Occupational health and organizational culture within a healthcare setting: Challenges, complexities, and dynamics

Edited by
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Occupational health and organizational culture within a healthcare setting: Challenges, complexities, and dynamics

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Editorial: Occupational health and organizational culture within a healthcare setting: challenges, complexities, and dynamics

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Editorial on the Research Topic
Occupational health and organizational culture within a healthcare setting: challenges, complexities, and dynamics

The ever-changing healthcare demands and the challenges posed by global health crises have prompted the healthcare sector to give increased importance to occupational health. Stemming from the realization that a productive and sustainable workforce is rooted in the health and wellbeing of workers, there is growing interest in formulating and implementing strategies that help identify, prevent, and manage occupational health risks (1). This trend is expected to continue as employers aim to enhance the health and safety of their employees while improving organizational culture, performance, and competitiveness (2–4). Institutional priorities have shifted significantly to focus on providing sufficient support to healthcare workers in these areas. Recent papers, some of which are featured in this Research Topic, explore various facets of this topic, such as the nuanced interplay of labels and concepts in healthcare settings and how to approach learning when the system fails and patients are harmed (Wiig et al.). The research reported in this Research Topic features the critical role of professional engagement, the challenges and solutions surrounding workplace violence, and the need for continuous training in fields like nursing (Al-Mugheed et al.; Wang, Tang et al.; Yu et al.). Moreover, these studies emphasize the importance of adaptability and resilience in healthcare systems and teams (Fagerdal et al.).

The wellbeing of healthcare professionals, encompassing their physical, mental, and emotional health, is deeply intertwined with the quality of care delivered to patients (5). Organizational culture plays a pivotal role in this dynamic, setting the tone for how healthcare professionals engage with their work, colleagues, and patients. A positive and supportive organizational culture fosters collaboration, continuous learning, and resilience, directly contributing to enhanced patient outcomes and professional satisfaction. Conversely, a negative culture can lead to burnout, reduced efficiency, and compromised patient care (3). As such, understanding and cultivating a healthy organizational culture is critical for the holistic wellbeing of healthcare professionals and the patients they treat (6). Examining these issues, several papers on the Research Topic offer valuable insights into the influence of organizational culture on healthcare providers and their patients. For instance, the study by Babaie et al. in neonatal intensive care units explores the multifaceted nature of

safety culture from the perspective of frontline medical staff in Iran. Ellis, Tran et al. showed the adaptability and resilience of healthcare systems during challenging organizational changes, emphasizing the role of a supportive workplace culture in their empirical study of an Australian hospital undergoing significant transformation. The poignant commentary from Montgomery and Lainidi, highlights the urgent need for systemic shifts in healthcare organizational cultures, a sentiment further amplified by the global challenges presented by the COVID-19 pandemic. In a different cultural setting, Wang, Zhang et al. developed a scale for the hospital organizational environment in China, reflecting its vital role for understanding the values and behaviors of both clinicians and nursing staff. As the world continues to grapple with the COVID-19 crisis, the case study by Paquay et al. recounts the benefits of post-shift clinical debriefings, signifying the integral role of organizational strategy in ensuring patient safety and bolstering clinician wellbeing. Lastly, the salient perspective article by Ellis, Falkland et al. critically reflects the intricacies and challenges tied to defining, measuring, and improving safety culture in healthcare. Understanding organizational culture is crucial, as it directly influences the mental wellbeing of its workers, shaping workforce burnout and staff retention. In the aftermath of the COVID-19 pandemic, burnout is one of the most prevalent staff wellbeing problems, with the ability to being able to retain and attract healthcare workers being fundamental to the ability to provide healthcare services in the future.

An integral aspect of occupational health, especially in sectors like healthcare, is understanding and addressing professionals' mental and emotional wellbeing. The psychological state of health care workers can significantly affect their cognitive capacity, influencing their performance, decision-making, and interactions with others (7). The psychological wellbeing of healthcare professionals, including their emotional resilience and coping mechanisms, can also directly influence the quality of care they provide to patients. This mental and emotional health is affected by the demands of their profession and work environments. Examining these concerns, several papers within this Research Topic shed light on the intricate relationship between the psychological health of healthcare workers and the environments they navigate. For instance, Seaward et al. highlight the occupational health and safety issues within residential aged care, suggesting potential neglect of worker wellbeing. Arad et al. investigated the interplay between teamwork and the psychological safety of surgical staff in Israel. Similarly, a study conducted in Germany by Treusch et al. examined the association between job satisfaction and the mental health of physician assistants, which encompassed facets such as general job satisfaction, work-related factors, and mental health indicators. This study paints a comprehensive picture of the challenges experienced. Yang et al. explored job burnout among primary health workers in China, illuminating the protective role of work-family support. The demanding nature of anesthesia work and its implications for staff wellbeing is captured in the study from Khalafi et al. The detrimental effects of incivility in hospitals, as discussed by Pavithra et al., emphasize the significance of a respectful and nurturing workplace culture for maintaining staff wellbeing. Together, these papers demonstrate the profound impact of workplace environments on the psychological health of healthcare

professionals and, consequently, the care and care quality they deliver to patients.

In the complex and dynamic landscape of healthcare, the importance of the wellbeing of healthcare workers stands out more than ever. Occupational health plays a significant role in determining the quality and efficiency of patient care. As global health challenges continue to emerge, healthcare professionals' resilience, adaptability, and mental fortitude are tested, underscoring the need for supportive and nurturing workplace cultures. The research presented in this Research Topic serves as a testament to the impacts on safety and wellbeing of the intricate relationship between organizational culture, workplace environment, and the health of healthcare professionals. It reinforces the idea that a positive organizational culture uplifts the spirits of those working within its confines, directly translating to better patient outcomes. As we reflect on these findings, several questions arise: How can healthcare institutions uphold and enhance positive organizational cultures amidst resource constraints and mounting external pressures? What measures can be taken to bridge the gap between recognizing the importance of occupational health and implementing effective solutions? How can interventions be tailored to address the unique challenges diverse healthcare settings face worldwide? And given the ongoing impact of the COVID-19 pandemic, how can healthcare systems better equip themselves-both in terms of infrastructure and the wellbeing of their healthcare workers-to respond to future global health crises? The insights gleaned from this Research Topic show a pressing need to prioritize and invest in the wellbeing of healthcare professionals. As the backbone of the healthcare industry, their physical and psychological health inevitably determines the quality of care patients receive. Moving forward, it is imperative for stakeholders at all levels, from policymakers to hospital administrators, to commit to fostering environments that champion the holistic wellbeing of healthcare professionals, thereby ensuring a brighter and healthier future for all.

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Patient safety and staff psychological safety: A mixed methods study on aspects of teamwork in the operating room

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Objectives: To predict the amount of teamwork that takes place throughout a surgery, based on performing a preoperative safety standards (surgical safety checklist and surgical count) and to explore factors affecting patient safety and staff psychological safety during a surgery, based on interprofessional teamwork.

Methods: This mixed methods study included quantitative and qualitative analyses. Quantitative data included 2,184 direct observations of surgical cases with regard to the performance of safety standards during surgeries in 29 hospitals, analyzed using multivariate binary logistic regressions. Qualitative data were obtained from an analysis of 25 semi-structured interviews with operating room (OR) clinicians and risk managers, using an inductive thematic analysis approach.

Results: Analysis of the OR observations revealed that a lack of teamwork in the preoperative "sign-in" phase doubled the chances of there being a lack of teamwork during surgery [odds ratio = 1.972, 95% confidence interval (CI) 1.741, 2.233, $p < 0.001$] and during the "time-out" phase (odds ratio = 2.142, 95% CI 1.879, 2.441, $p < 0.001$). Consistent presence of staff during surgery significantly increased teamwork, by 21% for physicians and 24% for nurses ($p < 0.05$), but staff turnover significantly decreased teamwork, by 73% for physicians ($p < 0.05$). Interview data indicated that patient safety and staff psychological safety are related to a perception of a collaborative team role among OR staff, with mutual commitment and effective interprofessional communication.

Conclusions: Healthcare organizations should consider the key finding of this study when trying to identify factors that affect teamwork during a surgery. Effective preoperative teamwork positively affects intraoperative teamwork, as does the presence of more clinicians participating in a surgery, with no turnover. Other factors include working in a fixed, designated team, led by a surgeon, which functions with effective interprofessional communication that promotes patient safety and staff psychological safety.

Introduction

Patient safety is an ongoing concern in operating rooms (OR) due to the complex work environment, a high level of stress, and vulnerable patients (1, 2); these factors can lead to the occurrence of errors and patient harm. Additionally, standard safety checks to prevent errors are sometimes omitted or not fully performed (3). Teamwork is a major component in the promotion of safety; however, most surgical teams include clinicians from various disciplines, with differing priorities, roles, backgrounds, and expertise (4). Although they share the goal of providing safe and successful surgical care (5, 6), they are susceptible to errors such as performing wrong-site surgery (2). Major errors in the OR, or surgical "Never Events" (such as wrong-site surgery and retained foreign items during surgery) are preventable, unjustifiable adverse events that should be reduced through quality improvement that involves better teamwork (7).

Effective teamwork is an essential component of safe surgery (8). Teamwork is defined as a dynamic process involving two or more healthcare professionals with complementary backgrounds and skills, sharing common health goals (9–13). A surgical team is defined as comprising "professionals of different disciplines, educational backgrounds, and experiences (who) must work interdependently in a dynamic, high-stakes environment" (14). Surgical outcomes are strongly dependent on communication and cooperation among the surgical team (15–18). Thus, ineffective teamwork is linked to poorer surgical outcomes for patients and reduced patient safety that can result in adverse events (19).

Teamwork is not only related to patient safety. Some of the factors that inhibit teamwork can be explained by the concept of staff psychological safety. Psychological safety represents a shared belief among a team that it is safe to engage in interpersonal risk-taking, this feeling being necessary for team learning and working toward a common goal (20). Generally, poorly defined tasks and a lack of resources lead to a poor sense of psychological safety, whereas leadership, trust among team members, and an ability to solve problems (21) engender an environment that fosters empowerment (22). Consistent with this notion, studies have shown that empowered and enhanced practice entails teamwork, communication, and supportive supervision, which is associated with improved team performance and to a lesser extent with patient outcomes (23).

Bates and Singh (24) described the importance of policies to prevent both previously known and unanticipated risks. Surgical safety standards promote and enable a sense of staff psychological safety during a surgery in order to prevent Never Events (25). The World Health Organization's surgical safety checklist and the use of surgical counts require collaboration between nurses and physicians, thereby encouraging intra- and inter-disciplinary teamwork (26).

In this study, we analyzed the effect of preoperative teamwork on intraoperative teamwork between physicians and nurses in relation to adherence to safety standards and staff turnover; we also evaluated the concepts of individual and team role definitions in relation to safety. We used a mixed methods design, because quantitative data can provide only a partial understanding of effective teamwork, while an analysis of qualitative data enabled us to refine and explain the quantitative results by exploring participants' views regarding teamwork and aspects of staff psychological safety (27).

Methods

The current study used a triangulation, mixed methods convergence design to analyze teamwork in the OR (28). It included a retrospective cohort study that used data captured from observations of safety standards in the OR to predict the level of teamwork throughout a surgery; we also conducted purposive recruitment of individuals to participate in semi-structured interviews regarding their perceptions of safety in the OR (29).

Participants

Quantitative dataset

Observers recruited by the Israeli Ministry of Health (MOH) observed the adherence to surgical safety standards during surgical cases in terms of quality control and patient safety assessments, in 29 general hospitals (based on the MOH criteria for a general hospital) in Israel between December 2018 and May 2021. Five large hospitals had >800 beds, 10 medium hospitals had 400–800 beds, and 14 small hospitals had <400 beds. Seven of the hospitals were in rural areas and 22 in urban areas.

Qualitative dataset

We interviewed 25 individuals, comprising OR clinicians (anesthesiologists, surgeons, and nurses with management positions who currently practice in ORs) and risk managers from general hospitals and the MOH, based on what we anticipated to be sufficient to achieve data saturation. Five risk managers were from the MOH, and 20 interviewees were clinicians and risk managers from eight hospitals (four large hospitals with >800 beds, two medium hospitals with 400–800 beds, and three small hospitals with <400 beds; five were in urban areas and three in rural areas).

