12 "I am encouraged by my colleagues to report any patient safety concerns I may have" from the SAQ instrument. Both questionnaires are suitable for assessing patient safety culture from the perspective of hospital staff in Estonian hospitals and are available in both Estonian and Russian.

ETHICS STATEMENT

The studies involving humans were approved by Research Ethics Committee of the University of Tartu, decision 347/T-3. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SA is the main author of the article. KP is the main supervisor. MV was responsible for statistical analysis. MK contributed to

methodological quality, and HC for substantive quality. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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Emotional and Psychological Safety in Healthcare Digitalization: A Design Ethnographic Study

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Objectives: Emotional and psychological safety is important during the use of digital technologies in healthcare. We aimed to gain comprehensive insight into needs, influencing factors and outcomes in the context of perceived safety and digital technologies in healthcare.

Methods: We employed a participatory, design ethnographic research approach with 16 participants in 10 use cases. The methods included in an iterative process were, think-aloud, guideline-based interviews, process mapping, storyboard creation, and photo documentation. A qualitative, primarily inductive data analysis and synthesis was performed.

Results: Perceived safety is influenced by various factors and unmet needs. Increased perceived safety can positively support the use of digital technologies, whereas low perceived safety can limit or even hinder its use.

Conclusion: The needs of the different target groups should be considered throughout the entire process of digital technology development and healthcare provision to support their implementation. These findings support further research by providing specific aspects of emotional and psychological safety regarding target groups, settings, and ages and those with different levels of affinity for digital technologies.

Keywords: emotional safety, psychological safety, digital technology, healthcare, participatory research

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INTRODUCTION

Digital transformation, as a response to COVID-19 [1], affects many areas of society [2] and is related to perceived safety in healthcare [1]. The implementation of digital technologies (DTs) provides new opportunities, e.g., by strengthening the empowerment of healthcare recipients (HCRs) [3] and supporting flexible care provision through analog and digital care by healthcare providers (HCPs), e.g., through telemedicine [4]. However, several studies have shown concerns regarding safety and security related to DTs [1] and have recently stressed the need to investigate emotional (ES) and psychological safety (PS) related to patient safety [5, 6]. A differentiation between "feeling safe" and "being safe" in healthcare is required. The consequences of not feeling safe can include the loss of trust, fear, trauma, and in the further course restricted healthcare use [5]. From a public health point of view, how people perceive risks, related

emotions, efficacy, information or trust perceptions, can also be associated with sense of public health safety [7].

In general, ES is related to a feeling that is located on a continuum between feeling safe and feeling threatened and that is influenced by internal and external conditions and factors [8] and PS is defined as perceived safety in the context of the work environment and team dynamics [9].

Although, several studies considered perceived safety related to DT, only a few have studies investigated it as a primary research focus in the recent years. These mainly qualitative studies were restricted to a limited target group, such as older people or selected DTs such as robotics, assistive technology or telecare [8]. For example, Akalin et al. stressed in a "two-by-five mixed-subjects design experiment" of a human-robot interaction (N = 27) that perceived safety is a key factor in sustaining interaction, collaboration, and acceptance in the context of the use of DTs in healthcare and is related to a sense of control, trust, and comfort [10]. Others have reported that DT use in a simple design can enhance perceived safety for elderly people [11] and that a robot design can decrease perceived safety by either looking too human-like or not having enough human traits [12]. Understanding and prioritizing the needs of DT users can support their acceptance of DTs [13]. In summary, although the phenomenon is relevant in healthcare, currently, the evidence is limited. This is especially true for the psychological safety of DTs use [8]. Therefore, we aimed to gain deeper insight into needs, influencing factors, and outcomes in the context of emotional and psychological safety and DT in healthcare.

METHODS

Design

Our design ethnographic approach (DEA) [14] involves participants as co-designers, considering scientific standards [15] and the "involvement" level of participation [16] to improve evidence by participatory methods [17]. DEA is "(. . .) interpretative, qualitative, engaged, active, constructivistic, interactionistic, phenomenological, explorative, and abductive." [14] Usually, case studies are applied, that include one or more cases to investigate poorly researched "real-world phenomena in complex contexts" across various settings [18, 19]. We also provided a real-world user experience [20] to uncover users' needs and feelings to investigate an even deeper level of user expression, by addressing and observing what individuals say, do, and create [21]. Insights about implicit and tacit knowledge (and needs) could be gained, e.g., skills that people are capable of but that are not easily articulated verbally [22]. Member checking [23] was conducted. This study was conducted as part of the research project titled "Emotional safety as a condition for success of the digital transformation in healthcare (SteTiG)," registered at the Open Science Framework: https://doi.org/10.17605/OSF.IO/UTSQN. Our study was approved by the ethical committee of Fliedner Fachhochschule Düsseldorf: 04/2022. Ethical advice from the Ethical Committee Ärztekammer Nordrhein: 2022107.

Sample Design and Setting

Criterion-based convenience sampling [24] was performed, which resulted in 16 participants in 10 design ethnographic (DE) use cases. We recruited participants on the basis of expert and project member recommendations as well as snowballing. HCRs of different ages (e.g., children, adults, and elderly individuals), genders, and settings were included. Different disease patterns were considered (e.g., people with acute and/or chronic diseases). HCPs, such as physicians, psychotherapists, paramedics, and nurses were considered. A family member also took part in the study to support an underage child and to add a family perspective. The sampling of heterogeneous use cases was primarily based on the WHO classification of digital health interventions [25] which allowed us to observe differences in perceived safety with respect to DTs (see **Table 1**): a personal health tracking (1) diet app and (2) a sleep app; (3) a mobile electrocardiogram; (4) a closed-loop system for diabetes type 1; (5) virtual reality (VR) and (6) robotics in care facilities; (7) hospital information system; (8) telemedicine psychotherapy; (9) tele-psychotherapy; and (10) simulation training in emergency care.

This study was conducted in Germany, toward the end of the COVID-19 pandemic from July 2022 to February 2023. DTs have become more important in several areas of life and public communication [27]. Therefore, diverse familiar real-world settings were considered (*in situ* and online) to capture the full spectrum of DT usage and to ensure that participants felt at ease. Related disturbances, e.g., people passing by, were accepted as authentic parts of the real-world context.

Data Collection

For each use case three visits (see **Figure 1**) were performed using the think-aloud technique [28], guided semi structured interviews [29], storyboards [30] supplemented with a process map [31], and a structure formation technique (SFT) [32] for data collection. The process was documented using audio-records, photographs, field notes and observation protocols.

The first visit was performed *in situ* to better involve vulnerable groups and online Zoom visits were conducted upon participant request. Zoom interviews followed the same structure by using a digital visualization tool (Miro boards). Sociodemographic data, health status, self-reported technical affinity and the specific type of DT were recorded beforehand.

For each data collection phase an interview guide [29] (see **Supplementary Material 1**) was developed. The first guide involved a think-aloud approach and the user was encouraged to share feelings and thoughts while using the DT. Then associations of perceived safety were discussed. Finally, a closing question was posed to provide the opportunity for additional information or thoughts. The second guide included a member check of the findings of the usual use of the DT from the first phase, an idealization of the user experience design of the DT in relation to perceived safety, and the same closing question from the first visit. A process map was provided to the participants to reflect on the usual DT use and to ask for corrections, if needed. For the idealization of DT usage and its design, an imaginary space was opened where all ideas were allowed. The third guide included a member check of the idealized DT use and its design, as well as an opportunity to make additions. To check for completeness and correctness, the visualizations of the ideas were translated into storyboard process maps and visual prototypes. The interviews with the underaged child were conducted using shorter and simpler language. The child's sister was present and took part on her own request.

TABLE 1 | World Health Organization classification of digital health interventions-based description of use cases (North Rhine-Westphalia, Germany. 2023).

World Health Organization classification of digital health interventions		1. Interventions for clients						2. Interventions for healthcare providers			
		1.4 Personal health tracking				1.8 Lifestyle intervention tools (Hermann et al. [26])		2.1 Client identification and registration	2.4 Telemedicine		2.8 Healthcare provider training
		1.4.2 Self-monitoring of health or diagnostic data by client		1.4.3 Active data capture/ documentation by client		1.8.1 Digital psychosocial facilitation		2.1.2 Enroll client for health services/clinical care plan	2.4.1 Consultations between remote client and healthcare provider		2.8.1 Provide training content to healthcare provider(s)
Use cases		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Digital technology		Diet app, used on smartphone	Sleep app, used on laptop	Mobile electrocardiogram	Closed-loop system pump	Virtual tours via Google Earth using virtual reality glasses	Robot	Electronic health record in hospital information system	Telemedicine psychotherapy via video consultation tool	Tele-psychotherapy via video consultation tool**	Simulation training in emergency care with electrocardiogram patient simulator
Participants*		HCR, patient with obesity	HCR, patient with insomnia; HCP, doctor	HCR, patient with AVNRT	HCR 1, child, patient with diabetes type 1; HCR 2, family member	HCR, elderly person in retirement home; HCP 1 and 2, nurses	HCR 1 and 2, elderly people in retirement home; HCP, nursing home project manager	HCP, internist	HCR, patient with psychosis	HCP, child and adolescent psychotherapist	HCP, instructor/ paramedic
General setting		Germany									
Setting in daily live		Usually used at home, after a meal or in the evening	Usually used at home, before or after sleep	Everywhere, especially at home	Everywhere	Retirement home, lounge area	Retirement home, lounge area	Hospital, doctors' room	At home, living room	Doctors' office/At home, living room	Fire and rescue service academy, simulation room
Selected research setting	1. Visit°	At home, living room table[a]	Doctors' office, patient room[b]	At home, living room[a]	Bakery[b]	Retirement home, lounge area[b]	Retirement home, lounge area[b]	Hospital, doctors' room[a]	At home, living room[a]	At home, living room[a]	Fire and rescue service academy, simulation room[a]
	2. Visit°°	At home, living room table[a]	Doctors' office, patient room[a]	At home, living room[a]	Bakery[b]	Retirement home, lounge area[a]	Retirement home, lounge area[b]	Zoom[a]	At home, living room[a]	At home, living room[a]	Zoom[a]
	3. Visit°	At home, living room table[a]	Doctors' office, patient room[b]	At home, living room[a]	Bakery[b]	Retirement home, lounge area[a]	Retirement home, lounge area[b]	Zoom[a]	At home, living room[a]	Zoom[a]	Zoom[a]
Data collection		Researcher 1				Researcher 2	Researcher 1		Researcher 2	Researcher 1	

*Legend: * = for more details about participants see **Table 2**: participants' characteristics; ** = digital technology only used during COVID-19 lockdown; interview time: ° = 30 min single participant, 45–60 min for more than one participant; °° = 45 min single participant, 60–90 min for more than one participant.*

HCR, healthcare recipients; HCP, healthcare provider; AVNRT, atrioventricular nodal reentrant tachycardia; researcher 1 and 2 = social and product designers.

[a]*One-to-one interview.*

[b]*Group-interview.*

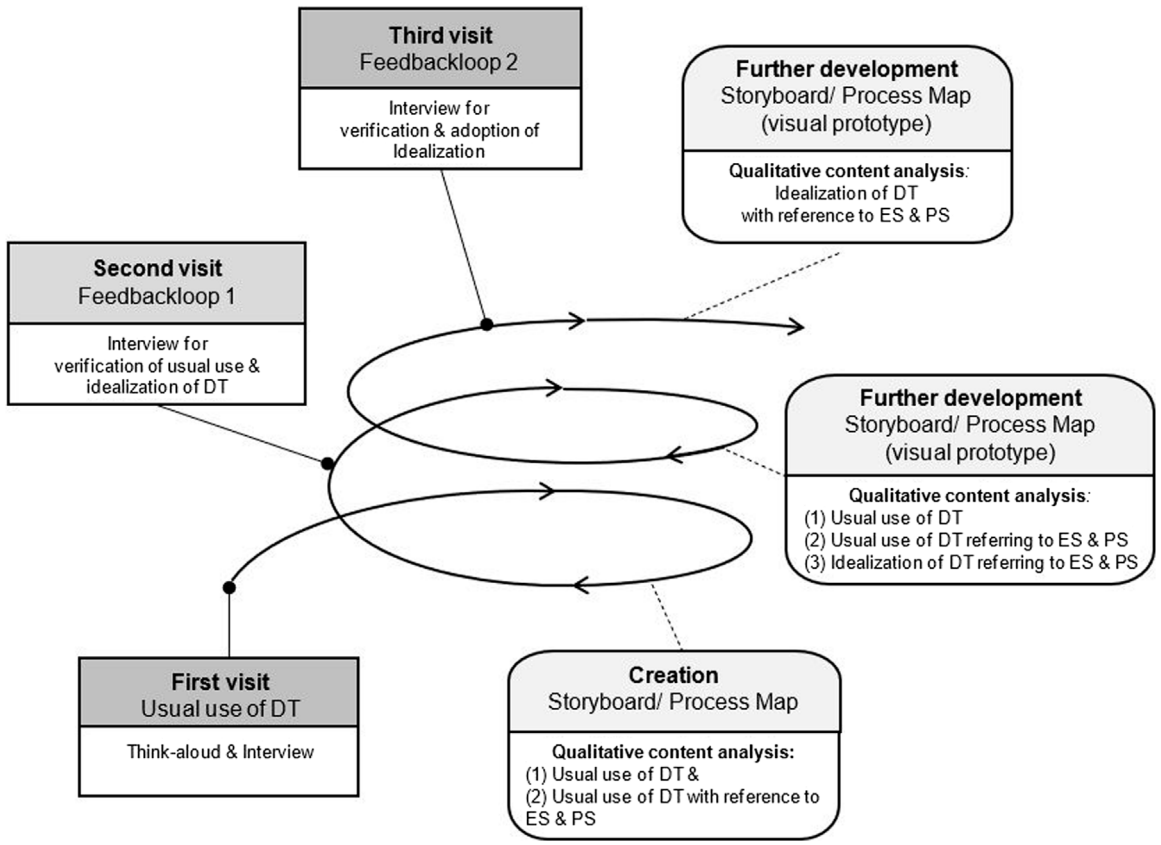

FIGURE 1 | Design ethnography approach—definitions, data collection and analysis (North Rhine-Westphalia, Germany. 2023). Legend: ES, emotional safety; PS, psychological safety; DT, digital technology. Definitions of methods and techniques in data collection and analysis: 1) Think-aloud technique [28] = it aims to collect data about a cognitive process by verbalization and working memory regarding subject and task. 2) Guided semi structured interviews [29] = semi structured interviews contain "(. . .) prepared questioning guided by identified themes in a consistent and systematic manner interposed with probes designed to elicit more elaborate responses (. . .) to help direct the conversation toward the topics and issues about which the interviewers want to learn". 3) Storyboarding [30] = "Storyboarding is the process of describing a user's interaction with the system over time through a series of graphical depictions and units of textual narrative" 4) Process mapping [31] = it refers encompassing understanding of the process and contains "(. . .) identification, information gathering, map generation, process analysis and taking improvement forward." 5) Structure formation technique (SFT) [32] = in core, it "(. . .) consists in passing on a system of rules which allow for visualizing the structure of each particular subjective theory (. . .) to make the dialogue-consensus between research subject and research object possible (. . .) according to the dialogue consensus criterion of truth (. . .) to approximate an ideal speech situation as closely as possible."

Data Analysis and Synthesis

A qualitative inductive content analysis was performed [33] by four researchers (MV, AB, CV, and LO). Peer group sessions and supervision (SK) were performed. A final harmonization of the terminology and clustering of domains on the basis of the core dimensions was performed by one researcher (MV). First, the data for each use case were analyzed with respect to the influencing factors, needs, and outcomes that would serve the design of future DTs in the healthcare sector, taking perceived safety into account. General thoughts and feelings about usual DT use were analyzed separately from the results concerning perceived safety to determine aspects that went beyond the context of feeling safe. Second, the core dimensions, main categories, and subcategories were developed. The synthesis [34] considered the different DTs, HCRs and HCPs related to ES and PS, and digital affinity. Complementary or specific categories are presented separately. Finally, content related domains were developed.

RESULTS

Participants

A total of 30 visits were conducted across the 10 use cases. Sixteen participants were included in the 10 selected use cases (see **Table 2**). The age ranged from 11 to 86 years, and 12 out of the 16 participants were women. Participants with chronic or acute disease were recruited, with some having only a chronic or acute disease. According to our defined target groups, nine HCRs and seven HCPs were included.

Impact of Perceived Safety

Perceived safety has influenced all the target groups' DT usage behavior, thoughts, emotions, and needs. In total, 13 outcomes (see **Supplementary Material 2A**) were associated with low or strong perceived safety in different contexts and with different DTs. We observed that a low level of perceived safety had an influence on the

TABLE 2 | Participants' characteristics (North Rhine-Westphalia, Germany. 2023).

Use cases/digital technology		Total n	Diet app	Sleep app	Mobile electrocardiogram	Closed-loop system	Virtual Reality	Robotic	Hospital information system	Telemedicine psychotherapy	Tele-psychotherapy for children	Simulation training in emergency care
Total number of participants*		16	1	2	1	2	3	3	1	1	1	1
Project collaborators included		1	—	1	—	—	—	—	—	—	—	—
Gender	Female	12	1	1	1	2	2	2	—	1	1	1
	Male	4	—	1	—	-	1	1	1	—	—	—
	Various	—	—	—	—	—	—	—	—	—	—	—
Age	in years R	11–86	53	61–63	29	11–23	19–86	29–86	60	33	32	34
	A ± SD	45,56 ± 24,2		62 ± 1		17 ± 6	43.67 ± 30.07	66.33 ± 26.41				
Final school degree	Lower-level degree	3	—	—	—	—	1	2	—	—	—	—
	Average-level degree	1	—	1	—	—	—	—	—	—	—	—
	Higher-level degree	11	1	1	1	1	2	1	1	1	1	1
	Other (e.g., primary school diploma)	1	—		—	1	—	—	—	—	—	—
Education (multiple response)	Vocational (school or academy)	4	1	1	—	—	—	2	—	—	—	—
	University or college degree	9	—	1	1	1	1	1	1	1	1	1
	Missing value (no data available)	3	—	—	—	1	2	—	—	—	—	—
Other education	e.g., specialized doctor status, license to practice	2	—	—	—	—	—	—	1	—	1	—
Target group roles	Healthcare recipients	9	1	1	1	2	1	2	—	1	—	—
	Of this group, family members	1	—	—	—	1	—	—	—	—	—	—
	Healthcare providers	7	—	1 (a)	—	—	2 (b)	1 (c)	1 (a)	—	1 (d)	1 (e)
Disease	Chronic disease	3	—	—	—	1	1	—	—	1	—	—
	Acute disease	1	—	—	1	—	—	—	—	—	—	—
	Chronic and Acute disease	4	1	1	—	—	—	2	—	—	—	—
	Neither	8	—	1	—	1	2	1	1	—	1	1
Technical affinity (f)	High tech-savvy	10	1	1	1	2	2	1	—	1	—	1
	Moderately tech-savvy	2	—	1	—	—	—	—	—	—	1	—
	Low tech-savvy	4	—	—	—	—	1	2	1	—	—	—

*n, number of participants; R, range; A, average; SD, standard deviation; *all participants are German.*

(a) Doctor (b) Nurse (c) Nursing home project manager (d) Psychotherapist (e) Paramedic (f) Self-reported technical affinity was recorded before the interviews.