Data collection

Quantitative observations

We used data from 2,184 different surgical cases; the data were collected by the MOH using accepted guidelines for making direct observations. The direct observations were performed by trained observers on the performance of a surgical safety checklist and surgical counts throughout a surgery, based on international and national guidelines for their performance. The surgical cases observed were selected at random by the observers from the planned operations plan in each OR on the day of observation, taking care to not always observe the same team members. The observations were performed by physicians, medical students, nurses, or nursing students. All observers underwent simulation training for 8 h. To ensure observers were competent, observers with >5% discordance between their observation entries and the expected entries in the simulation were not allowed to perform the observations. For the purposes of our study, we chose items in the surgical safety checklist and surgical counts that represent teamwork throughout a surgery, as they require the mutual performance of more than one team member, for example, two nurses or a physician and a nurse, or the mutual performance of all team members present for a surgery (Appendix 1). In the surgical cases observed there were no observations involving the occurrence of Never Events.

Qualitative semi-structured interviews

The 25 interviews were conducted between September and December 2019 by one of the authors (DA). Participants were approached based on their professional position and the size and location of their hospital (Appendix 2). The interviews were audio recorded and the recordings were transcribed verbatim. Participants provided verbal consent to participate and received no compensation. The interviews were conducted in person at the participants' offices and lasted an average of 20 min.

Field notes were taken by one of the authors (DA) during and immediately after each interview, in which the interviewees described factors contributing to surgical errors and Never Events, and recorded any nonverbal reactions, such as anger or discomfort, during the interview.

Analysis

Quantitative analysis

The statistical software package SPSS-25 was used to analyze the data captured during the observations. A multivariate logistic regression model was used to predict the level of teamwork during a surgery based on two measures: the level of preoperative teamwork as a predictor of teamwork during surgery and the effect of staff presence and turnover on teamwork.

Preoperative teamwork

The variable representing a lack of preoperative teamwork included seven items (Appendix 1), expressing the level of team collaboration when performing a surgical safety checklist during sign-in and time-out phases right before the beginning of a surgery. A lack of teamwork was defined as the number of items in which the team did not work together. We ranked the variable from 0 to 7 (where 0 represents the most teamwork and 7 represents the least).

Intraoperative teamwork

The variable representing intraoperative teamwork was created from four items performed during the second surgical count (Appendix 1). At that point, two nurses perform the surgical count together and include the surgeon in the process. A lack of teamwork was defined as the number of items on which the team did not work together. The variable was ranked from 0 to 4 (where 0 represents the most teamwork and 4 represents the least).

Staff presence and turnover

To evaluate the effect of staff turnover throughout a surgery on teamwork, we created two variables. The first evaluated the mean number of physicians (anesthesiologists and surgeons) and nurses participating in sign-in, time-out, and second surgical count throughout the surgery. The second evaluated the standard deviation (SD) of the number of physicians and nurses present during a surgery to represent staff entering and leaving the OR. For this measure, the higher the number, the higher the turnover (0 represents no change).

Qualitative analysis

The interviews analyzed factors that contribute to surgical Never Events in the OR. The interview guide (Appendix 2) was developed based on opinions from clinicians and risk management experts and the categories of contributing factors evolved inductively from the interviews. To test the interview guide, two pilot interviews with two participants were conducted, after which one question was omitted due to lack of relevance to the study. The data from the pilot study were added to the final analysis.

For the qualitative analysis, we used the six-phase inductive thematic analysis approach described by Braun and Clarke (30):

(1) Data familiarization—two investigators (DA and AF) independently read and re-read the transcripts to establish familiarity with the data and to search for possible meanings and patterns.
(2) Generating initial codes—the initial codes were independently generated from the data by two investigators

(DA and AF) to generate topics of interest, following an inductive coding approach.

(3) Searching for themes—the various codes were sorted into potential patterns (themes) and all relevant coded data extracts were coded within the identified themes and sub-themes. This phase was led by DA and completed with AF and RR.

(4) Reviewing themes—themes were reviewed by DA and AF, and broader code groups were created for each theme and entered into Microsoft Excel, version 16.0. Any disagreements about the codes used were discussed among all four investigators (DA, AF, RM, and RR).

(5) Defining and naming themes—DA and AF re-coded the themes and sub-themes, then extracted and detected the story that each theme told and considered whether it fit into the broader context of our data. Each sub-theme was given a final name.

(6) Producing the report—the final themes were analyzed and synthesized into results that were presented in a final report, reviewed by RR and RM.

We followed Tracy's (31) accepted criteria for qualitative best practices, which we have used previously. Transparency was maintained throughout the process of sorting, choosing, and organizing data. The rigor of data analysis was achieved through the development of a rational framework to transform and organize raw data into the research report. Two investigators (DA and AF) analyzed the data and shared it with the rest of the research team to ensure triangulation. Finally, the information was continuously shared with team members during the analysis, with their input based on their various types of professional expertise, strengthening the credibility of the analysis.

Results

Observations

We used data from 2,184 surgical cases. Most were general surgeries (37.5%), and most lasted for 1–2 h (53.3%). At the three surgical phases observed, three physicians (SD 0.9–1.02) and two nurses (SD 0.52–0.58) were present (Table 1).

Preoperative and intraoperative teamwork

The effects of the preoperative variables on intraoperative teamwork, based on the results of the multivariate binary logistic regression model, are shown in Table 2. The variables tested (amount of preoperative teamwork in the sign-in and time-out phases and the effect of staff presence and turnover on

teamwork) predicted a lack of teamwork [$\chi^2_{(6)} = 408.110$, $p < 0.0001$, Nagelkerke's $r^2 = 0.236$]. When testing for multicollinearity, none of the independent predictors' variance inflation factor (VIF) exceeded 1.25, supporting the absence of collinearity. There were no significant differences in relation to hospital location ($p > 0.05$) or size ($p > 0.05$).

Regarding preoperative variables, the effect of each incidence of not performing a sign-in almost doubled the chances of a lack of teamwork when the second surgical count was performed during surgery [odds ratio = 1.972, $p < 0.001$, 95% confidence interval (CI) 1.741, 2.233]. A similar effect was found for not performing the preoperative time-out (odds ratio = 2.142, $p < 0.001$, 95% CI 1.879, 2.441).

The variable of consistent staff presence in the OR revealed a "protective" effect of a minimum mean absolute number of staff and a "harmful" effect of staff turnover during the surgery. Each increase in the number of physicians or nurses decreased the chance of a lack of teamwork by 21 and 24%, respectively ($p < 0.05$). However, each increase in the turnover of physicians reduced the chance of teamwork by 73%. A similar but non-significant trend was seen with the turnover of nurses ($p = 0.068$). There was no significant difference in the results in relation to a hospital's size or location.

Semi-structured interviews

We interviewed 25 clinicians and risk managers who held administrative roles (Table 3). Most were female with more than 30 years of experience. The interviewees were not observed during the quantitative observations of safety standards.

We identified four main themes regarding the relationship between teamwork and patient safety and staff psychological safety: (1) perception of individual role vs. collaborative team role; (2) team leadership; (3) team characteristics (designated team and team communication); and (4) recommendations to improve teamwork. These themes are expanded upon below.

Individual vs. collaborative role

Most physicians and nurses viewed patient safety as their individual responsibility and not that of the team. Most nurses with more than 10 years of experience perceived themselves to be the safety supervisor during a surgery. Their comments included: "We are in charge of implementing the standards in the OR. We supervise how they are performed." and "Nurses have a huge responsibility. They stop dangerous work processes before harming the patient."

A surgeon, however, thought that nurses' supervisory role negatively affected their relationship with a surgeon and thus affected the safety and success of a surgery: "Nurses are not nurses anymore. They are a control system that controls and criticizes physicians. They check us all the time. Instead of

TABLE 1 Characteristics of surgeries observed.

Characteristic		Observations, number, and percentage of total surgeries ($N = 2{,}184$)
Surgical specialty	General surgery	820 (37.5%)
	Orthopedics	431 (19.7%)
	Gynecology	239 (10.9%)
	Otolaryngology	216 (9.9%)
	Urology	177 (8.1%)
	Plastic surgery	89 (4.1%)
	Vascular surgery	58 (2.7%)
	Cardiology	55 (2.5%)
	Ophthalmology	51 (2.3%)
	Neurosurgery	39 (1.8%)
Duration of surgery*	>1 h	361 (16.5%)
	1–2 h	1,164 (53.3%)
	2–3 h	196 (9%)
	3–4 h	360 (16.5%)
	>4 h	103 (4.7%)
Number of physicians present at the surgical phase (mean ± SD)	Time out	3.28 ± 0.97
	First surgical count	3.02 ± 1.02
	Second surgical count	3.18 ± 0.90
Number of nurses present at the surgical phase (mean ± SD)	Time out	2.30 ± 0.57
	First surgical count	2.29 ± 0.58
	Second surgical count	2.22 ± 0.52

*Duration of surgery is represented in categories of hours, 1 min differentiates between categories.
SD, standard deviation.

TABLE 2 Results of the binary logistic regression predicting a lack of teamwork throughout a surgery.

Variable	Odds ratio	95% CI for odds ratio		p-Value
		Lower	Upper	
Lack of teamwork at preoperative sign-in	1.972	1.741	2.233	<0.001
Lack of teamwork at preoperative time-out	2.142	1.879	2.441	<0.001
Mean number of physicians participating in the surgery	0.830	0.726	0.950	0.007
Mean number of nurses participating in the surgery	0.798	0.642	0.992	0.042
SD of the number of physicians participating in the surgery (turnover)	1.258	1.001	1.580	0.049
SD of the number of nurses participating in the surgery (turnover)	1.227	0.985	1.528	0.068

SD, standard deviation.

focusing on their nursing role, they sit and write what the physicians are doing instead of helping them."

Anesthesiologists' opinions differed. Most viewed themselves as individual safety supervisors: "This is the essence of our role. To assess and evaluate the work environment all the time and make sure everything is working properly." "Often, I inform the surgeon about relevant background diseases that his patient has. I don't think this is my role, but I see myself as a

TABLE 3 Characteristics of interviewees.

Characteristic		Respondents, N (%) (N = 25)
Sex	Male	10 (40%)
	Female	15 (60%)
Profession	Anesthesiologist	6 (24%)
	Surgeon	3 (12%)
	Nurse	9 (36%)
	Risk manager (physicians and nurses)	7 (28%)
Experience in profession, years	1–9	0 (0%)
	10–19	5 (20%)
	20–29	7 (28%)
	30–39	10 (40%)
	>40	3 (12%)
Experience in current position, years	0–4	9 (36%)
	5–9	9 (36%)
	10–14	2 (8%)
	15–19	1 (4%)
	20–25	4 (16%)

gatekeeper." Only a few considered their role to be collaborative: "The safety standards define specific roles for each clinician, but also define our role as a team."

Team leadership

Most interviewees suggested that surgeons should function as team leaders, thereby directing the safety of the surgery. An anesthesiologist stated that "If the surgeons understand that they are in charge of all aspects of the surgery, it will improve safety." The nurses agreed and added that one meaning of leadership is taking responsibility. "Surgeons don't understand their responsibility. They are supposed to call for a time-out process, but they do not, so the nurses take charge and do it instead." "When we (nurses) do the surgical count, we know the surgeon needs to be involved and it seems like we bother him." On the other hand, an anesthesiologist did not think they should be as involved as the nurses: "It is the surgeon's business if he skips the standards and takes shortcuts, I don't deal with it."

Only a few surgeons, from small rural hospitals, viewed their role to be that of a leader in prioritizing safety standards. "We are performing the surgery and we know what is important and how to prevent errors. Nurses are stricter in following the standards and rules." "Most of the standards do not focus on risk reduction and can lead to more errors; we know what to focus

on." A risk manager explained that this attitude among surgeons arises from their training: "Surgeons trust shortcuts because they learned in medical school to diagnose the quickest way and then to provide solutions to errors without basing them on standards and checklists."

A few risk managers explained that surgeons lead a surgery in clinical terms, but not as team leaders. "Their weak point is their hubris. They don't think they should review what others (nurses and anesthesiologists) did. It is like wearing a seat belt when you drive, wearing eyeglasses when you are nearsighted." For example, "when there is a discrepancy in the count, the surgeon prefers to finish the surgery without waiting for the nurses to recount."

Team characteristics

Two main team characteristics related to safe teamwork were described: working in a fixed, designated team for a specific type of surgery and interprofessional communication.

A designated team was perceived as increasing the team's commitment to the safety of a surgery. A few surgeons thought that this type of team would increase nurses' commitment. "We never leave the surgery in the middle, but stay beyond our shift because this is the right thing to do for the safety of the surgery and the patient. Nurses, however, leave for their lunch break or go home. We have a substitute nurse, but she comes in the middle and does not know what happened before. If the nurses were committed like us and stayed from the beginning to the end, the teamwork would be better and there would be fewer errors." On the other hand, a nurse described the turnover of surgeons as a factor affecting patient safety. "The surgeon says the surgery is urgent, but leaves for his private clinic in the middle and gets replaced, or he tells me: if you don't prepare the patient to start the surgery before 3 p.m. we will not operate."

Most anesthesiologists agreed that working in a designated team would benefit the quality and safety of a surgery. "Working in the same team all the time, without turnover, will promote the safety and success of the surgery. When you work with the same people, you know what they think and how they operate." "If we all work together on the same mission from the beginning of the surgery until the end, we will be able to provide quick responses to urgent issues and consult with each other."

Communication was mentioned as an essential aspect of teamwork and safe surgery. Most anesthesiologists and nurses emphasized the importance of communication: "The physician and the nurse should communicate well and be involved in each other's work because they work together on a big mission." "During the sign-in and the time-out, the communication between all staff involved is much better than expected and prevents errors." "In the OR, we are a multidisciplinary team that works closely together, physically

and emotionally, and we have to find a way to interact and communicate effectively."

An anesthesiologist noted that poor communication between surgeons and anesthesiologists can affect patient safety: "It is very rare that there are errors in machines and equipment; the main errors are related to decision-making and lack of communication between us. For example, something went wrong in the surgery but the surgeon did not think to call the anesthesiologist who was around and could assist." Interestingly, one surgeon noted that: "There should be communication between the patient, anesthesiologist, and surgeon during the surgery."

Inappropriate communication can be hurtful and may even deteriorate into bullying that can risk the staff's psychological safety. Some nurses described situations in which they were bullied by physicians: "I tell the surgeon that I am missing a sponge in the count, who screams that I should go to school and learn how to count. So, I insist on stopping the surgery and refuse to give him the stitches to close the fascia…In the X-ray, the sponge was found behind the heart… I feel like I am in a warzone." "There was a discrepancy in the surgical count, but the surgeon insisted that everything was OK. I stepped in and told him that I am the supervising nurse, and I will call his manager if he does not stop the surgery. He stopped and the sponge was found in the urethra."

Recommendations for improving teamwork

Most physicians and nurses suggested performing simulation training in controlled settings to improve teamwork. A surgeon suggested "a controlled simulation of interdisciplinary teamwork that would include training in leadership and communication skills." A nurse suggested that the simulation should include "performance of safety standards and communication skills, such as speaking up and conflict management." A risk manager suggested implementing interdisciplinary root cause analysis after any adverse events. "Performing root cause analysis by the OR staff will enable discussing teamwork issues freely and resolving them without concerns due to the presence of risk management or hospital administrators." "It will lead to trust among the team members and better solutions that will prevent future errors."

Surgeons, anesthesiologists, and nurses all thought that technological solutions would facilitate their work processes and promote a better work environment. Some surgeons suggested using a digital time-out adjusted to patients' requirements that would reflect the risks related to the particular patient and surgery. Anesthesiologists recommended computerized systems that would integrate patient data and signal an alert regarding anesthesia risks. Nurses thought that scanners would ease the surgical counting process.

Discussion

Teamwork is an essential component of risk reduction, patient safety, and staff psychological safety during a surgery and contributes to preventing Never Events. For this study we analyzed interprofessional preoperative teamwork and its effect on intraoperative teamwork; we then identified factors affecting teamwork that are related to patient safety and staff psychological safety.

The results revealed that teamwork in the preoperative setting and consistent staff presence during a surgery, without turnover, were predictors of teamwork during surgery. A few studies have evaluated preoperative teamwork but not in relation to teamwork during surgery or to risks to patient safety, as analyzed here. Myklebust et al. (32) described the preoperative phase as busy, because each clinician must complete preparatory tasks as quickly as possible to prepare the patient, which can be a chaotic process when trying to simultaneously accomplish individual and collaborative tasks. This can lead to conflict and an unpleasant atmosphere, which was also supported in our findings that staff perceived their role as individuals rather than a team and led to challenges in team communication. Although we did not find any studies that directly evaluated the effect of preoperative teamwork on intraoperative teamwork in relation to safety standards, it is likely that preoperative tension might continue during a surgery and inhibit the key determinants of staff psychological safety: speaking up, team collaboration, and experimentation (33).

Another predictor of teamwork during surgery is the number of team members. We found that that additional physicians and nurses increased the degree of teamwork. We did not find any studies that had defined an adequate number of staff members needed on a surgical team or their composition per specific surgery. However, some studies did find that adequate surgical team size had a positive effect on teamwork, possibly because there are more people available to help complete tasks and share the total cognitive load (34, 35). Adequate staffing can compensate for unexpected emergencies or prolonged surgical cases (36). Inadequate staffing has been identified as a barrier to teamwork, mostly by nurses and surgeons and to a lesser extent by anesthesiologists (14). In contrast, however, a few studies have found that larger teams might create barriers to optimal performance because of the greater communication demands and role ambiguity (12), which may prolong operative time (37).

Regardless of the required team size, the staff we interviewed highlighted the importance of a permanent, designated team, which reinforced our findings regarding turnover. Staff turnover during a surgery was considered to have a negative effect on teamwork, was perceived to show a lack of commitment, and caused the risk of a breakdown in communication due to the lack of familiarity among team members and with a patient's condition. Nursing turnover during a surgery was found

to increase opportunities for breakdowns in communication during handover (38), as it interrupts the flow of surgery (10) and may prolong it (39). A review found that anesthesiologists usually take breaks as part of their work culture, but they are aware of the importance of handoffs in relation to patient safety. However, surgeons rarely take breaks, as they feel that leaving a surgery would affect its success (40).

One suggestion for improving teamwork arising from our study included working in a fixed, designated team that is led by the surgeon. Surgical teams are often constructed on an *ad hoc* basis and thus fluctuate, which can lead to a lack of familiarity (13). Familiarity enables a shared definition of teamwork and professional roles that can increase positive surgeon–anesthesiologist relationships (14, 34). Doll et al. (41) found that a managerial decision to assign a particular anesthetist to a surgeon and to use a predefined surgical list resulted in decreased operative times. This may be because a team in which each clinician has confidence in her or his colleagues and works on the basis of common principles and values can work more quickly while still avoiding risks to patient safety (11). Such confidence among team members can be achieved through teamwork training in soft skills, such as communication, which was found to be the primary means to increase coordination among healthcare team members (42). Evidence in the literature regarding who should lead a surgical team is sparse. Some have assumed that the surgeon is the leader (36), but others have assumed that it could be anesthesiologists due to their perioperative role in standardizing patient care and leadership (13).

Our interviewees described communication as an essential component of teamwork. In general, effective team communication improves patient outcomes and prevents errors (43). Safety risks can be identified and responded to by conducting a daily huddle aimed at preventing specific safety risks due to surgical errors (44).

Our findings revealed the existence of ineffective communication between surgeons and anesthesiologists, which may affect clinical decision-making and patient safety. Possible explanations for this ineffective communication include ineffective interprofessional communication (45) and differing mental models and role perceptions (16).

According to our findings, there was some disrespectful communication between surgeons and nurses. In an earlier survey of 7,465 clinicians, 70.1% had experienced incivility and 36.9% had been bullied (46), which may inhibit individuals from speaking up and prevent the maintenance of a psychologically safe team (22). The reasons suggested included intrapersonal (personality traits, psychological conditions, transient psychological states), organizational (production pressures, mismanagement, administrative inefficiency, working conditions), and interpersonal (perception of status, hierarchy, situational triggers) (46, 47).

Strengths and limitations

The strengths of this study include that it revealed new insights into teamwork in the OR, specifically in relation to safety. The mixed methods design allowed us to obtain a comprehensive picture of the effect on teamwork of performing safety standards such as a surgical safety checklist and surgical counts. We also explored factors contributing to or preventing teamwork during surgery that could risk patient safety and a team's psychological safety.

The main limitation of this study was the inability to control the methodology used to collect the observational data received from the MOH, which limited our ability to analyze personal and environmental factors that may affect teamwork. Factors such as gender, areas of expertise, and the length of experience of clinicians observed were lacking, so as the workload at the OR at the time of observation. The data also lacked information about other team members who may affect teamwork, such as technicians. The data represent observations performed over 4 years, which may affect the generalizability of the findings.

Conclusion

This study revealed that the level of preoperative teamwork can predict the level of intraoperative teamwork, specifically with regard to patient safety. We also found that the number of clinicians participating in a surgery and their level of turnover affects teamwork. Factors that would support effective teamwork are designated teams with defined roles and having leaders who promote teamwork and effective communication. An effective team is key to boosting the teamwork and team engagement that is associated with improved team performance in relation to staff psychological safety and patient safety.

We recommend promoting the psychological safety of medical staff by mediating between the requirements of individual professional roles and the expected collaborative team roles and the work environment in the OR. This could be accomplished by creating fixed, designated surgical teams with a defined leader who manages all aspects of a surgery and its teamwork. This will promote patient safety and staff psychological safety. The team members should have sufficient familiarity with each other to solve problems, engage in mutual learning from errors, and improve safety. These teams would benefit from soft-skills training that can increase their coordination and engagement through routine team huddles. An advanced technological environment that facilitates work processes for the team could also benefit their performance. Further study is needed to define the appropriate size and composition of a surgical team needed to ensure patient safety in every surgical procedure through ensuring effective teamwork that promotes staff psychological safety.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval for the study was obtained from the Medical Research and Ethical Committee of the Israeli Ministry of Health (MOH 032-2019), on 27 December 2019. The need for informed consent was waived because only deidentified data were used. The individuals interviewed provided verbal consent to participate and received no compensation.

Author contributions

All authors participated in developing the initial idea and design of the study, data collection, analysis and interpretation, writing the initial draft and critically revising the manuscript, and take responsibility for the accuracy of the material contained in the study. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.1060473/full#supplementary-material

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Check for updates

Key issues of health and safety for workers in residential aged care: An expert study

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Introduction: Residential aged care (RAC) represents a fast-growing sector within Australia's health care system and is characterized by high levels of workplace injury. To better understand this injury problem, this study investigated key informant perspectives concerning sector occupational health and safety (OHS) focused on key issues associated with the risk of worker injury.

Method: Semi-structured interviews were undertaken with nine key informants representing (OHS) specialists, healthcare employers, regulators, worker association representatives, and academic researchers in OHS or healthcare. Interviews were transcribed verbatim and analyzed using thematic analysis.

Results: This study identified six themes on OHS within RAC including (i) the physical and emotional nature of the work, (ii) casualization of employment, (iii) prioritization, (iv) workforce profile, (v) OHS role construction, and (vi) clinical standards. The study highlighted differences in OHS roles between RAC and other safety-critical sectors regarding governance and management of OHS. The key informants identified a propensity within RAC to downplay or disregard worker OHS issues justified through prioritizing resident safety. Further, neither OHS professional nor institutional logics are prominent in RAC leadership and decision-making where the emphasis is placed on mandatory standards to maintain funding purposes. Several recommendations are made to address identified issues.

KEYWORDS

aged care OHS, worker injury, residential aged care worker injury, worker health and safety, occupational health and safety, aged care sector, demographics and OHS, physical and emotional work

1. Introduction

The aged care sector represents one of the largest employer groups in Australia ([1]). The sector continues to experience growth in supporting the needs of the country's aging population ([2]). Sector employees provide direct resident care or hold positions in cleaning, catering, laundry, and other services. Australia's peak organization responsible for worker health and safety, Safe Work Australia, regards direct health care workers as "a key risk group due to the very nature of the work they do on a daily basis" [([3]), para 3].

A subset of the aged care sector is residential aged care (RAC). RAC service providers deliver 24-h care outside the home to persons requiring significant assistance (4), including for activities of daily life such as bathing, eating, and moving about (5). RAC work is both physically and psychologically demanding (6–8). Physical demands are associated with activities of daily resident life such as bathing, dressing, and moving from beds. Psychosocial demands stem from high workloads, low job control, resident verbal aggression, and emotional aspects of the job (6). Commonly reported injuries among RAC workers include sprains/strains and chronic joint or muscle conditions, as well as stress and other psychosocial conditions (9). Significant evidence shows too that psychosocial hazards impact workers physically by increasing the risk of musculoskeletal disorders (10). The hazardous nature of RAC work is acknowledged by the sector regulator and researchers. As an example, one source of injury data found that 14% of 8,885 direct care workers surveyed reported a work-related injury or illness during 2016–2017 (9).