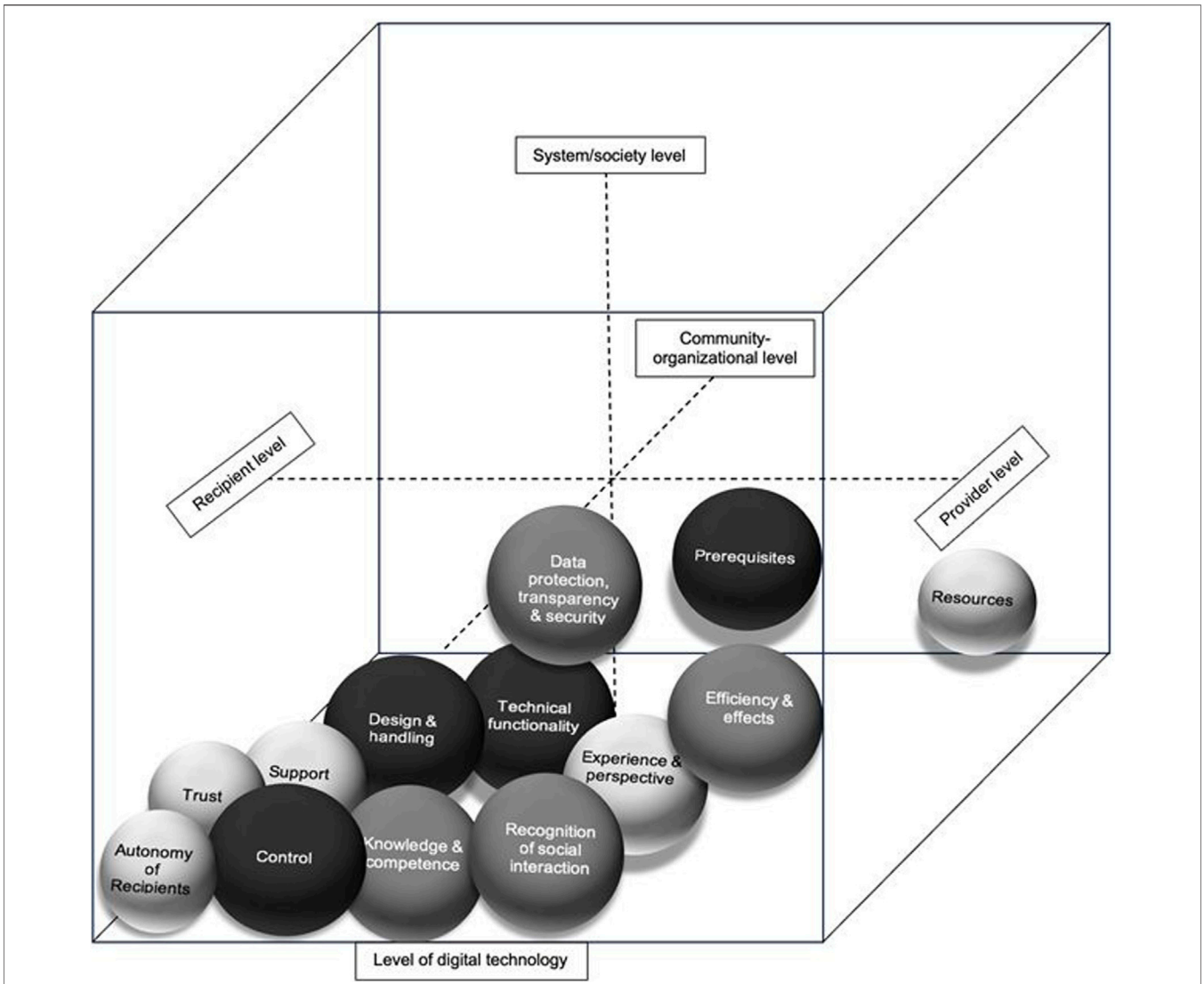

FIGURE 2 | Core dimensions of influencing factors and needs in the context of feeling safe and digital technologies in healthcare (North Rhine-Westphalia, Germany. 2023). Legend: larger black spheres = mostly addressed CDIFs/CDNs; smaller lighter spheres = rarely addressed CDIFs/CDNs; bottom layer = digital technology level; left layer = recipient level; right layer = provider level; upper layer = system/society level; and rear layer = community-organizational level.

implementation of DTs: use depending on certain circumstances (n = 6), nonuse (n = 4), partial use (n = 3), or use other than intended (n = 1). In the case of DT use, depending on certain circumstances, the HCPs weighed the benefits of a DT according to their patients' health status and one HCR was afraid to use the DT autonomously because of fears of breaking something or doing something wrong. The non-use of DTs was related to limited competencies, control, discomfort, and increased risk perception. Partial use was related to feelings of danger, limited functionalities, limited control, competencies, and knowledge. In one case, because of limited perceived safety, the DT was used in another way than intended due to its limited functionality. In six cases, low perceived safety had an impact on HCPs' and HCRs' thoughts and emotions, including skepticism, mistrust, and discomfort. In contrast, strong perceived safety had, in four use cases, a positive influence on DT use and thus its implementation. For HCRs, regular DT use was related to aspects of trust, recommendations, and positive health effects. In general, the use of DTs was not classified as risky.

Influencing Factors and Needs

A total of 13 domains were developed on the basis 40 core dimensions containing ES and PS aspects. Thereof 22 core dimensions that cover influencing factors (CDIFs) and needs (CDNs). Fourteen core dimensions were exclusively addressed by influencing factors and four core dimensions by needs. The CDIFs/CDNs were based on 150/48 main categories and 232/90 subcategories identified from the 10 use cases (see **Supplementary Material 2B–D**).

The domains covered four levels: the DT level, the individual level, the community-organizational level, and the system-society

level. The participants focused mainly on the individual level, particularly in relation to DTs (see **Figure 2**). Among the 13 domains, nine were addressed by both the HCRs and HCPs, three were addressed primarily by the HCRs, and one was addressed only by the HCPs.

Perspective of Healthcare Recipients and Providers

Most of the CDIFs and CDNs were addressed in several use cases and were covered by all target groups related to ES and PS. The four domains "*design and handling*," "*technical functionality*," "*control*" *and* "*prerequisites*" were addressed in all ten use cases. While the domain "*control*" focused mainly on the DT level, "*design and handling*" and "*technical functionality*" additionally took the community-organizational level into account. "*Prerequisites*" took all levels into account. All four domains considered ES and PS.

The "*design and handling*" addressed in terms of ES and PS aspects included two related topics: user-friendliness, which was mentioned most frequently, and the flexible availability and usability of DTs, which were covered by needs. The need for DT optimization was also mentioned frequently, predominantly by those with a high level of DT affinity.

> "It's a great program, and it's easy to use. (. . .) I feel safe using it because it's simple. (. . .)" (HCP, tele-psychotherapie, 1st visit)

"*Technical functionality*" was related to available and reliable digital health data transfer for HCPs to ensure the quality and safety of a correct diagnosis and treatment. The need to improve the PS was related to the availability of patient data via various DTs, including the HCR's health data/feedback to the HCP. Furthermore, the PS was related to the technical reliability of DTs and was also mentioned as a need. In three cases, the autonomous, reliable function of DTs was mentioned. For one HCP, it was important to differentiate between technical errors and one's own mistakes related to the DT.

> "But I always find it difficult when it's caused by the technology. And the participants can't understand that it's a technical problem right now (. . .). That's actually what I (. . .) mean by perceived safety (. . .)" (HCP, simulation training in emergency care; 3rd visit)

The domain "*control*" encompassed three types of control: gaining control through the DT, being in control of the DT, and (gaining) control over the DT through analog backup/redundant measures. Gaining control through the DT, especially over one's own health status, helped the participants feel protected and independent, which led to ES. This CDIF was exclusively mentioned by HCRs, who used DTs for personal health tracking independently from an HCP. Being in control of the DT was mentioned frequently and included aspects with a negative influence on perceived safety, such as a lack of control (over HCRs), to ensure the integrity of the HCR and the DT. (Gaining) control over of the DT through analog backup/redundant measures was mentioned by a child with diabetes. These backup measures, such as a glucometer or spare batteries, could provide supportive ES in the case of (possible) DT failure. The patient, a child, also described her parents' control as a guarantee influencing ES. The patient's sister mentioned the DT (diabetes pump) itself as a strong factor for ES, as it took control through autonomous functions.

> "I can tell you how our parents feel about it: very, very safe. They know for a fact that when she's at school and has the pump, it's super safe (. . .)" (Family member, closed-loop system; 1st visit)

The domain "*prerequisites*" addressed the CDIF related to usage and implementation concerns associated with the DT, which was addressed in seven cases for ES and PS. These concerns reflected aspects such as legal restrictions on the choice of the DT. This domain also included the aspects of freedom from pain while using DTs and eliminating hazards.

> "(. . .) the risk of accidentally defibrillating yourself is simply too high. That would of course be a major safety hazard in terms of perceived safety. That can't actually happen here (with the DT) (. . .)." (HCP, simulation training in emergency care, 1st visit)

The way in which DTs are used, e.g., certainty about the physical wellbeing of HCRs and HCPs during the use of DTs, plays a role in perceived safety. In this context, the design and usage of DTs seemed to be particularly relevant because they pose a potential physical safety risk. In particular, the HCPs expressed the need for physical safety when DTs were used to support ES and PS.

The domain "*knowledge and competence*" addressed in nearly all of the cases (n = 9) encompassed two interdependent frequently mentioned CDIFs at the DT level: recipients' knowledge and competence toward the DT and familiarity based on regularity of use. These CDIFs reflect the perceived familiarity of the user, who develops knowledge, competences, and self-confidence through repeated or regular use, which supports ES and PS.

> "The content (of the app) gives me a sense of safety, and I learn a new what I have already read (. . .)" (HCR, sleep app, 2nd visit)

The latter CDIF was the most frequently mentioned by both the HCPs and HCRs. The need to develop a habit through the regular use of and early introduction to DTs was mentioned by the HCRs and HCPs of the robotic and VR technology use cases. Another CDIF that was frequently mentioned concerned the HCRs' knowledge of and competence in DTs and had a strong influence on ES. The CDIF related to self-confidence in DT use was mentioned mostly by vulnerable groups (the child and elderly individuals). This CDIF was strongly related to support during DT use, as mentioned by the HCRs. In the case of a lack of self-confidence, support in dealing with DTs independently was needed. Additionally, support and guidance are needed during DT use to improve ES.

The domain "*efficiency and effects*" (n = 8 cases) contained mostly PS, e.g., efficient healthcare provided by the DT as well as

the health and care effects associated with the DT. This domain was mentioned by both the HCPs and HCRs.

> "(. . .) I would actually like to be informed when I order something and it's done. (. . .) It would be much better for my safety and also for patient safety (. . .)" (HCP, hospital information system, 1st visit)

The accessibility of DTs was mentioned in the context of VR. The domain has been discussed much at the DT level, but some factors have also been addressed at the organizational level.

The domain "*data protection, transparency and security*" (n = 8 cases) was nearly evenly relevant to both ES and PS, expressed at all levels. The CDIF concerning secure data management and protection was addressed at the DT, organizational and system levels. The transparency of DT data management was a concern at the technology-organizational level, especially for the HCPs. The domain "*recognition of social interaction*" was also covered by 8 cases located at the DT level and included the exchange of experience with DTs between HCRs and HCPs, which enhanced perceived safety. A reduction or loss of familiar interpersonal interactions/relationships, e.g., between HCPs and HCRs, was related to low ES in the case of unmet needs. The opportunity for visual interaction independently of DTs was mentioned by the HCPs as a need to promote the doctor–patient relationship to promote feelings of safety for both parties. Inadequate healthcare because of limited interpersonal interaction due to the presence of DTs was mentioned by both the HCRs and HCPs using teletherapy, resulting in a low perceived safety.

The "*support*" domain (n = 7 cases) was almost exclusively mentioned by the HCRs. Support in the context of DTs was mentioned as a core dimension of the factors influencing ES and needs related to ES. The effective inclusion of medical expertise using DTs was related mostly to the technology level, whereas support was seen partly at the organizational level. The inclusion of medical expertise through DTs was discussed in cases where HCRs tracked their own health to increase perceived safety. The "*experience and perspective*" domain, which was represented in seven cases, addressed CDIFs related to ES and PS equally. The need for humans in healthcare and their irreplaceability by DTs was mentioned by an HCP in the robotic case. (Negative) feelings during DT use inhibited perceived ES, especially for vulnerable users.

The domain "*trust*" (n = 6 cases) was covered by only one CDIF at the DT level. The factor related to trust in and by HCPs was addressed by both HCRs and HCPs as relevant for ES. HCPs were seen as a mediator of trust in DTs. As HCP act as reference persons, their emphatic and credible interactions and the transfer of knowledge build trust. We observed that trust in human beings was greater than that in DTs and supported ES. The promotion of trust was also mentioned by the HCPs as a CDIF and CDN for successful implementation. The maintenance of trust in DTs was stressed, as was the presupposed relationship for further DT use.