Despite the physicality of RAC work, aged care work has been labeled "women's work" [(11), p. 112] due to its similarity with unpaid care work that is traditionally carried out by women. Aged care work in Australia is particularly gendered with female workers comprising 87% of RAC workers, and 32% of aged care workers are born overseas (9). Female, migrant, and/or culturally and linguistically diverse (CALD) workers are often considered vulnerable through their employment in casual, short, or fixed-term contracts and agency work (12). Up to 20% of aged care workers fall within these precarious employment arrangements making them vulnerable to limited job security and a lack of leave entitlements (11, 13, 14). Vulnerable and precarious work not only exposes workers to unfavorable work arrangements but also to hazardous conditions (12). Workers with English as a second language also have a higher likelihood of injury resulting from communication difficulties (15) and may be reluctant to identify safety concerns (16). Scarino et al. (15) suggested that this situation arises when questioning supervisors or colleagues is considered culturally disrespectful (15).

RAC services are delivered by not-for-profit, private, and public sector organizations. The sector is regulated and accredited under the Federal Government's Aged Care Act 1997 (Cth) (referred to in the following as "the Act"). The Act includes a prescribed funding framework and requires RAC service providers to be accredited with a set of eight Aged Care Quality Standards (ACQS) for compliance (17). The quality standards each focus on a different aspect of consumer outcomes (17). As an example, one quality standard covers infection control, which became a significant compliance focus during the COVID-19 pandemic. Worker health and safety (OHS) is not a specific quality standard within the funding framework or the accreditation and audit process (4).

The demands of healthcare workers are undertaken typically by personal care assistants (PCAs). There is no specification for PCAs to hold a minimum qualification, nor is there a registration or accreditation process for such roles (4). Hence, PCAs meet no industry-specified standards for OHS literacy or training. The potential result may be OHS shortfalls through, for example, miscommunication or worker reticence in clarifying critical information (4, 16). Consistent with the broader workforce profile, the PCA workforce profile is predominantly women from culturally and linguistically diverse (CALD) backgrounds (2).

Figures 1, 2 display relative RAC worker proportions by forms of employment, based on data from the Department of Health (14). Most permanent PCAs are engaged on a part-time basis (Figure 1) (14) while overall, some 21% of PCAs are employed as casuals or on contract (Figure 2) (14). This infrequent work-engagement profile is compounded by a significantly under-resourced workforce (2).

Recently in Australia, nationwide concerns for persons in resident care prompted a Royal Commission into Aged Care Quality and Safety (2018–2021) (2), which provides evidence that workforce development and OHS exhibit a leadership deficit and have been underfunded and undervalued. The Royal Commission concluded that many of these issues existed pre-COVID, however, COVID likely exacerbated these challenges. Despite these long-term issues, there have been few investigations of key issues for the health and safety of workers in RAC in Australia. This is surprising given the high frequency of RAC work-related injuries relative to other sectors (4, 18). Further research into the key issues for the health and safety of workers is justified due to the projected growth of the sector and the complexity of the issue. First, the number of RAC workers is expected to grow significantly in response to forecasted increases in the aging population and the corresponding demand for supporting services (6). Higher demand will likely result in increased worker injuries given that risk factors are not well understood (19). Second, OHS issues in healthcare are considered wicked problems (20–22). Goh et al. describe wicked problems as "messy" [(23), p. 118] since they cannot be easily defined, and proposed solutions may make existing problems worse. Considering the sector and OHS from a wicked problem perspective, and seeking to understand the complexity of the challenges, may prove a useful approach. To date, much research has focused on individual factors and ignored the complex nature of many RAC worker injuries (6). For instance, the complex nature of RAC OHS and RAC injuries, which involve both physical and psychosocial contributors, suggest simple countermeasures may not be effective in creating safer RAC work environments.

To address this gap, the study reported here questioned key informants about issues pertaining to RAC worker OHS. These
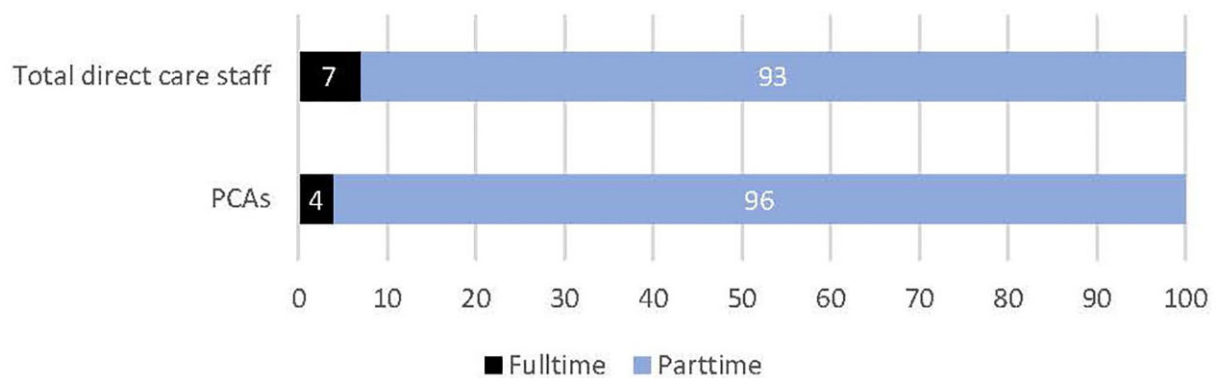
FIGURE 1
Percentage of permanent part time to full time direct care staff. Data source was sourced from the following publication and formatted into a graph (14).
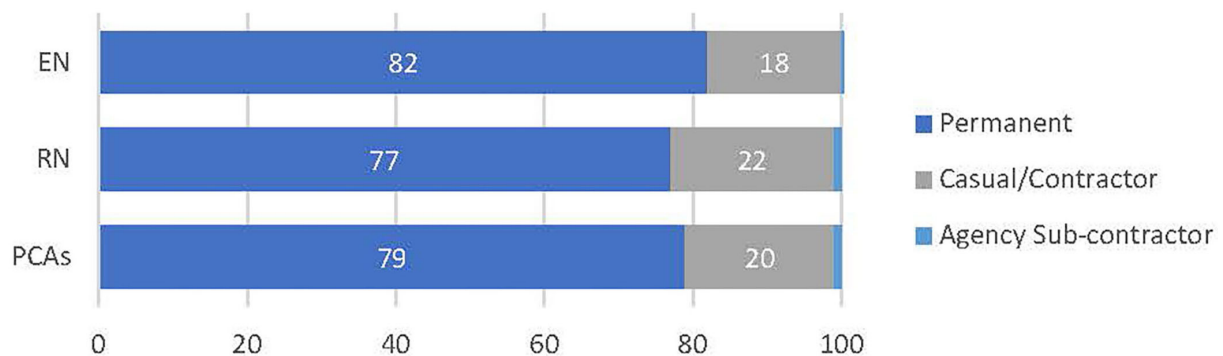
FIGURE 2
Proportion of direct care workers in each employment type. Data source was sourced from the following publication and formatted into a graph (14).

issues concerned both general insights on OHS practice and issues arising from the COVID-19 pandemic onset. Specifically, the study aimed to better understand key issues associated with RAC OHS and to identify priority areas for future research. Before describing the method and results, a review of extant literature situates the study. Key themes are reported and discussed, and a concluding discussion follows including requirements for further research.

2. Literature review

The RAC sector represents a complex environment supported by multiple systems relying upon a diverse workforce undertaking physically and emotionally demanding work (24). Regarding extant literature, two fields of research informed the

study: (i) Regulatory systems and OHS management and (ii) OHS professionals and institutional logic.

2.1. Regulatory systems and OHS management

Traditionally, the RAC sector has not been deemed a safety-critical sector when compared to aviation, oil and gas production, or nuclear power generation (25). Long-established safety-critical industries are required to implement safety management systems to comply with external regulations (26, 27). Recent literature argues RAC should also be considered safety-critical (25). However, the external regulator for RAC service providers is focused on meeting ACQS accreditation (17) for resident care and service provision. There is no

quality standard within the external regulation for RAC that mandates the implementation of OHS management systems (28).

The RAC sector must, like all other Australian employers, meet basic OHS legislation (29). However, OHS legislative compliance does not link to funding or involve mandated audits. Hence, RAC service providers instead prioritize compliance with required quality standards to maintain funding through securing accreditation (28). Typically, frameworks for external accreditation influence an organization's operations (30, 31). For RAC, quality standards compliance demands resourcing and time commitments directed toward accreditation-related activities including preparation for external audits and appraisals (32). As Pomey et al. (33) highlight, maintaining accreditation becomes the RAC's primary concern as this is linked to government funding.

Grote identifies specific considerations for designing effective OHS management systems (34). First, safety management at the organizational level should comprehensively address the specificities of external regulation frameworks and respond to the sector or organizational nuances. However, the gap that exists for RAC is that the ACQS does not include the health and safety of workers (17). Second, Grote highlights the need for the management of safety which aligns with safety processes and personal safety. Grote notes that when process safety and personal safety are disconnected, hazards are presented (34). For example, in RAC a personal hazard may arise where a worker slips, trips, or falls while a process hazard may stem from errors in dispensing medication to residents. From a RAC perspective, personal hazards facing a worker do not expose residents to injury risk while process hazards may not directly expose workers. This dichotomy of risk exposure found in RAC contrasts with safety-critical industries where process and personal safety are aligned (34). Notwithstanding, hazards arising from the COVID-19 pandemic have demonstrated that RAC process safety directly impacts RAC workers where infection (managed as a process hazard) spread among both workers and residents (35).

The disconnect between personal and process safety adds complexity, reducing worker OHS (34). On this, Grote argues that maintaining the health and safety of the worker in such situations requires actions by the organization in addition to their primary task of meeting accreditation standards and process requirements (34). For example, resident bed-making standards may require additional actions including manual handling training, overhead tracking, or mechanized beds, to minimize worker-related hazards (e.g., back strain). However, when resident safety and resource/cost savings are overarching priorities, the low priority of OHS may be compounded by the RAC sector lacking OHS professionals at appropriate decision-making levels (36), discussed next.

2.2. OHS professionals and institutional logics

There is a paucity of empirical research on the role of OHS professionals within organizations (37, 38). The broader OHS literature postulates that effective relationships relied upon by OHS professionals derive from critical interactions with senior managers (39–41), power relationships (37, 42), and hierarchical authority or positioning (43, 44). While holding positional authority improves an OHS professionals' capacity to influence senior management (45), the positioning and authority of OHS roles within RAC have not been documented, although anecdotally, high-level OHS roles within these organizations appear uncommon. Regarding qualifications, Oakman et al. report that in questioning 10 RAC specialist OHS managers/coordinators, just three had graduate-level OHS qualifications and two had minimal or no qualifications in OHS (36).

Provan identified institutional logic and institutional work as factors influencing the roles of OHS professionals (37). Institutional logic assumes a particular set of "assumptions, values, beliefs, and rules by which individuals... provide meaning to their social reality" [(46) p. 804]. Institutional logic shapes institutional work represented by organizational actions. Institutional work, conducted alongside operational activities, is constructed by a professional's values, rules, and shared beliefs. These factors influence worker behavior toward what is important (47, 48). Institutional logic within healthcare can often cause conflict in meeting the competing goals of medical standards, care requirements, and managerial aspirations (49). An example is the care institutional logic which follows a worker's professional values and beliefs. This form of logic may push RAC workers to consider residents' health and safety before their own (50). As competing institutional logics rely upon differing interpretations of reality, their existence may exacerbate solving complex OHS problems (49).

Rae and Provan (51) posit that OHS professionals' work practices are a form of institutional work. Specific bodies of knowledge and accreditation frameworks have been developed for OHS pertaining to professional roles and problem-solving (52). In the context of RAC, as outlined earlier, there is a propensity to focus on quality standards and compliance. However, there is tension between this compliance approach and more proactive approaches, particularly in terms of determining new, changing, or emerging hazards and risks. There has been limited empirical research that explores this tension.

The literature review highlights issues potentially impacting RAC OHS performance. These include overshadowing OHS by prioritizing quality standards, high proportions of female and CALD workers disinclined to raise safety concerns, vulnerable workers on insecure work arrangements, and tensions in institutional logic provided by prominently positioned OHS

professionals. These propositions warrant further investigation to assess their impact on RAC worker OHS. In line with the previously stated aims, the reported study sought key informant viewpoints and opinions on these issues to uncover priorities for further RAC OHS research.

3. Method

3.1. Study design

The study employed key informant interviews, a suitable technique for investigating undeveloped research areas (53). The creation of a semi-structured interview guide was informed by a literature review identifying factors underlying the RAC sector and refined following discussion between authors (see Table 1). A semi-structured interview guide was preferred allowing key informants to draw deeply on their own perceptions and views of the health and safety of workers in RAC.

Ethical approval for the study was granted by the Human Research Ethics Committee, Federation University Australia (project number A19-133).

3.2. Key informants and recruitment

Key informants were selected to provide a range of sector and stakeholder perspectives on RAC OHS. A purposive sampling approach was implemented (54). Key informant research utilizes participants chosen for their qualifications, knowledge, and/or specific status in relation to the study (53). The key informants for this study were purposively chosen to also draw on diverse stakeholder viewpoints (53). Five key informants (stakeholder) groups were identified:

TABLE 1 Interview guide questions.

1	What led you to your current position and the connection with aged care?
2	What works and what doesn't work in aged care worker health and safety?
3	Do you see any structural challenges within the sector?
Prompt	For example, where OHS sits within a RAC organization and its position?
4	Have you identified any difference between the different types of aged care – for example private, public, and not for profit?
5	What can you tell me about leadership within the sector?
6	I would like to ask about your experiences with leadership in the RAC sector and leadership shown day to day?
7	Have you any thoughts or experiences regarding the accreditation standards as they relate to OHS?
8	Any comments regarding the balance or priorities of worker safety and resident safety?

1. OHS regulators to gather the perspective of the RAC sector and OHS challenges;
2. Worker association providing broader worker perspectives of OHS;
3. Employer associations to gain the perspective of managers within the sector;
4. Academic researchers in OHS or healthcare can convey holistic or specialized perspectives of the sector and its challenges; and,
5. OHS industry association representatives for a specialized perspective.

Key informants were identified through the lead researcher's professional network. No professional relationships existed between the researchers and key informants, though for the lead researcher, brief unrelated interactions had occurred with two key informants. Initially, direct contact for study participation was made through an email invitation to 11 potential key informants. Nine provided consent to participate in the study, two invitations were unanswered. Table 2 provides a summary of the nine key informants for the study, along with sector/stakeholder group representation or association.

3.3. Interview process

All key informants agreed to interviews being audio recorded. Semi-structured interviews were conducted from November 2020 to May 2021 and ranged between 30 and 60 min in duration. Interview questions and topics are listed in Table 1. Due to COVID-19 restrictions, eight interviews were conducted remotely via video and one by telephone. Interviews were transcribed verbatim using the Microsoft Teams technology (55) with manual corrections or additions from recorded notes.

3.4. Data analysis

A qualitative thematic data analysis followed Fereday and Muir–Cochrane's hybrid approach for identifying codes and data patterns. The process followed three stages. In stage one, interview transcripts were reviewed against recordings for accuracy. In stage two, data accounting for data repetition was analyzed among key informants and pattern identification (56). A deductive process aligned to interview questions to identify "meaningful units of text" [(56), p. 87] while an inductive process reflected new themes created for data segments outside a deductively derived theme. In stage three, a review of derived themes was conducted to identify any overlap. Themes were considered and refined by all authors at

TABLE 2 Summary of key informant stakeholder groups and experience.

Key Informant	Key Informant Groups				
	OHS Regulators	Worker Association	Employer Associations	Academic Researchers	OHS Industry Associations
1		10 + years			
2				10+ years Health sector quality, safety, and systems improvement	
3				10+ years OHS and human factors	
4	2 + years				
5					5 + years
6				10 + years OHS and management	
7				10 + years Health sciences, injury research & safety culture	
8			5 + years		
9				10 + years Patient safety	

each stage of the analysis and write-up. Six themes emerged for reporting.

3.5. Researcher positionality/bias

The positioning of the lead researcher is acknowledged to have informed the research process (57). The lead researcher has extensive professional experience as an OHS consultant in the Australian RAC sector. This positionality reflects a combination of insider and outsider roles informing the present study. Given the dearth of empirical and scholarly work on the focal topic, this positionality is acknowledged as a strength in the current inquiry. The possible introduction of unintentional bias was acknowledged and challenged during data analysis and interpretation through reflective practice among the research team. To counter any possible bias from insider positionality, initial findings and qualitative themes were reviewed with second and third authors by considering direct evidence from interviews. This process of inquiry prioritized the construction of themes with key informants' own words rather than with the lead researcher's (first author) interpretation and the making of meaning.

4. Results

Six identified themes were: (i) Physical and emotional work; (ii) Casualization of RAC work; (iii) Prioritization of

OHS and resident safety; (iv) Female, CALD, and aging workforce; (v) OHS role construction and importance; and, (vi) Tension between clinical standards and OHS approaches. Table 3 provides a visual theme summary mapped to key informant evidence. Each theme is now described along with direct quotations from key informants to provide examples and supporting evidence.

4.1. Physical and emotional work

Theme 1 provides key informant insights on the health and safety of workers as influenced by high levels of physical work and emotional demands. Key informants noted that the seriousness of OHS risks had only recently been acknowledged by the industry and wider community. Furthermore, limited budgets and available resourcing for RAC facilities were noted as factors exacerbating the nature of RAC work.

The pool of RAC candidate workers is limited, indicating that persons unsuited to RAC positions may take up employment. The following quote from an academic key informant describes the situation where an unprepared worker suffered consequences, ending for a time their RAC employment:

> An organization appointing a 50-year-old woman into a key support role. She was relatively unfit. And then… [the RAC work required] a lot of physical, manual…, ongoing

TABLE 3 Themes discussed across key informant groups.

Themes	Key informant groups				
	OHS regulator	Worker association	Employer associations	Academic researchers	OHS industry associations
Theme 1: Physical and emotional work		✓		✓	
Theme 2: Casualisation of RAC work	✓	✓		✓	
Theme 3: Prioritization of OHS and resident safety	✓	✓	✓	✓	
Theme 4: Female, CALD and aging workforce	✓	✓	✓	✓	
Theme 5: OHS role construction and importance	✓	✓		✓	✓
Theme 6: Tension between clinical standards and OHS approaches		✓			✓

lifting and work, day in day out… Within 4 months she is off on stress leave with both physical and also emotional needs.

Key Informant 2

Key informant 1 stated that the regulator has historically paid little attention to the RAC sector. As this key informant explains, RAC is becoming recognized as a safety-critical sector of employment:

It's taken [the OHS regulator] until the last 3 years or so to even recognize health [and the RAC sector] as a hazardous industry… We have had to …push and upskill [the regulator] to understand what is going on in health.

Key Informant 1

Competing demands of worker OHS contextualized by limited budgets and resources were reported by several key informants. Key informant 3 described the RAC sector as "incredibly understaffed". The consequential result is underserviced clients due to RAC workers' inability to perform important resident care roles. This is also reflected in the following comment related to the effects of funding constraints:

I think the general outcomes are showing that… [where profit is] one of the goals… [for-profit providers] have to cut services. The biggest cost is staffing costs. You can have one less TV in the room or …. you can cut down staff, which is one of the longer-term challenges.

Key Informant 2

Limited resources and staff cutbacks compound risks posed due to the physical and emotional nature of RAC work. The limited support provided to available staff for

addressing and minimizing OHS risks is highlighted in the quote below:

There aren't enough [RAC] workers to provide emotional and practical and physical support that is often needed in the aged care facilities… [RAC] workers are putting [in] enormous amounts of emotional, psychological… and practical care. But we don't give them the time in their roles to do that, and often not the training to do that, given the increasing rates of dementia and other psychosocial conditions that come as we all age.

Key Informant 2

The physically and emotionally demanding nature of RAC work encapsulated by Theme 1 was conveyed by a worker association key informant and academic, and no others. This suggests that the effect on the health and safety of workers from the nature of OHS work may be overstated or not widely appreciated.

4.2. Casualization of RAC work

Key informants provided examples where casual employment and other non-regular work arrangements compromise workers' OHS in RAC. A typical scenario faced by RAC workers is described below:

[RAC reflects] a very insecure workforce. A lot of the workforce will work in more than one place. It's not uncommon... to hear [of RAC workers] working at two or three different facilities, working 60–70 h a week just to try to make ends meet because the pay is so poor.

Key Informant 1

The transience of RAC workers across multiple facilities was identified as a phenomenon spreading COVID-19 infections.

> There is a lot of this part time work that is shining the light on… [the casualized nature of RAC work] because these workers are going to multiple facilities and therefore being vectors [for COVID-19].
>
> Key Informant 3

Key informant 6 noted injury risk from job fatigue over a 24-h job cycle in the context of job insecurity. RAC workers may be disinclined to report fatigue-related injury where this is seen to reflect poorly on their work capacity. Key informant 6 stated that RAC workers were often reluctant "about reporting an injury [which] means that… [injury is typical] severely underreported". Key informant 6 expressed concerns regarding reporting and monitoring of OHS risks, as well as job-specific training, explaining:

> Certainly, from other industries we've seen that casualization and lack of training issues… are associated with higher [OHS] incidents and under reporting [of OHS incidents]. [There is] no reason to think that the aged care sector is different… If you have got an increasingly casualized workforce, you might still be providing training, but unless you are making sure that everyone has access to training and they are paid for the time that they spent training, you'll have people who miss out on… [training].
>
> Key Informant 6

Employer and OHS key informants did not identify worker OHS issues associated with the casualized workforce. This suggests a possible lack of recognition of potential effects among these stakeholders.

4.3. Prioritization of OHS and resident safety

According to key informants, RAC service providers place a higher priority on resident-related safety with lower priority given to worker OHS. Typical examples provided by key informants included scenarios where meeting resident needs exposed workers to a risk of injury. The prioritization of resident safety over worker OHS and its resultant effects on workers is discussed below:

> Residents' safety [is prioritized] as the absolute be-all and end-all… that focus is often taken… at the expense of staff health and safety. When you've got health services that have as part of their values [that] patient safety comes first, that… means that staff safety doesn't come first… Therefore, it must be second or third or fourth or something

else, and that I think is a bit of a context for the staff around where they sit and how they're valued and what that means for them.
>
> Key Informant 1

In the scenario depicted next, a worker risks injury through standard OHS work practices. The key informant's testimony describes how resident priorities become embedded and even though this creates a hazard, workers may be unwilling to speak up:

> [In our research] we were doing surveys [with workers on culture] and… [in the] qualitative comments… [workers] were making comments like: 'I almost feel as though I shouldn't report this incident, because it's someone with dementia and they can't control their arms. They didn't mean to hit me, but I did get hit…' And so, it was the downplaying of the health and safety issues for staff that was a real concern for examples like that.
>
> Key Informant 6

Similar insights were shared on the lack of appropriate communication channels. The resident health condition described here is seen as a factor excusing injury risk exposure:

> [The workers] don't like… [the incidents], but they are more accepting of when the patient hits them or yells at them because they know that that person's got dementia, so they don't report it, so the "higher ups" [(i.e., the managers)] don't know that that's happening.
>
> Key Informant 4

However, such risky situations for workers may be changing according to key informants. RAC service providers have introduced new practices to reduce known injury problems. An example here is of lifting machines:

> Increasingly, there has been a focus on worker health and safety… Back injuries in health and aged care have always been an issue, and there's more… of a focus around lifting machines [to] support… [lifting residents].
>
> Key Informant 8

The compatibility of residents and the health and safety of workers were also noted by key informants. Verbatim interview comments explain:

> Keeping yourself safe does not mean that your patients are not safe. In fact, quite the opposite. If you're safe it's going to be safer for your patients… [RAC service providers] are quite unaware of their OHS obligations, whether it's deliberately unaware, or maybe ignorant of them. I think a little bit from column A, a little bit from column B, depending on the provider, depending on the time …...

But OHS is not something they think is their problem or their business.

Key Informant 1

Key informant representatives from the regulator, employer and employees, and researchers all discussed prioritization of resident safety over worker OHS. The employee representative and researchers suggested this to be an issue embedded in RAC worker culture. Of note, even when asked directly about this question, OHS industry associations did not respond in a form allowing representation of this theme. The absence raises the question of whether this situation is unique to RAC as opposed to other industry sectors.

4.4. Female, CALD, and aging workforce

Key informants recognized that characteristic RAC worker profiles (e.g. female, CALD, older workforce, and low paid) underpin OHS concerns. Key informants identified OHS challenges raised within RAC pertaining to the employee profile. Key informant 2 summarized this in terms of worker rights:

I would say it's [the RAC sector] a caring industry, 90% of the people in the industry are women, low paid. I know it's these three things together [that] often brings a lack of attention on worker rights, worker safety, worker conditions, etc... its [RAC OHS] traditionally been an area that's been overlooked.

Key Informant 2

CALD workers may lack assertiveness which may then be taken advantage of by RAC service providers:

There's... a significant proportion [of the RAC workforce] who are from a CALD background, who fear authorities who don't know what their rights are. That seems to suit aged care in many respects because... [CALD workers] don't ask a lot of questions. They don't put their head up - they do as they are told.