The domains "*resources*" (n = 5 cases) and "*autonomy of recipients*" (n = 3 cases) were covered by only some CDIFs. Resource-efficient healthcare via DTs could lead to increased PS; in contrast, challenges and concerns about the effort and time involved in using DTs could hinder PS. A feeling of sovereignty and empowerment was gained through DT use, leading to ES.

Digital Technology and Target Group Related Perceived Safety

Across all of the technologies, the domains "design and handling," "control" and "technical functionality" were addressed in terms of feelings of safety. "Autonomy of recipients" was mentioned only in relation to apps, mobile electrocardiograms and video consultation tools. "Data protection, transparency and security" is mentioned in relation to apps, mobile electrocardiograms, robotics, hospital information system, video consultation tools and electrocardiogram patient simulation equipment.

We observed that various target groups held distinct perspectives on perceived safety. Most of the target groups covered many different domains. People with high to moderate levels of affinity for technology addressed domains such as "*design and handling*," "*efficiency and effects*," "*knowledge and competence*," and "*prerequisites*" with the latter involving usage and implementation concerns related to DTs. HCPs with a lower level of affinity for technology focused mainly on the reliability of digital health data.

Elderly participants expressed a strong need for an introduction to DTs by familiar and trusted persons for perceived safety. Human factors and involvement can significantly influence ES. HCPs, informal caregivers, and peer support all contribute to ensuring that vulnerable HCRs feel emotionally safe when adopting and using DTs. However, uncertainty in the independent use of DTs without support and uncertainty regarding the correct use and termination of DTs had negative effects on feelings of safety. In contrast, existing competences in relation to DTs had a positive impact on perceived safety among HCRs with low technical affinity.

DISCUSSION

This study provides multifaceted insight into the various participants' experiences of ES and PS, perspectives, and needs, providing valuable insights into improving the use, design, and implementation of DTs in healthcare contexts, captured by 13 domains. Akalin et al. [10] described six domains of perceived safety in the case of social human–robot interaction based on subjective and objective measures that were similar to ours: "*control*," "*trust*," "*experience*" and "*transparency*." Additional domains, such as familiarity and comfort, were indeed also mentioned in our study, but as subdimensions. These domains might have greater relevance for perceived safety, considering that the domains that we added, were probably related to a different set of DTs and the inclusion of both the HCP and HCR perspectives.

Our results showed that CDIFs were often related to each other from both the ES and PS perspectives. The finding that user friendliness was the most common factor in the domain "design and handling" was in line with the findings of Cimperman et al. [35]. User friendliness supports older adults' acceptance and adoption of telecare.

The studies by Nyholm et al. [12]. and Akalin et al. [10] indicated that robots must be reliable and predictable in terms of their actions

for patients to experience a sense of safety. DT reliability was also mentioned by Johannessen [11] in relation to the perceived safety of telecare and homecare professionals. In our study, we observed that reliable functionality is related to all other DTs that we have considered and that it should fit with the user's abilities, skills, and resources. However, in our study, the predictability was also rather specific to robotics, from an HCP perspective.

Control was also mentioned by Nyholm et al. [12]. Patients felt safe when they had control, e.g., over patient data. In addition, we were able to subdivide control into three sub aspects: "gaining control through the DT, being in control of the DT, and (gaining) control of the DT by analog backup/redundant measure." This highlights the complexity of this influencing factor. Control of one's own health through the use of DTs was often mentioned as a positive factor, but support from HCPs or family members was also always an influencing factor and need. As described by Zhou et al. [36], support plays a crucial role for elderly people. However, healthcare services lack the capacity for sustained assistance, making family members essential in helping elderly people adjust to the digital society [36]. We saw a need for support for several target groups and that resources were seen as a clear perquisite for PS. For HCPs, not only the PS and its associated influencing factors but also the ES of the HCRs were important. Of the seven HCPs, six also considered ES in the context of PS. Considering our findings, perceived safety during DT use deserves increased attention given the ES, PS and implementation consequences of interactions with DTs. Perceived safety in relation to DTs influences the usage behavior, thoughts, emotions, and needs of HCPs and HCRs, with low perceived safety leading to cautious or altered use and strong perceived safety encouraging regular use.

Limitations

Our research might have guided the focus of the participants only to perceived safety. However, our methods (e.g., think-aloud) provided the opportunity for other aspects related to the use of DTs. We were not able to cover all DTs according to the WHO classifications, but we had included a sample considering the perspectives of HCRs and HCPs and selected a variety of DTs in different settings. Credibility (validity) was increased by member checking during data collection, confirming the participants' responses and statements regarding their perceived safety. The results were triangulated later in the overall study to enhance dependability (reliability).

Conclusion

Perceived safety can have various consequences for further actions, feelings, and thoughts related to DT use. By considering the thirteen domains, we were able to identify core factors and needs in the context of perceived safety and DTs. When dealing with several DTs, special attention should be given to the context of perceived safety, target groups, ES and PS perspectives, settings, and DTs. ES and PS were determining factors in the acceptance of DT use and, therefore, the implementation success of DTs. To facilitate the adoption of these DTs, addressing these emotional needs becomes particularly important. The unmet needs of vulnerable HCRs should be considered because they often feel overwhelmed, uncertain, or insecure when faced with DTs, especially if they lack support. It is imperative to acknowledge these concerns to enhance ES. However, the interrelation of the PS with ES should also be considered. Finally, involving people from the early stages of developing DTs can help identify ES and PS needs and usability requirements and should be integral to the decision-making process of DT design in healthcare. Further research investigating quantitatively the relationship between the outcomes of increased or decreased perceived safety is needed.

ETHICS STATEMENT

The studies involving humans were approved by the ethical committee of Fliedner Fachhochschule Düsseldorf: 04/2022. Ethical advice from the Ethical committee Ärztekammer Nordrhein: 2022107. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by all participants, including the participants' legal guardians/next of kin.

AUTHOR CONTRIBUTIONS

DC and SK have developed the DEA in the context of the study aim, and DC, SK, AB, AK, and CV have developed the concept of data collection. AK, MV, SK, PM, and BH supported the recruitment of participants. MV and AK performed the DEA data collection. SK, AB, CV, and MV developed the data analysis design and MV, AB, CV, and LO conducted data analysis and synthesis. BH participated in use cases. PM, AK, CB, DC, and SK provided recommendations for literature. SK performed the supervision of the complete research. MV and SK prepared the manuscript. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.ssph-journal.org/articles/10.3389/ijph.2024.1607575/full#supplementary-material

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Psychological Safety and Work Design as Mediators of Supervisors' Dark Triad Traits Impact on Nurses' Task Performance

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Objectives: This study investigates how nurse supervisors' Dark Triad personality traits (Machiavellianism, narcissism, psychopathy) influence nurses' task performance, mediated by perceptions of enriched work design (autonomy, task variety, social support, safe work conditions, feedback quality) and psychological safety.

Methods: A multisource approach was used to collect data from 256 manager-nurse dyads across various healthcare settings. Nurses completed surveys assessing their work design and psychological safety. Managers completed a self-assessment of Dark Triad traits and rated their nurse subordinates' task performance. Confirmatory factor analysis and structural equation modeling (SEM) were used for analysis.

Results: Supervisors' Dark Triad traits core component impacted nurses' task performance indirectly, mediated by psychological safety and nurses' perceptions of their enriched work design. Psychopathic traits revealed a significant direct negative effect on nurses' performance, while other Dark Triad traits did not show direct effects.

Conclusion: This study sheds light on key factors influencing nurses' performance, offering insights for healthcare organizations aiming to optimize work environments and improve team effectiveness.

Keywords: psychological safety, dark triad traits, task performance, enriched work design, nurses work environment

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INTRODUCTION

In healthcare organizations, the performance and wellbeing of nursing professionals are critical for the effective delivery of patient care. As a result, various lines of research have focused on identifying the factors that influence nurses' performance and wellbeing [1–3]. Key determinants include work design, psychological safety, individual and interpersonal wellbeing, nurse staffing, availability of patient care resources, and the personality traits, management styles, and behaviors of supervisors. In the healthcare literature, such comprehensive environments are frequently described as "better care work environments" [1], "healthy work environments" [2], or "positive work environments" [4]. Collectively, these factors are often referred to in the literature as the nurses' work environment. These broader conditions have been identified as key determinants of nurses' wellbeing and performance [1, 3, 4].

One component of nurses' work environment is their work design. Specific dimensions of work design—such as decision-making autonomy, social support, performance feedback, safety work conditions, and skill variety—have been shown to significantly enhance nurses' wellbeing and performance [5–9]. Work designs featuring high levels of these attributes are often described as having an "enriched work design" [10–12]. Such enriched work designs not only support nurses' professional needs but also contribute to their overall job satisfaction and performance.

Another component of nurses' work environment are the leadership styles, behaviors, and personality traits of nurses' leaders or managers. Such attributes play a pivotal role in either reinforcing or undermining nurses overall work environments [2–4]. Leadership styles such as transformational leadership, inclusive leadership, and abusive supervision have been recognized as significant predictors of nurses' wellbeing and performance [13–17]. Recent studies have increasingly highlighted the role of leaders' nefarious personality traits, specifically those within the Dark Triad—Machiavellianism, narcissism, and psychopathy—in shaping workplace dynamics and outcomes. These traits, characterized by manipulation, self-centeredness, and a lack of empathy, have been linked to negative employee outcomes, such as decreased job satisfaction, increased stress, and impaired psychological safety, in various organizational contexts [18, 19]. Leaders exhibiting Dark Triad traits may foster a toxic work environment marked by fear, hostility, and mistrust [20, 21], significantly undermining the wellbeing and performance of their subordinates.

Finally, psychosocial factors, such as psychological safety and burnout, have been considered part of nurses' work environment [22–24], and shown to be affected by nurses' work design and their supervisors' styles and traits. In turn these psychosocial factors have been identified as antecedents of nurses' wellbeing and performance [22–25].

Despite the growing body of research on the effects of work design, psychosocial factors, and leadership characteristics on employees' performance and wellbeing, limited attention has been given to the impact of managers' Dark Triad traits within specific industries, including healthcare. Initial findings suggest that these traits may have differential impacts across different industries [26]. This gap is significant, considering the direct link between nursing professionals' performance and the quality and safety of patient care. Understanding how these personality traits influence nurses' experiences could provide valuable insights into preventing negative workplace environments and enhancing overall healthcare delivery.

To address this gap, the current study aims to explore the mechanisms through which managers' Dark Triad traits affect nurses' psychological safety, perceptions of their work design, and task performance. By examining these relationships, this research seeks to offer a more comprehensive understanding of how managers Dark Triad traits influence nurses' wellbeing and performance, ultimately contributing to more effective management practices in healthcare settings.

The Importance of Nurses' Work Environment in Their WellBeing and Performance

In healthcare organizations, the wellbeing and performance of nursing professionals are essential components that directly influence the quality of patient care and outcomes. Nurses are often at the frontline of patient interactions, providing critical care, monitoring patient health, and executing medical interventions. As such, their physical, emotional, and psychological wellbeing significantly impacts patient safety, satisfaction, and recovery rates. Studies have shown that when nurses experience high levels of job satisfaction and wellbeing, there is a marked reduction in medical errors, improved patient outcomes, and increased overall patient satisfaction [27, 28]. Conversely, poor wellbeing among nurses can lead to burnout, high turnover rates, and suboptimal patient care, which pose substantial risks to healthcare quality [27, 28].

Ensuring a supportive work environment for nurses is not just beneficial for the staff but also crucial for maintaining high standards of patient care. The nurses' work environment is a comprehensive concept that encompasses a wide range of factors influencing nurses' experiences and interactions within the workplace [1–4]. These factors can be structural, such as work design, nurse staffing levels, and the availability of patient care resources, or interpersonal, including the quality of relationships with colleagues, communication, and the management styles and personality traits of supervisors. Other elements like organizational culture, leadership support, professional development opportunities, and work-life balance also play a critical role in shaping the environment in which nurses operate. Together, these determinants influence how nurses perceive their work environment, impacting their engagement, satisfaction, wellbeing, and ultimately, their performance [1–4].

Enriched Work Design in Nursing

One component of nurses' work environment is the design of their work. Enriched work design refers to job characteristics that provide greater autonomy in decision-making, a variety of skills, social support, safe working conditions, and meaningful feedback, among other features [5, 12]. In the context of nursing, enriched work design has been associated with higher levels of job satisfaction, wellbeing, and performance [7, 8]. Attributes such as autonomy allow nurses to make decisions and execute tasks independently, promoting a sense of control over their work and professional accomplishment [2, 3, 29]. Nurses' skill variety and opportunities for continuous professional development keep their job stimulating, preventing burnout and fostering a sense of competence [9, 23]. Social support from colleagues and supervisors provides emotional and professional assistance, facilitates collaboration and teamwork, reduces feelings of isolation and enhances job satisfaction, work performance, and quality of care, which is essential in healthcare settings [2, 3, 30]. Furthermore, working conditions that ensure health and safety help reduce physical and mental stress, decrease the risk of injuries, and promote overall wellbeing, contributing to nurses' ability to provide high-quality

care [1, 3]. Finally, reliable feedback on performance helps nurses improve their skills and recognize their contributions [2, 31].

While each dimension of enriched work design can improve specific aspects of the work experience, the aggregate impact tends to create a more holistic and supportive work environment that optimizes employee wellbeing and performance [11, 12]. The combination of characteristics often leads to synergies that enhance overall outcomes more effectively than any single dimension on its own [32]. Synergistic effects occur when the positive impact of multiple job characteristics interacts to produce greater overall benefits, such as increased job satisfaction, wellbeing, performance, and reduced burnout [6, 31–33]. Several previous studies highlight these synergistic effects. Hackman and Oldham's model [10] posits that multiple job characteristics, such as skill variety, task identity, task significance, autonomy, and feedback, work together to create meaningful work experiences. They suggest that when these characteristics are all present in a job, they lead to higher motivation, satisfaction, and performance than any individual characteristic would in isolation. Recent research [6, 31, 32] emphasizes that enriched work designs involve the interplay of different factors like autonomy, feedback, and social support. These factors do not just add value individually, but interact to enhance employee engagement, learning, and wellbeing. For instance, autonomy combined with feedback fosters a learning environment, which supports professional development and better problem-solving. Another study [34] found that job resources such as autonomy, support, and opportunities for growth buffer against job demands and prevent burnout. This protective effect is particularly strong when multiple dimensions are present, highlighting the synergistic relationship between them [24]. Research in healthcare settings [35], found that when job autonomy is combined with supportive leadership and meaningful feedback, nurses experience lower levels of burnout and higher job satisfaction. The combination of these factors contributes to a more supportive environment, where nurses can thrive, and patient care quality improves. Overall, the evidence suggests that the synergistic effects of multiple job characteristics in an enriched work design is a critical component of a supportive work environment for wellbeing and optimize performance, which ultimately benefits patient care.

Psychological Safety in Nurses' Work Environment

A work environment that promotes psychological safety enables nurses to voice concerns, report errors, and suggest improvements without fear of punishment, fostering an atmosphere of trust and continuous learning [36–39]. Psychological safety is a key positive antecedent of nurses' performance [40]. Psychological safety refers to the extent to which nurses feel safe to take interpersonal risks, such as speaking up, surfacing concerns, or disagreeing openly, without fear of negative repercussions. It is considered crucial for nurses' performance due to its impact on individual and team dynamics within healthcare settings [22, 41]. In psychologically safe environments, nurses are more likely to seek feedback, learn from mistakes, and engage in both professional development and team learning. Research also indicates that psychological safety contributes to a positive work environment, promoting nurses' emotional wellbeing and job satisfaction [22], as well as serving as a buffer against burnout [41]. When nurses feel psychologically safe, they are more likely to communicate effectively with colleagues, leading to better coordination of care. This, in turn, positively influences patient safety and the overall quality of care [36, 37]. Furthermore, psychological safety acts as a mediator between various antecedents, such as leadership styles and work design characteristics, and behavioral outcomes, such as team learning behavior and task performance [15, 38, 39, 42–44]. For example, leadership can encourage psychological safety, creating the conditions for creative problem-solving and learning from errors [42, 43].

Previous research indicates that work design characteristics play a critical role in fostering psychological safety at work. Job Characteristics Theory proposes that work design has significant impact on employees' psychological states [10]. Specifically, Edmondson's seminal work [38] shows that task design, social support, skill variety, and feedback serve as antecedents of psychological safety. A later meta-analysis confirms that work design features like autonomy, job enrichment, and supportive work contexts significantly contribute to psychological safety by signaling trust and collaboration [39].

The Role of Leadership in Shaping Work Environments

Leadership is a pivotal factor in shaping the work environment and, by extension, the wellbeing and performance of nurses [15–17]. Different leadership styles—such as transformational, inclusive, and abusive leadership—have varying impacts on the work environment. Transformational leadership, characterized by inspiring and motivating employees to exceed their expectations and focusing on individual development, has been shown to positively influence nurse satisfaction, reduce burnout, and enhance patient care quality [16]. Inclusive leadership, which promotes a sense of belonging and values diversity, has similarly been linked to enhanced psychological safety and job satisfaction [15]. On the other hand, leadership behaviors associated with abusive supervision or toxic leadership can have detrimental effects on the work environment, leading to increased stress, reduced job satisfaction, and higher turnover intentions among nurses [17, 45]. Effective leadership is essential for fostering a positive work environment that supports nurse wellbeing, enhances teamwork, and promotes high standards of patient care.

Leaders' Dark Triad Traits Impact on Nurses' Work Design Perceptions and Psychological Safety

A less studied facet of leadership characteristics is the Dark Triad personality traits. Research indicates that the three Dark Triad

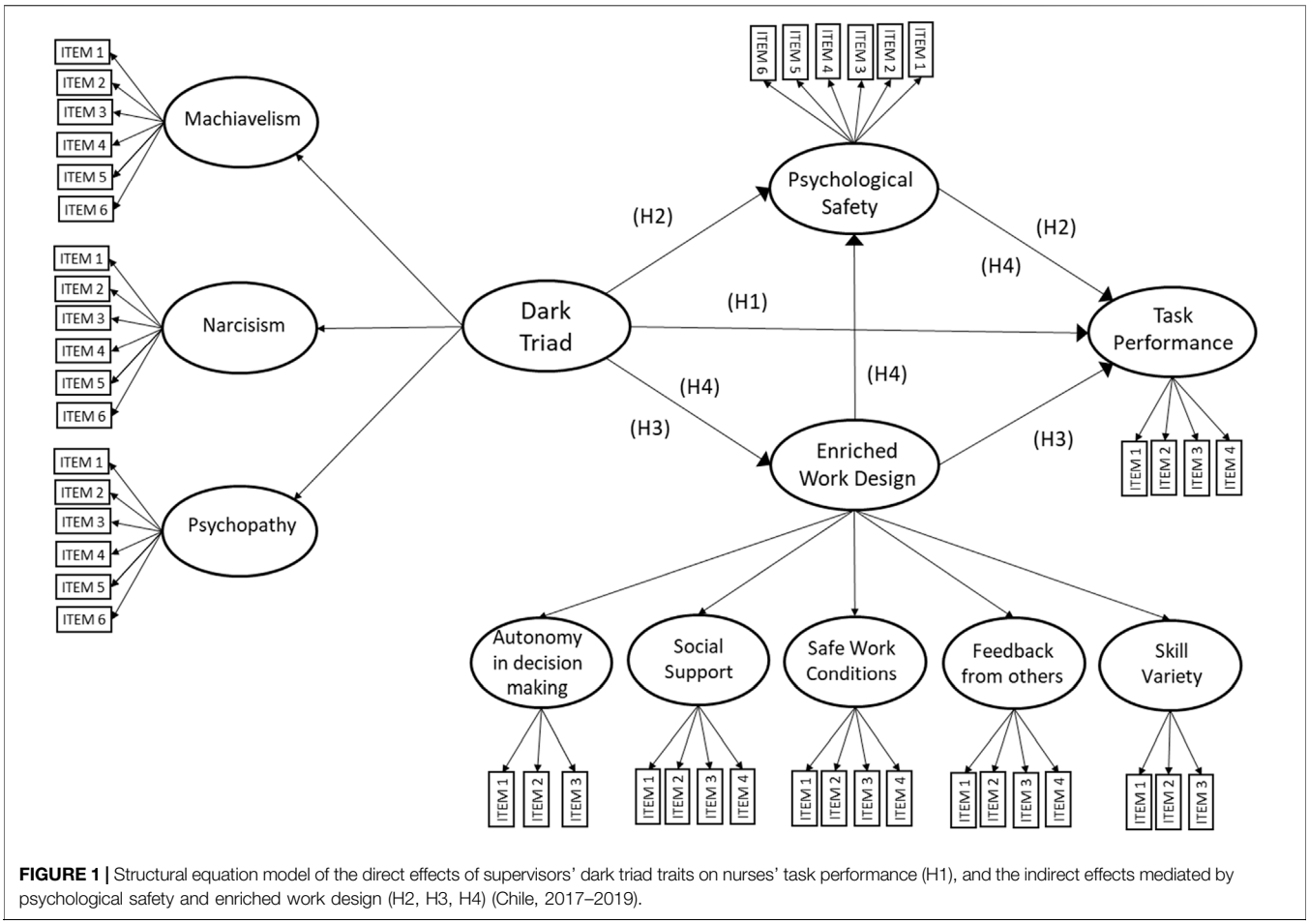

FIGURE 1 | Structural equation model of the direct effects of supervisors' dark triad traits on nurses' task performance (H1), and the indirect effects mediated by psychological safety and enriched work design (H2, H3, H4) (Chile, 2017–2019).

traits—Machiavellianism, narcissism, and psychopathy—while interrelated, represent conceptually distinct constructs encompassing different aspects of antisocial behavior [46]. Prior literature has identified a "core" component of shared variance among these traits, with proposed commonalities including lack of empathy or callousness, primary psychopathy components, and tendencies toward social dominance and power-seeking behavior [46]. Leaders who exhibit these traits often create toxic work environments characterized by fear, hostility, and mistrust, which can significantly impact employees' psychological safety, job satisfaction, career fulfillment, and overall wellbeing [17–20]. Within organizational settings, these traits have been consistently associated with increased workplace stress, diminished morale, and elevated turnover rates [47–49].