Key Informant 1

A lack of understanding of worker backgrounds and characteristics may cause a disjoint between workers and managers. This is explained in the following quote:

[Management have] a lack of understanding of the people that work for them. Aged care... has a lot of CALD - cultural, [and] linguistically diverse individuals... The work is done by women, lower education than the men... [the men] are the ones who manage the work that's done and because of that there's issues... [between RAC workers and]

the white Anglo Saxon protestant males that typically run or are the CEOs of the organizations.

Key Informant 4

The aging RAC workforce was also raised as an important issue. Concern surrounded older employees' (noted below at 70 plus years) reduced physical capabilities when engaged in RAC:

I've seen carers... [who are] over 70 [years of age] and that definitely concerns me from a health and occupational health and safety perspective. I think they're more risk. I don't want to sound ageist, but I do get some concerns when I see people of that age... [in] what can be a very heavy, heavy role.

Key Informant 8

Most key informant group representatives, except industry representatives, noted safety implications due to the RAC worker profile. This lack of input from the OHS industry associations suggests that this issue may be unique to the RAC sector.

4.5. OHS role construction and importance

Theme 5 relays the influence of the relative position of OHS within the organization in terms of role construction and importance. Four of five key informant groups were represented in this theme. The influence of OHS in RAC was recognized by reporting lines, level of authority, and subsequent organizational power. For example, a comparison of typical OHS positions in RAC facilities with OHS positions in safety-critical work organizations is described:

The problem overall with aged care, comparative to other industries, is that it suddenly became, in terms of [COVID-19] infection, a high-risk industry. So when we look at high risk industries in the context of health and safety we see within the organizational hierarchy health and safety executives reporting to CEOs and boards; [people] who have power in the company, and who engage with heads of plants and line managers and supervisors, and have teams of health and safety people out and about... and the concept of health and safety is understood at board level... Aged care does not look at it that way at all.

Key Informant 5

The qualifications of OHS roles in RAC are also noted as being low relative to traditional high-risk sectors. OHS responsibilities in RAC are covered by less qualified individuals in lower-level roles:

> [Typically], you have… [OHS positions] as second tier within the health service, which means that when you're recruiting, it's not that executive position that you might get in other industries… It means that it's very difficult to attract good people to do the health and safety role. Then it means that you don't necessarily have the best people in [the] health and safety role, which therefore perpetuates the cycle because they're not actually pushing the fact that… [OHS] needs to have a higher priority and that more needs to be done.
>
> Key Informant 1

Also, the relative positioning of OHS in RAC compared to the positioning of comparable roles in high-risk industries is elaborated upon:

> In something like mining, you find a lot of health and safety managers who have degrees in health and safety. They're very skilled at presenting to their board and getting safety as a high priority… They also tend to have more male occupational safety managers. In aged care, I came across more female safety managers and they hadn't had the training or the experience necessarily to be able to push the case for prioritization of health and safety… If… [OHS professionals] are not senior enough in the structure, it can be really hard for them to get the resources that they need [for OHS], and it's frustrating for them.
>
> Key Informant 6

Many key informants noted distinctions between RAC OHS roles and other high-risk sectors. RAC OHS was positioned low in the organizational hierarchy and typically requires no formal OHS qualifications. A subsequent lack of power held in these positions may be reinforced through gender stereotyping. Interestingly, when asked about the positioning of OHS, the employer association key informant provided no response, suggesting a view toward obfuscation or irrelevance.

4.6. Tension between clinical standards and OHS approaches

Theme 6 indicated that a traditional RAC safety approach in meeting clinical standards proves suboptimal when compared with the OHS proactive approach. For example, in responding to COVID-19, RAC service providers complied with clinical standards for infection control based on currently known diseases. Employed safety practices failed to control infection spread in RAC facilities. In contrast, OHS professionals follow a 'risk-based' proactive analysis to identify and counter new risks without necessarily relying on safety protocols embedded in standards.

In RAC, safety may be addressed at some level, based on the regulations, however, forward-looking health management was placed as a secondary priority. This is explained below:

> There's a tendency for many health and safety people in aged care to do safety, but less so health. And the health supposedly sits with the clinical standards staff, but the clinical standards staff don't do the health and safety part of health.
>
> Key Informant 5

This informant went on to explain that RAC service providers focus on compliance with clinical standards for health yet fail to consider responsibilities for worker health within OHS. The key informant also identified challenges that COVID-19 infection control presented for RAC service providers relying on clinical standards, suggesting that if qualified OHS practitioners were in place, then issues associated with infection spread through ventilation may have been addressed earlier:

> What the health and safety person does, in that situation, is applies precautionary basic risk management, [and] says, 'there are things here we don't know. We must upgrade our controls in a precautionary way. We go harder because we're not certain what's causing the problem…..We don't keep our standards in our controls lower in the presence of increasing infections [as was the case during COVID] because that's the best evidence … that what you've got doesn't work'.
>
> Key Informant 5

Hence, a different approach to safety and risk is applied by qualified OHS professionals when compared to the risk approach employed by clinical aged care workers. This is described:

> So traditionally, infection, prevention and control is treated as a clinical matter. And it's usually done on the basis of, "is there evidence that this is a risk?" From the OHS side we are saying – "well, … is there evidence that it's not a risk?" Because if there's no evidence that it's not a risk, then we treat it as a risk until we get that evidence… That [is the] precautionary principle.
>
> Key Informant 1

Contributions to Theme 6 were restricted to the worker association and OHS industry associations. Key Informants here conveyed tension between clinical standards and OHS approaches (Table 3). Differing approaches to safety management, these being essentially either reactive or proactive, will in most circumstances have low consequences for safety. However, when new risks emerge, or safety management is compounded by other extant factors, a proactive approach may prove preferable.

5. Discussion

The results from our study highlighted six main themes representing key issues for the health and safety of workers in RAC. These included: (i) the relatively hard physical and emotional nature of RAC work, (ii) a casualized RAC workforce contributing to worker vulnerability, (iii) prioritization of resident safety over employee OHS in RAC, (iv) implications for RAC arising from a predominantly female, CALD background and an aging workforce, (v) non-optimal OHS Role constructions in RAC, and vi) how the choice between clinical standards and OHS approaches may reduce RAC safety. Some themes emerged through deductive analysis and confirmed existing knowledge, such as the physical and emotional nature of RAC work, and have been identified previously (6, 8, 58, 59). However, the benefit of our hybrid approach, which also enabled inductive analysis, meant this study makes an important contribution by way of expanding understanding of existing knowledge, whereby key informants highlighted contextual factors exacerbating previously identified challenges. For example, key informants noted unsuitable workers may be employed due to a limited candidate pool. RAC workers also face resource constraints and staff cut-backs due to cost-saving initiatives which in turn exacerbate workloads and reduce available support. Workers being employed across multiple facilities was also identified as raising the potential for COVID-19 spread. Prioritization of resident safety over the health and safety of workers was also evident in the findings, with examples of resident-induced incidents that employees accepted as part of the job rather than a risk to be ameliorated. COVID-19 responses also showed clinical/care approaches as dominant over the proactive OHS approach when managing risk.

In addition, three novel and important contributions emerged through this study. First, RAC workers' health and safety have been a low priority and may continue to be unless a systematic change is pursued across the sector. The ACQS do not specify the health and safety of the workers, and the interviews in this study demonstrate this lack of priority trickles down through management decision-making and resource allocation, and also to the coal-face workers who in practice also prioritize resident health and safety over their own. Rather than RAC demonstrating a holistic and integrated model for worker and resident health and safety, it appears notions of quality, accreditation, and compliance manifest a dichotomy of resident vs. health and safety of the worker, with worker injury statistics indicating workers bear the brunt of these conditions. RAC residents certainly deserve their health and safety to be a priority, but at the moment this comes seemingly at the cost of commitment to the health and safety of workers. Resident and worker safety considerations should not be considered a trade-off situation in RAC. This study provides an evidence base with insights from representatives across a number of stakeholder groups that this dichotomy exists, it is detrimental to the health

and safety of workers, and we argue this issue is worthy of further research.

Second, despite recently being escalated to a safety-critical status (largely due to COVID infections) the extant governance of the health and safety of the RAC workers is yet to reflect equivalent approaches to that of other safety-critical sectors such as aviation, oil and gas production or nuclear power generation. Previous research has highlighted the importance of having an influence on senior leaders as well as workers' health and safety considerations in strategic or funding decisions (39, 40, 60). However, our findings highlight that RAC OHS roles typically lack suitable qualifications and seniority to influence decision-making and inform the step-change required for the health and safety of the RAC worker to curb workplace injuries and create safer environments. These inadequacies of RAC OHS governance are complicated by the context of RAC worker health and safety, for instance, that the RAC workforce is at risk of injury. Our study confirms prior knowledge that the nature of work, the workforce characteristics, and the casualization of the workforce are challenges, however, combined with governance deficiencies, these issues create a "perfect storm" for workplace injuries. Our study indicates that unless something is done to address these challenges, workplace injuries of RAC workers are likely to get worse before we see improvement.

Third, our study identified preferred modes of operation in RAC workers' health and safety whereby traditional dominant health sector-related logic and clinical methods were championed over a proactive worker health and safety approach, and the deficit of such approaches was highlighted with the mismanagement of COVID infections by RAC service providers (48, 49). While infection control is a specific requirement within the ACQS (17, 28), RAC service providers largely applied their typical clinical methods in responding to COVID infections. However, COVID-19 presented a new and unprecedented hazard where standard approaches proved sub-optimal. A proactive approach using OHS logic may have been preferable in using expert knowledge to translate from general evidence on virus spread to improving ventilation within RAC facilities (61). Our study highlighted that reliance on traditional dominant clinical methods, combined with a lack of worker health and safety governance, low prioritization of the health and safety of workers, and a vulnerable workforce with limited ability to speak up about broken systems, was ill-prepared for an external force such as COVID-19. Unless significant change occurs in the sector, they may well be ill-prepared for subsequent challenges.

6. Limitations

Study themes were limited to data provided by selected key informants and their available knowledge. Unknown bias may have been introduced by key informants' responses influenced by social desirability or adherence to their professional positions.

Theme development was based on subjective interpretations by the researchers, though direct quotes do provide objective supporting evidence. While the semi-structured nature of the interviews allowed for key informants to provide their own views and perspectives, further studies may use the results reported here as a guide to analyzing RAC holistically using a systems perspective. Future related studies may also focus on methods for installing OHS institutional logic throughout RAC. While this study did not seek to explore the influence of key informants' gender or age on their insights/responses, there may also be potential for future studies to explore how socio-cultural factors impact reported insights and/or experiences of the health and safety of RAC workers.

7. Practical implications

This study contributes the much-needed knowledge of the complex nature and interactions of RAC and worker health and safety from the perspective of a range of key informants and provides practical implications and suggestions for future research. Practical implications are evident at the policy, process, and practice levels. For instance, the absence of specific guidelines related to worker health and safety in the ACQS is an oversight that appears to enable systematic undervaluing and de-prioritization of worker health and safety and needs to be addressed by government and relevant sector stakeholders. In terms of process, a key initiative would be incentivizing the implementation of appropriate worker health and safety governance structures for the sector, and by RAC service providers. In terms of practice, a key initiative would be employee groups and worker unions engaging in a campaign to inform RAC workers of their rights at work and practical solutions to respond to workplace demands in ways that simultaneously uphold resident and worker health and safety.

In addition, the results and findings present several relevant pathways for future research. There is an opportunity to study the impacts of the RAC funding model and its association and prioritization within the quality standards. There is also an opportunity to better understand RAC leadership and its approach to managing conflicting priorities within the complexity of RAC workplaces. Further research into these significant challenges may help stakeholders and policymakers within the sector better understand how to integrate worker health and safety to improve resident care.

8. Conclusion

Worker health and safety in RAC is complex and influenced by a range of themes, each of which can impact worker health and safety performance within a RAC facility. Of particular importance is how worker health and safety are prioritized, based on how the sector is funded and accredited. This arrangement can influence the governance of worker health and safety and the institutional logic that guides decisions about worker health and safety. Without appropriate governance structures with OHS representatives in positions of influence with senior decision-makers, worker health and safety will be less effective in demonstrating the value of their professional logic across the organization. Further research investigating the prioritization of worker health and safety and residents is best addressed and the influence of leadership in the sector will help in understanding how to incorporate and integrate worker health and safety into RAC sector frameworks. This will also aid in encouraging RAC service providers to better understand the importance of worker health and safety and its positive impact on organizational decisions.

Data availability statement

The datasets presented in this article are not readily available because interview data only. Requests to access the datasets should be directed to LS, e.seaward@federation.edu.au.