Recent studies beyond the healthcare sector have demonstrated that managers with pronounced Dark Triad traits negatively influence various employee outcomes, including job satisfaction, turnover intentions, career progression, wellbeing, and team performance. For example, subordinates working under managers with Dark Triad characteristics may engage in knowledge hiding as a defensive response to perceived threats [50]. These managers frequently manipulate task assignments, limit employee autonomy, and withhold positive feedback, resulting in increased stress and demoralization among their staff [17, 51, 52]. Furthermore, Dark Triad traits in supervisors, along with other forms of destructive leadership, typically undermine followers' perceptions of crucial job characteristics, such as decision-making autonomy, social support, and feedback quality [45, 53, 54], ultimately compromising followers' career success and wellbeing [55].

In healthcare, where the quality of patient care is paramount, the presence of Dark Triad traits in leadership roles could have particularly damaging effects. Leaders with these traits may undermine collaboration, discourage open communication, and foster a culture of blame, all of which are detrimental to patient safety, quality of care, and the collaborative and continuous learning of nursing work.

Current Study: Testing a Multiple Mediation Model

Although the negative effects of Dark Triad traits have been well-documented across various sectors [19–21, 26, 27], research examining their specific impact in healthcare settings remains limited. Given the unique demands of healthcare—such as collaboration, compassion, and patient care—the harmful

consequences of these traits could be particularly critical. Understanding how managers' Dark Triad traits influence nurses' psychological safety and work design is therefore essential for fostering environments that support both performance and wellbeing.

This study explores how supervisors' Dark Triad traits interact with work design to affect nurses' psychological safety and task performance. **Figure 1** presents a structural equation model that incorporates two key latent variables: the core factor of supervisors' Dark Triad traits and the second-order factor of enriched work design characteristics. By modeling DT traits as a second-order factor, this approach captures the collective toxic influence of Machiavellianism, narcissism, and psychopathy on work environment perceptions and performance outcomes [46]. Similarly, treating work design as a second-order construct reflects the combined effects of autonomy, skill variety, social support, and feedback in shaping nurses' experiences and performance [24, 32, 34].

Based on previous literature discussed above, three mediation pathways are proposed in the structural equation model in **Figure 1** to explain how supervisors' Dark Triad traits, work design, and psychological safety interact to influence task performance:

First, because supervisors' Dark Triad personality traits can negatively influence nurses' task performance, and because other mediation mechanisms not fully accounted for by the model have documented (e.g., increased stress, burnout, or reduced morale), it is proposed that some of the impact of supervisors' Dark Triad traits will have a direct effect on nurses' task performance (H1).

H1. Supervisors' Dark Triad personality traits are negatively related to nurses' task performance.

The first mediation hypothesis managers' Dark Triad traits are expected to negatively affect nurses' psychological safety. Leaders' high in Dark Triad traits may foster an environment where nurses feel unsafe to express concerns or take risks, fearing negative repercussions. This diminished psychological safety reflects a work environment where interpersonal risks are perceived to carry negative consequences, eroding trust and open communication. In such settings, nurses are less likely to perform effectively, as they lack the confidence and psychological security needed for optimal task engagement. Consequently,

H2. Psychological safety mediates the relationship between managers' Dark Triad traits and nurses' performance.

The second mediation path focuses on the impact of managers' Dark Triad traits on nurses' perceptions of their work design. Supervisors exhibiting such toxic traits are anticipated to negatively affect key dimensions of nurses' work design, such as autonomy in decision-making, social support, feedback from others, skill variety, and safe work conditions. These dimensions are essential for fostering an enriched work environment. However, when supervisors limit autonomy, provide insufficient feedback, or fail to support a safe work setting, nurses' perceptions of their work design deteriorate. This compromised work design is expected to result in lower task performance, as an enriched work environment is known to enhance engagement, job satisfaction, and overall effectiveness. Therefore,

H3. Enriched work design mediates the relationship between managers' Dark Triad traits and nurses' performance.

The third mediation hypothesis posits that nurses' perceptions of an enriched work design positively influence their psychological safety, which in turn improves task performance. When nurses perceive high levels of autonomy, skill variety, social support, safe working conditions, and meaningful feedback, these elements synergistically enhance their psychological safety, facilitating an environment of empowerment, trust, and respect. For example, autonomy enables nurses to feel in control of their work, while skill variety boosts their confidence in their competencies. Strong social support fosters trust and collaboration, making nurses feel valued and respected. Safe working conditions allow them to focus on their tasks without distractions or fears regarding their wellbeing. Meaningful feedback reinforces that their contributions are appreciated, encouraging open communication. Collectively, these factors create a supportive atmosphere where nurses feel secure to express concerns and take interpersonal risks, ultimately leading to improved task performance.

H4. Managers' Dark Triad traits negatively influence work design, which in turn affects psychological safety and ultimately impacts performance.

The following sections will present the methodology used to test these hypotheses, along with the results and discussion.

METHODS

Procedure

To test the proposed model a multisource approach was employed, where nurses work design and psychological safety was reported by nurses, while nurses' managers Dark Triad traits and nurses' task performance were reported by nurses' direct managers. The usage of different sources of information when collecting data from study measures decreases potential common method variance [56]. Each participant provided a written informed consent, acknowledging the voluntary nature of participation, confidentiality of information, and understanding the benefits and risks associated with collaboration.

Sample

A convenience sampling method was utilized across various healthcare centers and settings where nursing professionals were employed. The healthcare institutions size was classified by managers as belonging to the following ranges of number of employees (0–100: 38%, 101–500: 21%, 501–1,000: 18%, 1,001–5,000: 15%, 5,001–10,000: 3%, >10,000: 5%). Managers also classified if their healthcare organizations were part of the public sector (45.3%) or private sector (54.7%), and if their organizations were a profit (31.6%) or non-profit (68.4%)

TABLE 1 | Means, standard deviations and correlations for all variables (Chile, 2017–2019).

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Autonomy in decision making	3.71	0.70	(0.76)										
2. Social Support	4.04	0.72	0.27	(0.77)									
3. Skill variety	3.65	0.73	0.34	0.29	(0.85)								
4. Feedback from others	3.43	0.81	0.34	0.33	0.24	(0.78)							
5. Safe work conditions	3.96	0.73	0.24	0.35	0.21	0.27	(0.73)						
6. Machiavellianism	2.11	0.73	−0.17	−0.02	−0.09	−0.13	−0.08	(0.87)					
7. Narcissism	2.58	0.74	−0.15	−0.09	−0.09	−0.12	−0.13	0.50	(0.84)		—		
8. Psychopathy	1.63	0.57	−0.13	−0.12	−0.14	−0.11	−0.08	0.66	0.48	(0.81)			
9. Psychological Safety	3.69	0.73	0.18	0.31	0.23	0.31	0.24	−0.29	−0.19	−0.28	(0.88)		
10. Task Performance	3.98	0.70	0.12	0.31	0.24	0.20	0.18	−0.09	−0.04	−0.26	0.36	(0.87)	
11. Public (1)/Private (2) sector	1.55	0.50	−0.15	−0.03	−0.13	−0.14	−0.07	0.12	0.08	0.06	−0.11	−0.01	
12. Profit (1)/Nonprofit (2)	1.68	0.47	−0.04	0.06	−0.02	0.09	0.08	−0.00	0.07	0.07	0.04	0.05	−0.16

Note: Correlations > |0.12| are significant at p < *0.05; correlations > |0.16| are significant at* p < *0.01.*

organization. A total of 256 manager-nurse pairs responded with a complete data set and qualified for the study requirements. Inclusion criteria for nurses involved being a nursing professional without a managerial role, expressing interest in participation, and consenting to the informed consent. For nurse managers, inclusion criteria involved being the direct supervisor of participating nursing professionals for at least 6 months, demonstrating interest in participation, and accepting to the informed consent. Managers average age was of 51.51 years old, being 83.6% females, and team members averaged 39.65 years old in age, 87.9% of them being female. Average tenure of managers at their job position was 6.24 years, while average tenure of nurse workers was 4.18 years.

Measures

Five key dimensions of nurses' work design, including autonomy in decision making, social support, feedback from others, skill variety, and safe work conditions were measured using a Spanish adaptation [57] of The Work Design Questionnaire (WDQ) [58]. Dark Triad traits were measured in supervisors using six items for each triad dimension (Machiavellianism, narcissism, and psychopathy) using a self-assessment version of D3-Short questionnaire [59]. Psychological Safety was reported by nurses through Edmondson's scale [38], evaluating the extent to which nurses feel safe to take interpersonal risks in their work without fear of negative consequences. A four-item scale measuring nurses task performance was adapted from previous research [60, 61]. This supervisor-rated scale focused on nurses' effectiveness, excellence, quality of care, and adequacy in fulfilling their job responsibilities. All measures used a Likert-type response format with five rating points, where 1 indicates total disagreement and 5 indicates total agreement. We controlled nurses' education level, job and organization tenure, and age, which has been previously related to nurses' performance [1]. As well, we controlled the private/public, profit/non-profit nature of organizations, and organizational size, measured by number of employees.

Item translation for all surveys (except WDQ) was conducted using a separate translator, reviewer, and receptor [62] – all of whom were proficient in both English and Spanish. We conducted a pilot study with a small sample of respondents who judged the readability and comprehension of the translated version. Pilot participants' concerns were then discussed by the researchers, and appropriate changes were made to the final version of the surveys.