Ethics statement

The studies involving human participants were reviewed and approved by the Federation University Human Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

LS, DM, and AT contributed to conception and design of the study. LS identified experts, identified interview topics, conducted and analyzed all interviews, and wrote the first and subsequent drafts of the manuscript. DM and AT contributed to interview topics and review of themes. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Patient safety culture in neonatal intensive care units: A qualitative content analysis

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Background: Safety culture, as an important and influential component of neonatal safety, can lay the ground for the provision of professional and quality care by creating a positive insight among workers. The present study aimed to explain the concept of safety culture and its dimensions from the perspective of the nurses and the physicians working in neonatal intensive care units (NICUs).

Methods: This qualitative directed content analysis study was carried out with 24 NICU physicians and nurses working in Tehran, Iran. These multicenter participants were selected through purposive sampling with maximum diversity in terms of demographic characteristics. The data was collected through in-depth semi-structured interviews and was analyzed using the deductive approach. The COREQ checklist was used for the comprehensive report of this study.

Results: The concept of patient safety culture in NICUs included achieving professional development, constructive interactions, organizational supportive climate, management's commitment to neonatal safety, planning and implementation of neonatal developmental care, which are extracted from 5 main categories, 10 generic categories and 21 sub-categories.

Conclusion: The dimensions of safety culture include procedures that, if promoted, could improve neonatal safety, reducing harm to neonates' health while expending less financial and human resources. Gaining knowledge of the status of these dimensions in wards and hospitals can give a purposeful direction to promote neonate health and policymaking.

Introduction

Patient safety is the first priority of healthcare systems. However, not enough attention has been paid to it in neonatal intensive care units (NICUs) (1). The NICU is a complex care environment; however, technology has improved premature infant survival and quality of life (2, 3). Premature infants endure invasive lifesaving diagnostic and therapeutic approaches daily (4). Long epochs of separation from parents, lack of sensory-environmental support, and repeated painful procedures are considered traumas that cause exaggerated hypothalamic-pituitary-adrenal axis (HPA) which results in increased cortisol and potentially

leading to dysregulation of the HPA axis (5, 6). The fragility and vulnerability of these neonates (7) makes it imperative to create a safety culture.

Implementation of trauma-informed care in the NICU requires that all NICU providers (doctors, nurses, dieticians, physical and occupational therapists) work together to create an environment that is conducive to healing (8). The prerequisite for providing quality care is to maintain neonatal safety, which is effective in preventing medical errors, reducing physical and neurological damage thereby decreasing mortality (9). In order to minimize errors and provide better care, it is important to implement a safety culture (4). Safety culture plays a critical role in achieving a safe organization (10) and improving the quality of care as a suitable concept for measuring patient safety interventions (3, 11).

In fact, delivering appropriate care services demands a positive safety culture among the staff, especially nurses and physicians (12–14). Organizations with a positive safety culture take preventive measures with a common perception of the importance of patient safety (12), and professionals pay more attention to applying safety policies and procedures in a matter of care. This shared vision creates an interprofessional collegial atmosphere between the healthcare staff in high-risk and damaging situations as patient safety becomes the priority. Defining the safety culture is the first step to examining and improving patient safety (13).

Conducting extensive research on the concept of safety culture and the various results obtained suggests the challenging nature of this concept among experts, during the last decade and a half (15). Safety culture is a multidimensional concept, the definition of which is associated with ambiguities (15, 16).

Some define safety culture as a subset of organizational culture that can vary in different departments, specialties, and professional groups (17), in contrast, others regard it as values, attitudes, competencies, and behavioral patterns (18). In some studies, the terms "safety culture" and "safety climate" are deemed synonyms (19). In the most comprehensive definition presented, safety culture consists of issues around the "Overall perceptions of patient safety", "Frequency of events reported", "Communication and openness", "Manager expectations and actions promoting patient safety", "Organizational learning", "Teamwork within units", "Feedback and communication about error", "Non-punitive response to errors", "Staffing", "Management support for patient safety", "Teamwork across units", and "Handoffs and transitions" (20). The combination of these dimensions has led to the development of the "Hospital Survey on Patient Safety Culture (HSOPSC)" questionnaire, which is the most accurate tool to assess the safety culture from the staff's perspective (15, 16).

In many NICUs, there is a shortage of information on safety culture (3). The different nature of care in these units, premature neonates' high sensitivity and physical differences, and considering mothers and neonates as a single care unit; make the safety culture in NICUs distinctive from other units, which may have different meanings and dimensions.

Overall, previous research in Iran (14, 21) and other countries (3, 11), often using quantitative approaches and tools tailored to other communities and social structures, failed to reach a universal consensus on the definition of safety culture as a concept, which is directly related to the quality of care (22). Considering the multidimensionality of the concept of safety culture and the specific conditions of neonatal intensive care units, it seems that quantitative studies alone cannot identify this complex concept. In-depth qualitative methods are better suited to accessing more profound aspects of safety culture (23).

Purpose

Recognizing the safety culture concept as an important factor in maintaining neonatal safety, especially from the perspectives of nurses and physicians who have first-hand experience in this field, plays an important role in hospital policymaking and providing safe care approaches. Therefore, the present study is conducted using a qualitative approach, aiming to explain the concept of safety culture and its dimensions in NICUs and to better and more deeply understand nurses' and physicians' perspectives on this concept.

Methods

Study design

This multicenter, qualitative study was conducted to explore the meaning of patient safety culture from the perspective of nurses and physicians working at NICUs in 12 hospitals affiliated to the Universities of Medical Sciences, from late April 2019 to March 2020 in Tehran, Iran.

Setting

These selected hospitals are the most prominent metropolitan educational and treatment centers for the referral and hospitalization of premature infants in need of intensive care in Iran.

Participants

Based on purposeful sampling, an appropriate method for qualitative study participant recruitment (24, 25), 35 staff were invited and 24 staff (15 Bachelors/Masters and PhD in Nursing, and nine physicians, including neonatologists, fellows, pediatricians, and pediatric assistants) agreed to participate in the study. The inclusion criteria consisted of physicians and nurses physically and psychologically healthy (according to their reports and medical records), a minimum of 1 year of experience in the NICU, with the ability and willingness to participate in interviews. The maximum diversity in terms of demographic characteristics was considered gender, age, marital status, level of education, work experience in NICU, and shift status. Nursing managers (matron and supervisors), and individuals who were not directly involved in neonatal care were excluded.

Data collection

Data were collected using one-on-one, in-depth semi-structured interviews based on the structure of the HSOPSC questionnaire, with open-ended questions (Table 1). The HSOPSC is developed by the Agency for Health Care Research and Quality (AHRQ) and explores

TABLE 1 Interview guide based on HSOPSC questionnaire.

Dimension of HSOPSC	Question
Overall perceptions of patient safety	What do you think neonatal safety means? What comes to your mind when you hear the word safety? What makes the safety of the neonates?
Frequency of events reported	How did it impact the patient when you or one of your partners made an error in the unit? In such cases, what is the unit's approach to error management?
Communication and openness	Regarding your relationship with your partners, which factors enable you to discuss an error with each other if one occurs?
Feedback and communication about error	How will you be notified if one of your partners makes an error? What happened after you reported an error to you or one of your partners'?
Management support for patient safety	How does the hospital's president or the unit's manager contribute to neonatal safety? What is the impact?
Non-punitive response to errors	Based on your experience, have you or your partners ever worried about the consequences of reporting a mistake you made? Can you give an example?
Staffing	How do you think issues such as high workload or the shortage of staff in the unit impact neonatal safety?
Teamwork within units	How does teamwork impact neonatal safety in your unit?
Teamwork across units	How do you think the relationship between your unit and other wards of the hospital impacts neonatal safety?
Organizational learning	How does your unit or the hospital help you learn from the errors made by you or your partners?
Handoffs and transitions	Has neonatal safety ever been compromised during shift change, neonatal transfer to another ward, or at the time of admission? Can you tell me more about it?
Manager expectations and actions promoting patient safety	How do you think the activities of managers, such as the hospital's president, matron, head nurse, or the head of the ward affect neonatal safety? How do managers' expectations of you impact neonatal safety?

the concept of safety culture in 12 dimensions (20). The survey of this instrument, examining 1,437 hospital workers, reported acceptable levels of Cronbach's α internal consistency (0.63–0.84) and construct validity (26).

In addition, questions such as "What do you mean" or "Could you explain it more clearly", taking notes during and after the interview, and the careful observation of nonverbal messages and behavior helped achieve a deeper understanding of the concept of safety culture.

The first author, who received thorough training in qualitative studies and has experience in teaching and working in the safety field, before the research, offered some information on the research objectives and the approximate duration of the interview. Written informed consent and permission to audio record the interviews were obtained from the participants before the interview commenced. The researcher also ensured that participants were aware of the confidentiality of the information and the right to withdraw at any time. Participants agreed on the location (rest room in the hospital, office, college, or park) and the time of the interviews, which were conducted in a quiet environment.

The interviews were conducted face-to-face and in the absence of other people. In qualitative studies, sampling continues until data saturation (27). In this study, although data saturation was achieved after interviewing 20 participants, four more interviews were conducted to further ensure data saturation. The interviews took from 25 to 55 min.

Approach

The directed (deductive) qualitative content analysis (DQCA) method was performed during participant interviews. This method is used when there are incomplete findings of previous research

about a phenomenon, and further research is necessary to clearly understand and explain that phenomenon (28). Whereas several studies on patient safety culture have been done, specifically based on the definition and structure of the HSOPSC questionnaire (12, 29), this method was applied to the analysis. Also, the Consolidated criteria for Reporting Qualitative research (COREQ) checklist (30) was used for the comprehensive report of this study.

Data analysis

The DQCA method was conducted using the Elo and Kyngäs' approach in three phases (31). In the first phase (preparation), each interview was recorded and transcribed, each text was reviewed several times to immerse the data. Then, in the second phase (organizing), the researchers developed a formative categorization matrix to place the codes into predetermined categories for analysis. During data analysis, using MAXQDA 10, the entire text of each interview was considered as an analysis unit. The expressions extracted from the participants' statements regarding the various aspects of the concept were identified as meaning units. Then the primary codes were obtained by the integration of the meaning units and were extracted and classified based on their similarities with the matrix. Coding was also done to other meaning units that were not related to the main categories but were related to the concept of safety culture. This allowed the emergence of new main categories. The codes were placed in the main categories, generic categories, and subcategories were formed through comparison with the categories of the matrix, using the constant comparison method. The matrix was gradually modified and finalized in a way that the obtained themes explained the concept of safety culture in NICUs which is reported in the third phase (reporting).

Trustworthiness

Speziale et al.'s criteria include credibility, transferability, dependability and confirmability, were considered (25). In order to peer-check the process, the interviews were reviewed by the research team after being codified. External reviews were done by a faculty member and a PhD student other than the research team members. Participant reviews were also carried out by two physicians and one nurse, who were randomly selected from among the participants, in order to confirm the results' accuracy. Purposeful sampling with maximum diversity contributed to data transferability. In addition to a complete report of all the phases that had been gone through and the descriptions of the analysis process, the participants' quotations were recorded to prove that the findings originate from the data.

Ethical considerations

This article is a part of the PhD dissertation in nursing, approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences under the ethics code IR.SBMU.PHARMACY.REC.1397.270. All participants were informed about the confidentiality of the data and written informed consent was obtained. The location and the time of the interviews were agreed upon by the participants. The researcher also obtained permission to audio record.

TABLE 2 Participations demographic characteristics (*n* = 24).

Characteristics		Number (%)
Sex	Female	18 (75)
	Male	6 (25)
Marital status	Single	9 (37.50)
	Married	14 (58.33)
	Divorced	1 (4.17)
Level of education	Bachelors in Nursing	5 (20.83)
	MSc student in nursing/ Masters in Nursing	6 (25)
	PhD candidate in nursing	2 (8.34)
	Pediatrician/ Pediatric resident	6 (25)
	Neonatologist/ Neonatology fellowship	5 (20.83)
Age (year)	24–34	7 (29.17)
	34–44	11 (45.83)
	44–54	6 (25)
Work experience in NICU	<5	5 (20.83)
	5–10	16 (66.67)
	>10	3 (12.50)
Shift status	Fixed	10 (41.67)
	Rotating	14 (58.33)

Results

Twenty-four physicians and nurses were interviewed. The demographic characteristics can be seen in Table 2. In the analysis of the interviews, 1,216 primary codes were obtained. After merging similar codes, 75 codes with a frequency of 793 remained. At the end of the categories, a total of 5 main categories, 10 generic categories, and 21 subcategories were extracted (Table 3), which explains the safety culture.