RESULTS

Statistical Analyses were made using SPSS 28 software for descriptive statistics, AMOS 28 software to perform confirmatory factor analyses, and to test the structural equation model (SEM) in **Figure 1**. As seen in **Table 1**, Cronbach's alpha reliability for all scales is above the 0.70 cut-off score, and therefore shows internal consistency [63]. The values for skewness (max = 0.10; min = −1.03) and kurtosis (max = 1.54; min = −1.07) for all items range between −2 and +2 – values, which are considered acceptable to indicate normal univariate distributions [64]. Correlation analyses show a significant positive relationship of all work design dimensions with psychological safety and with nurses' task performance. **Table 1** also shows a negative relation of the three components of Dark Triad with psychological safety. A negative relation is also significant between managers psychopathy trait and task performance, while Machiavellianism and narcissism traits had a negative but non-significant relation with nurse performance. The correlations of managers Dark Triad traits with all work design dimensions were in the expected direction, all negative, but not all of them achieved statistical significance.

A two-stage analysis was performed on data. First, a CFA was performed to test the construct validity of the measures, followed by structural equation modeling (SEM) analyses intended to test structural models [65]. Three CFA models were tested, and results are presented in **Table 2**. Model CFA-1 tested all items in the study in a single factor model achieving a poor fit (CMIN/DF = 4.28, CFI = 0.36, IFI = 0.35, RMSEA = 0.11). Model CFA-2 tested all items grouped into the four main factors of the study (work design, psychological safety, Dark Triad and work performance) which also shows a poor fit (CMIN/DF = 2.55,

TABLE 2 | Confirmatory factor analysis results comparing models with one factor, four factors, and a combination of second-order and first-order factors (Chile, 2017–2019).

	χ^2	df	CMIN/DF	CFI	IFI	RMSEA	LO 90/HI 90
Model 1	4229.54	989	4.277	0.355	0.349	0.113	0.110/0.117
Model 2	2510.40	893	2.554	0.696	0.693	0.078	0.074/0.082
Model 3	1428.60	954	1.467	0.910	0.909	0.043	0.038/0.047

Note: Model 1 is a single-factor model. Model 2 includes four distinct factors: enriched work design, Dark Triad traits, psychological safety, and task performance. In Model 3, the enriched work design encompasses five first-order factors: autonomy, social support, skill variety, safe work conditions, and feedback. The Dark Triad traits comprise three first-order factors: Machiavellianism, narcissism, and psychopathy, along with additional first-order factors for psychological safety and task performance. All χ^2 values significant at p < 0.01.

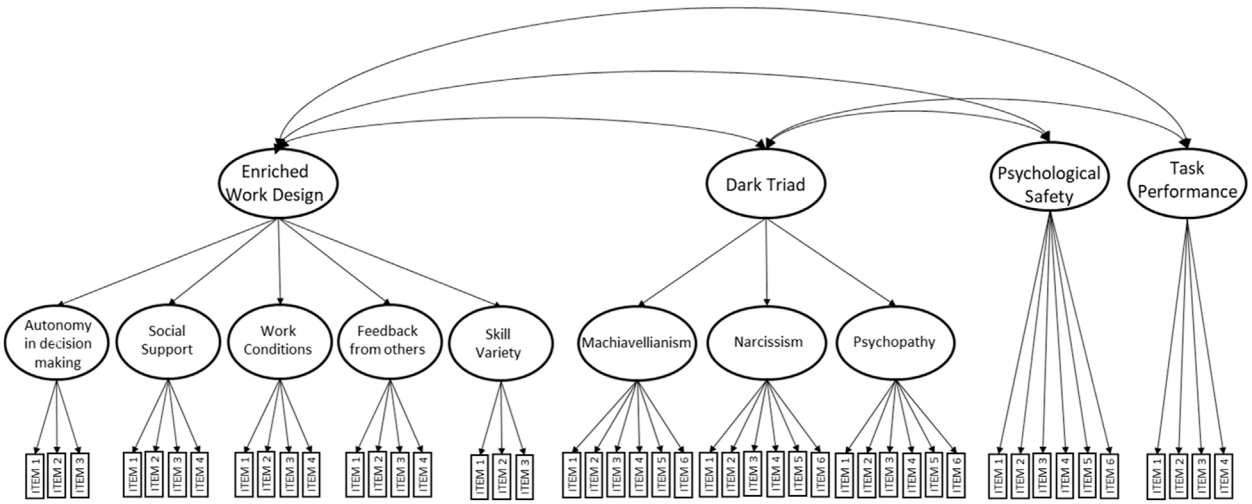

FIGURE 2 | The best-fitting Confirmatory Factor Analysis model CFA-3 (Chile, 2017–2019). Note: Model CFA-3 organizes work environment items into five first-order dimensions (autonomy in decision-making, social support, skill variety, safe work conditions, and feedback from others), which collectively contribute to an overall second-order work environment factor. Dark Triad items are grouped into three first-order factors (Machiavellianism, narcissism, and psychopathy), contributing to an overall second-order Dark Triad factor. Psychological safety and task performance items are assigned to two additional first-order factors. (CMIN/DF = 1.467; IFI = 0.910; CFI = 0.909; RMSEA = 0.043; LO90: 0.038, HI90: 0.047).

TABLE 3 | Analysis of direct effects and multiple mediation paths proposed in model 1: estimates and significance (Chile, 2017–2019).

Path	Standardized estimate (β)	Effect size	Standard error	*p*-value	Bootstrap confidence intervals (95%)	Significance
Direct Effects						
H1: DT → TP	–0.065	–0.089	0.102	0.384	[–0.289, 0.134]	Not Significant
Indirect Effects						
H2: DT → PS → TP	–0.058	–0.079	0.041	0.006	[–0.188, –0.019]	Significant
H3: DT → EWD → TP	–0.071	–0.097	0.063	0.013	[–0.287, –0.018]	Significant
H4: DT → EWD → PS → TP	–0.028	–0.039	0.023	0.007	[–0.111, –0.009]	Significant
Total Indirect Effects	–0.158	–0.216	0.075	0.001	[–0.423, –0.105]	Significant
Total Effects	–0.223	–0.304	0.184	0.025	[–0.777, –0.035]	Significant

Note: DT, dark triad traits; TP, task performance; PS, psychological safety; EWD, enriched work design.

CFI = 0.70, IFI = 0.69, RMSEA = 0.08). Model CFA-3 departs from model CFA-2 in that it arranges work design items into five first order dimensions (autonomy in decision making, social support, safe work conditions, skill variety and feedback from others) feeding a second order enrichened work design latent variable. Similarly, Dark Triad items are arranged into three first order factors (Machiavellianism, Narcissism and Psychopathy) which feed an overall second order Dark Triad latent variable. As seen in **Figure 2**, model CFA-3 has a much better fit that the other two CFA models (CMIN/DF = 1.467, CFI = 0.910, IFI = 0.909, RMSEA = 0.043), thus giving support to the Dark Triad and enriched work design latent variables.

Model SEM-1 tests the mediation hypotheses and direct effects proposed in this study (see **Figure 1**). Model SEM-1 shows a good fit of the data (CMIN/DF = 1.494; IFI = 0.904; CFI = 0.903; RMSEA = 0.044; HI90: 0.039 HI90: 0.049). **Table 3** presents the effect size and significance for the direct and indirect paths in the model. All model paths are significant except for the direct effect

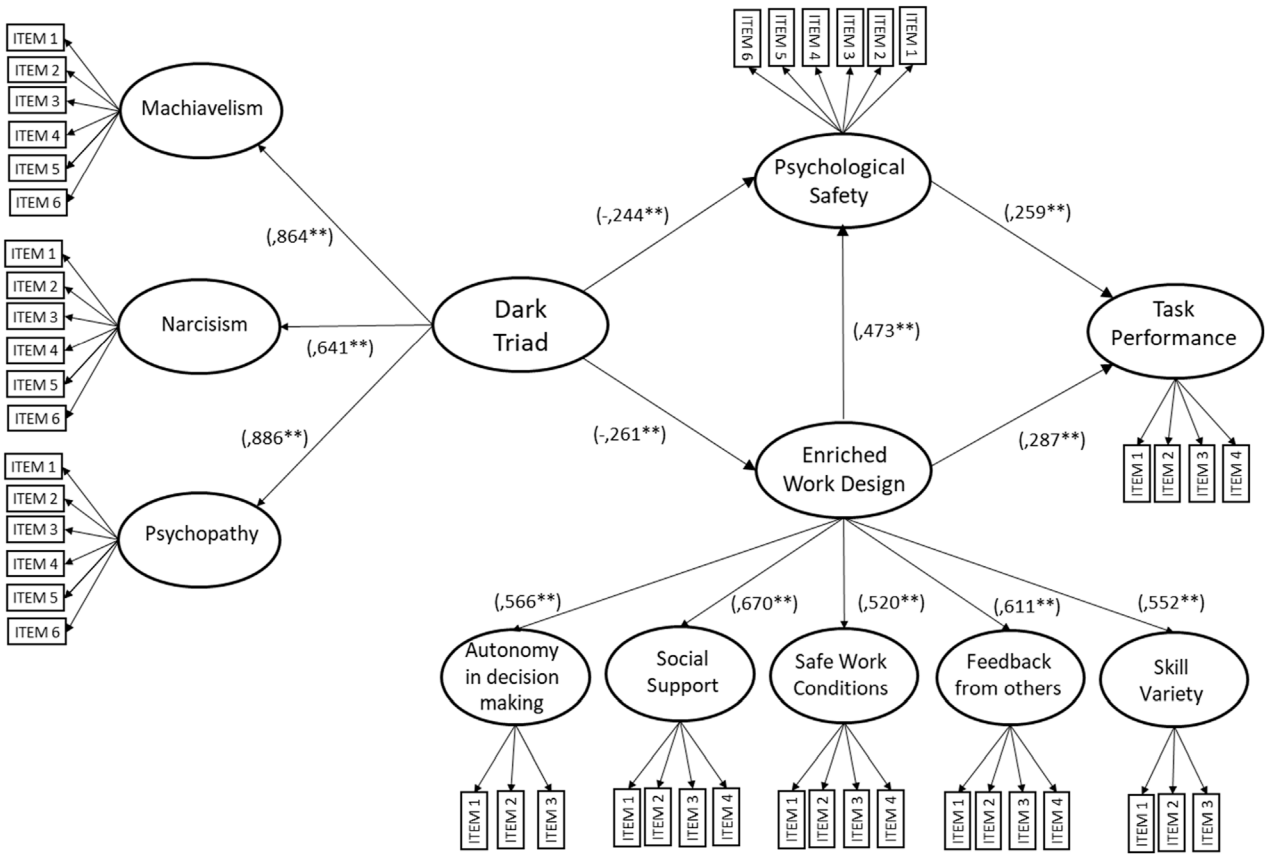

FIGURE 3 | Standardized coefficients for Structural Equation Model 2 predicting the indirect effects of Supervisors' Dark Triad Traits on Nurses' Task Performance, mediated by Psychological Safety and Enriched Work Design (CMIN/DF = 1.494; IFI = 0.904; CFI = 0.903; RMSEA = 0.044; LO90: 0.039, HI90: 0.049). Standardized Regression Weights in parentheses, $^{**}p < 0.01$ (Chile, 2017–2019).

of Dark Triad traits on task performance, which provides no support for H1. The indirect effect of Dark Triad traits on task performance through the psychological safety mediator is small but significant (effect size: −0.053; 95% Bootstrap Confidence Interval: [−0.114, −0.002]), providing support for H2. Additionally, the indirect effect of Dark Triad traits on task performance through the enriched work design mediator (H3) is also significant (effect size: −0.0599; 95% Bootstrap Confidence Interval: [−0.1151, −0.0142]). Finally, the serial mediation path, from Dark Triad traits through enriched work design, followed by psychological safety and leading to task performance, is significant as well (effect size: −0.053; 95% Bootstrap Confidence Interval: [−0.114, −0.002]), supporting H4. A model SEM-2 was tested, identical to model SEM-1, except that the direct path of Dark Triad on performance was eliminated, while retaining all other direct and mediation hypotheses of this study. No changes occurred to the model fit indexes (CMIN/DF = 1.493; IFI = 0.904; CFI = 0.903; RMSEA = 0.044), despite slightly strengthen significance for the rest of the model paths (see **Figure 3**).

Because correlations of Dark Triad dimensions were not all significant with task performance (see **Table 1**), we adapted model SEM-1 to separately test for the Machiavellianism, narcissism, and psychopathy traits, in replacement for the overall Dark Triad second order dimension. Post-hoc results indicate that when testing for the Machiavellianism trait alone, the mediation model has a good fit (CMIN/DF = 1.51, IFI = 0.93, CFI = 0.93 RMSEA = 0.045). However, the direct effect of Machiavellianism trait on task performance ($\beta = -.23$, $p > 0.712$). Similarly, when testing for the narcissism trait alone, the mediation model also has a good fit (CMIN/DF = 1.35, IFI = 0.99, CFI = 0.99 RMSEA = 0.043), but the direct effect of narcissism trait on task performance is not significant ($\beta = 0.08$, $p > 0.156$). In the case of the psychopathy trait, our data supported the mediation model (CMIN/DF = 1.53, IFI = 0.92, CFI = 0.92 RMSEA = 0.046). Interestingly, the direct effect of psychopathy traits on task performance is significant ($\beta = -.27$, $p < 0.001$).

Furthermore, since not all correlations between work design dimensions and Dark Triad traits were significant (see **Table 1**), we adapted SEM Model 1 *post hoc*, testing each work design dimension (autonomy, social support, feedback, skill variety, and safe work conditions) independently as mediators. Results for these direct and indirect paths indicate that none of the direct

paths from Dark Triad traits to task performance were significant: autonomy (β = −0.102, 95% CI [−0.589, 0.169], $p = 0.327$), social support (β = −0.128, 95% CI [−0.521, 0.114], $p = 0.212$), skill variety (β = −0.074, 95% CI [−0.051, 0.157], $p = 0.473$), safe work conditions (β = −0.076, 95% CI [−0.305, 0.126], $p = 0.485$), and feedback (β = −0.083, 95% CI [−0.319, 0.120], $p = 0.428$). Thus, Dark Triad traits did not directly influence nurses' task performance.

However, the indirect paths from Dark Triad traits to task performance via psychological safety were significant for all dimensions: autonomy (β = −0.173, 95% CI [−0.324, −0.086], $p < 0.001$), social support (β = −0.133, 95% CI [−0.263, −0.057], $p < 0.001$), skill variety (β = −0.147, 95% CI [−0.282, −0.073], $p < 0.001$), safe work conditions (β = −0.165, 95% CI [−0.312, −0.081], $p < 0.001$), and feedback (β = −0.147, 95% CI [−0.289, −0.068], $p < 0.001$). These results suggest psychological safety mitigates the negative effects of Dark Triad traits on task performance.

Finally, the direct paths from Dark Triad traits to task performance via specific job dimensions were not significant: autonomy (β = −0.008, 95% CI [−0.065, 0.029], $p = 0.536$), social support (β = −0.03, 95% CI [−0.131, 0.018], $p = 0.184$), skill variety (β = −0.04, 95% CI [−0.145, 0.000], $p = 0.047$), safe work conditions (β = −0.02, 95% CI [−0.119, 0.014], $p = 0.22$), and feedback (β = −0.019, 95% CI [−0.085, 0.005], $p = 0.132$). However, in the original model (**Figure 1**), where all work design dimensions were combined into an enriched work design second-order factor, the indirect mediation was significant (see **Table 3**), indicating that the combined effects of work design components are more influential than individual dimensions.

DISCUSSION

This study aimed to elucidate the mechanisms by which managers' Dark Triad traits (Machiavellianism, narcissism, and psychopathy) affect nurses' psychological safety, perceptions of enriched work design, and task performance in healthcare settings. The findings revealed significant mediation effects of psychological safety and work design on the relationship between Dark Triad traits and task performance, suggesting that these traits adversely influence performance primarily through their impact on work environment factors.

Theoretical Implications

The results underscore the critical role of psychological safety as a mediator in the relationship between managers' Dark Triad traits and nurses' task performance. Managers with elevated Dark Triad traits tend to create environments where nurses feel psychologically unsafe, inhibiting optimal performance. This finding aligns with Edmondson's theory, which posits that psychological safety is crucial for fostering high performance [38]. Our study demonstrates that the Dark Triad traits disrupt psychological safety, emphasizing the importance of maintaining a supportive work environment to enhance performance outcomes.

The identification of enriched work design as another significant mediator reinforces the idea that toxic leadership degrades essential job characteristics. Enriched work design is pivotal not only for psychological safety but also for task performance, as supported by job characteristics theory [10]. The synergistic effects of enriched work design, rather than isolated job dimensions, appear to buffer the adverse impact of toxic leadership. This holistic view highlights the importance of integrating job design improvements with leadership development initiatives.

Interestingly, despite the presence of managers with Dark Triad traits, nurses' task performance was still predicted in a positive direction. This suggests that while toxic traits negatively affect work conditions, the mediating effects of psychological safety and enriched work design can help buffer these influences. Research supports the idea that supportive environments foster resilience, enabling employees to perform effectively even under adverse leadership conditions [12, 15, 38]. These mediators act as protective factors, ensuring that positive work environment elements override negative leadership traits, leading to improved task performance.

Post-hoc analyses revealed that psychopathy had a direct, significant effect on performance, distinguishing it from Machiavellianism and narcissism. While the latter traits primarily exert their influence through mediation pathways, psychopathy seems to have a more immediate and detrimental impact. This finding supports prior research identifying psychopathy as the most toxic of the Dark Triad traits [21, 46]. Additionally, the confirmation of a second-order factor for enriched work design, and the significance of its mediation, suggests that these job characteristics function as an integrated construct, collectively influencing outcomes [24, 32, 34, 35].

Lastly, by extending the examination of Dark Triad traits to the healthcare sector, this study contributes to literature that has primarily focused on other industries. The absence of direct effects from Dark Triad traits—except for psychopathy—challenges prior assumptions of their uniformly negative impact [21], prompting a more nuanced understanding of their relationship with task performance.

Practical Implications

The findings hold significant implications for healthcare management. To mitigate the adverse effects of toxic leadership, organizations should prioritize initiatives aimed at promoting psychological safety and enriched work environments. Leadership development programs must focus on identifying and addressing Dark Triad traits among managers. Additionally, fostering environments where nurses experience an enriched work design is essential for enhancing performance and overall job satisfaction. The confirmation of second-order factors for Dark Triad and enriched work design characteristics suggests that interventions aimed at mitigating the effects of the Dark Triad or enhancing work design may benefit from a holistic approach that addresses these constructs as integrated entities rather than isolated traits or dimensions.

Strengths, Limitations and Future Research

This study's strength lies in its multisource data collection approach, which minimizes biases associated with common method variance, and the diverse sample drawn from various healthcare centers, enhancing the generalizability of the findings. However, limitations include the reliance on convenience sampling, which may restrict the representativeness of the results, and the focus on specific mediating factors without exploring others, such as emotional exhaustion or stress. Future research could incorporate these variables to further elucidate the direct effects of toxic leadership traits.

Future research should explore other mechanisms by which Dark Triad traits affect employee performance, including emotional exhaustion and burnout. Investigating the role of individual nurse characteristics—such as resilience or coping strategies—as moderators could provide valuable insights into the interplay between managerial traits and employee outcomes. Given the significant negative impact of psychopathy on task performance observed in this study, further research is warranted to understand how this trait uniquely affects healthcare settings compared to Machiavellianism and narcissism.

Conclusion

In conclusion, this study illuminates the pathways through which managers' Dark Triad traits impact nurses' psychological safety, work design, and performance. The findings emphasize the urgent need for healthcare organizations to address toxic leadership behaviors and cultivate supportive, well-designed work environments that promote high performance among nurses. Such efforts will not only enhance employee wellbeing but also improve patient care outcomes.

ETHICS STATEMENT

The studies involving humans were approved by Comité Ético Científico de Ciencias Sociales, Artes y Humanidades (Protocol ID: 161215011). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

MC and AR collected the data. AR and MC analyzed and interpreted the data. AR wrote the current version of the manuscript. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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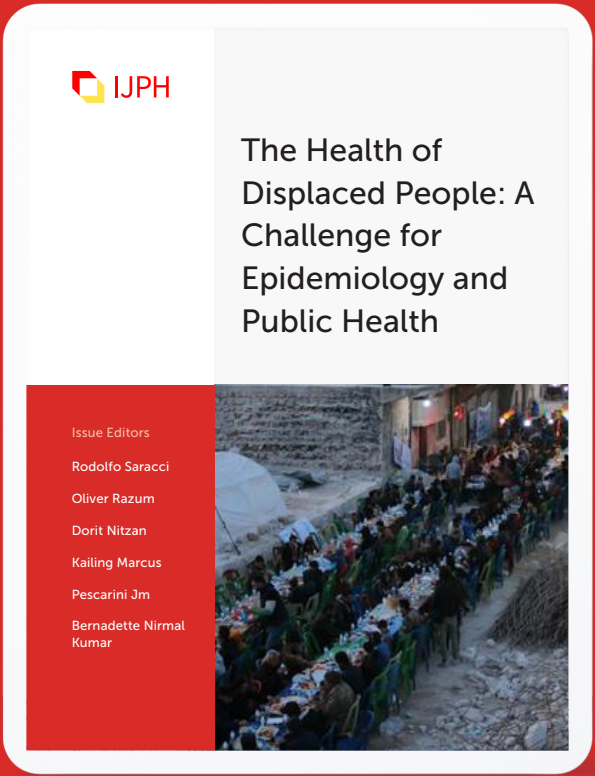

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