Main category 1: Achieving professional development

The concept of safety culture in NICU is rooted in achieving professional development, which includes "acquiring professional competence" and "professional concern". Mastery of clinical skills, critical thinking, and management of nurses' and physicians' emotions are considered important factors in health care.

> "The professional competence of NICU staff is important. We had a specialist partner who was intensely stressed in critical conditions with severe impact on her performance. During this working shift, we had IVF twins with sensitive conditions. Our partner was so anxious that she could not make a timely decision and carry out the right procedure. Unfortunately, both neonates passed away…" (Physician 3).

On the other hand, caregivers must adhere to job commitments and ethical requirements and act responsibly and responsibly in the serious matter of caring for the infant.

> "Safety culture is a reminder that everyone should be committed to professional and moral obligations, and make sure not to harm the neonate as a result of negligence and carelessness…" (Nurse 10).

Main category 2: Constructive interactions

Another dimension of the concept of safety culture in the NICU is constructive and desired professional interactions, which include "interaction and empathy" and "participatory care". The staff's cooperation with each other in providing care and support is an example of desirable interactions and empathy in the unit. Moreover, through professional interactions, partners have an opportunity to benefit from each other's skills and expertise.

> "The NICU staff should be different from other staff, the way they cooperate, the support the offer each other, or the way they work to improve each other's performance. This kind of interaction is valuable..." (Physician 7).

Adherence to the values and the principles of teamwork in providing participatory care and creating an environment where the staff can freely express their opinions and

TABLE 3 Main categories, generic categories, and subcategories of safety culture in NICUs.

Main categories	Generic categories	Subcategories
* Achieving professional development	* Acquiring professional competence	* Mastery of clinical skills * Critical thinking * The ability of emotion regulation
	* Professional concern	*Adherence to job commitments * Responsibility
Constructive interactions	Interaction and empathy	Staff's cooperation * Striving for mutual empowerment
	Participatory care	Teamwork in providing care * Constructive criticism in teamwork
Organizational supportive climate	Innovative climate and efficient supervision	Organizational innovative and creative climate Efficient supervision procedures
	Organizational leading and learning	Employees' in-service training * Inexperienced staff' leading
Management's commitment to maintaining neonatal safety	Effective management of resources	Manpower protection * Provision of care assistance equipment and facilities
	A comprehensive and systemic view of error	Fault management based on cause analysis Giving feedback and preventing errors
* Planning and implementation of neonatal developmental care	* Preparing a developmental care environment	* Designing a standard and appropriate space for care * Attention to the neonatal individualized developmental needs
	* Parental involvement in care	* Parents and neonate as a single unit of care * Mother as an independent caregiver

*All items (main categories and generic/subcategories) were obtained from interviews. The "non-asterisk" components are common with the HSOPSC (selected as framework) or modified. The "asterisk" components are new and obtained based on interviews only.

criticisms of infant safety issues shows a clear picture of safety culture.

> "At the NICU, we literally see team care and effective professional communication among physician and nurse partners. Anyone entering the NICU should have the attitude to criticize the status quo as a team member, and to notify anyone who has forgotten something and, of course, the other person must accept it too…" (Nurse 15).

Main category 3: Organizational supportive climate

An organizational supportive climate is defined as an "Innovative climate and efficient supervision" and "organizational empowerment and learning". The concept of safety culture is realized in an organizational environment that is a creative environment and encourages employees to come up with innovative strategies to improve neonatal safety. It all depends on supervisory procedures contribute to the implementation of this culture.

> "If the organization's strategy is to value these creativities, everyone is encouraged to come up with ideas and there would no longer be any need to give the staff a scale" (Nurse 1). "One of the most valuable things is the work done by the Neonatal Health Department of the Ministry of Health, which, based on field studies, is planning to more accurately follow up the issued topics. I don't

want to imply that by doing these, we have met the NIDCAP[1] standards, but we have long passed the disorganized health care…" (Physician 4).

The interviewees emphasized the need for in-service training, especially for the new staff, as a major factor in changing behaviors, improving the effectiveness of neonatal care, and achieving organizational learning that leads to a mental transformation in the staff and forms a common goal.

> "In-service training is an important process in any organization with specific funding. In the health system, where we are dealing with people, the issue becomes bolder, especially in regard with premature neonates, and should be specifically addressed..." (Physician 8).

Main category 4: Management's commitment to maintaining neonatal safety

Management's commitment to neonatal safety includes "effective management of resources" and "a comprehensive and systemic

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1 The Newborn Individualized Developmental Care and Assessment Program (NIDCAP) aims to prevent the iatrogenic sequels of intensive care and to maintain the intimate connection between parent and infant. It avoids over-stimulation, pain, stress, and isolation while it supports competence, self-regulation, and orientation.

view of error". Addressing the important issue of manpower protection with the aim of increasing occupational motivation and satisfaction and the provision of safe care assistance equipment requires principled managerial actions to provide and allocate funding to these resources, and determine the appropriate procedure for related follow-ups.

> *"It is true that the head of the unit manager supports us, but we did not receive the support we needed from the hospital management. Such attention creates a sense of security and satisfaction…"* (Nurse 6). *"When a device or apparatus is in short supply, or needs to be repaired, medical equipment providers and maintenance department should properly cooperate. In these cases, managers have to make rules to facilitate these types of access..."* (Physician 2).

While encountering an error, it is necessary for the management to adopt a systematic approach, with the aim of examining the personal and systemic reasons for the error from a different and holistic perspective, instead of punishing the one making the error, and sharing the results with the staff and give feedback on the required corrective actions to the employees.

> *"The right thing to do is to forget the old way of reprimanding the wrongdoer, and to fundamentally examine the whole system, in order to identify and eliminate the real causes…"* (Nurse 13). *"The best outcome is obtained from raising the staff's awareness. As long as the management does not inform the staff of these incidents and solutions, we will experience tragic events..."* (Physician 9).

Main category 5: Planning and implementation of neonatal developmental care

The last dimension of safety culture in the NICU is proposed as "preparing a developmental care environment" and "parental involvement in care". Designing a caring environment for developmental support, concurrently with providing medical care, is of great importance and an indicator of the safety culture in the unit. All healthcare methods such as position change, pain management, and supporting sleep-wake cycles should be planned in a way that facilitates neurodevelopment.

> *"Most of the infant's neurodevelopment happens in the ward. It makes us so sensitive to the care. We turned down the sound of alarms and turned off extra lights especially during evening and night shifts. If a surgery is done, we relieve the pain, and we really try to give them a good rest. We also have KMC in the care..."* (Nurse 3).

According to the safety culture, the turning point of care is the family and the neonate. In all safety considerations, parents, especially the mother and the neonate, are considered as a unit of care. In addition, a part of developmental care focuses on maternal empowerment as a therapist.

> *"The neonate is not separate from its parents. It is the provision of specialized care for the neonate and the family. So, there would be mental and even physical harm to the parents, especially the mother, which should not be ignored. Moreover, the mother plays a vital role in accelerating recovery..."* (Nurse 8).

Discussion

Safety culture can lay the ground for neonatal safety by making a systematic change in the staff and managers' perspectives. The findings of this qualitative study, based on the structure of the HSOPSC, led to the extraction of more detailed context-based information about the safety culture. Providing the characteristics of each dimension explains this concept from the NICU nurses and physicians' perspectives. The reports obtained from these demographically diverse samples supply valuable insight into this concept.

The concept of safety culture in NICUs was similar to the structure of HSOPSC; however, in some categories and details, it is very distinctive. The participants referred to the necessity of safety culture in neonatal care and its implementation in the unit and hospitals as a basic framework for safe practice and attitude. They regard safety culture as an organizational culture that prioritizes safe neonatal care. Managers and all staff take responsibility for its promotion through interaction and empathy. The results of this study are consistent with many other studies. In various studies on the beliefs, values, and attitudes of an organization's employees, individual and group behavioral patterns have been mentioned as the underpinnings of safety culture, which determines an individual's obligations and performance in a health organization (15, 16).

In the present study, the main dimension of neonatal safety culture is the achievement of professional development. Because staff are the main pillars of care provision, it is very important for them to acquire professional competencies, including high knowledge and care skills (10, 32). Many studies consider healthcare professionals as a key factor in safety culture (3, 12, 15, 33). Because responsible and professionally competent staff instill a sense of security and consider the patient's sensitive condition, their specialized skills can be used for the benefit of the neonates' health. This main category and its sub-categories were extracted based on the participants' opinions in the present study, which differs from HSOPSC. Therefore, it is regarded essential dimension of safety culture in NICUs.

Interviewees mentioned desirable and constructive interactions among partners, full of respect and mutual trust. The "Teamwork within/ across units" and "Handoffs and transitions" dimensions of HSOPCS consist of the items which explore how colleagues communicate. First impressions seem to suggest a similarity in dimensions, but the nature and quality of this interaction ("Striving for mutual empowerment" and "Constructive criticism in teamwork") are distinctive features of the safety culture in NICUs where employees have been trained. Physicians and nurse partners in the unit empathize with each other. This dimension is the most common form of the concept of safety culture perceived by health

system workers (12, 17, 29); as approved by previous qualitative studies (10, 17).

In the study by Wami et al., the interviewees believed that conflicts among the staff lead to poor teamwork and negatively affect patient safety culture (29). This issue is especially troublesome during patient handover, changing shifts, or transmitting information (23). On the contrary, coordinated teamwork can lead to appropriate multidisciplinary care (3, 12). A desirable interaction paves the way for the provision of specialty care in a participatory manner. On the other hand, it provides the climate for constructive criticism and its acceptance, regardless of administrative hierarchy and seniority, which leads to promoted neonatal safety. This climate is welcomed by all, and all this is realized within an appropriate context of organizational culture in the hospital.

In fact, another dimension of the concept of safety culture proposed by the interviewees is the depth of support provided by the organization, which is a combination of the "Manager expectations and actions promoting patient safety", "Management support for patient safety", and "Organizational learning" from the model. It focuses on development of the rules that facilitate neonatal safety and monitor its implementation. Maintaining neonatal health is the preservation of valuable human resources for the future. Therefore, optimizing the organizational culture by focusing on development of an appropriate vision and strategic planning to strengthen the patient's safety culture (12) is inevitable. Organizational learning was also mentioned as a formal procedure and a vital strategy for the promotion of the staff's knowledge, which is in line with various studies in this field (10, 12, 34, 35).

Management interventions play a key role in improving patient safety (32, 36) and should be given more attention in order to achieve effective communication and the efficient teamwork and obtain positive feedback. Protecting manpower is the most important action that results in increased job satisfaction, organizational belonging, and better performance among caregivers. Allocating funding resources for equipping the unit, providing care equipment, and creating a safe environment are other managerial actions considered by the interviewees, which is in line with previous studies (12, 37). In a qualitative study, the participants referred to an association between staff departure and the decline in the quality of care. They believed that management focuses on budgetary and economic goals instead of paying attention to employees and keeping them; staff and their demands are missed, and the existing problems (lack of equipment and supplies) are considered unimportant (23).

In this study, the importance of managers' supervision on the implementation of safety procedures, having an accident reporting system and forming a risk management and safety committee was discussed (10, 12, 23). But the effectiveness of such a system is questionable because, in general, serious incidents are reported, and there is still a reluctance to report these errors due to the fear of punitive actions by management, feelings of shame, and the loss of partners' trust. Although it is related to the "non-punitive response to errors", "frequency of events reported", "feedback and communication about error", and "staffing" of HSOPSC; however, the provision of care assistance equipment and facilities is the distinguishing feature of this safety culture dimension in the NICU department.

In addition, the planning and the implementation of neonatal developmental care was extracted as the last dimension of the safety culture concept, which differs from the results of previous studies on safety culture. Due to the nature of the developmental care program, family involvement is more highlighted (38, 39).

The role of parental involvement and kangaroo care in the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) (38) in maintaining neonatal neurodevelopment, is apparent to everyone. Kangaroo care is the best trauma-informed care intervention to promote parent-infant bonding through increased oxytocin levels in both mom and infant and relieve the stress. Furthermore, understanding the parent-infant safety-seeking behaviors will help providers use trauma-informed interventions containing respectful, nonjudgmental personalized care (6). The proper implementation of these requires staff knowledge and a positive understanding of and attitudes toward NIDCAP. According to the interviewees, the Neonatal Health Department at the Ministry of Health has taken helpful measures to appreciate and implement this program. Issuing instructions, facilitating mothers' continued presence and recruiting NICU nurses with master's degrees are some of the measures. However, there are still barriers such as high costs, time-consuming implementation of the program, and most importantly, family coordination with the care team.

Conclusion

The dimensions of safety culture include procedures that, if promoted, could improve neonatal safety, and shortcomings reducing harm to neonates' health while expending less financial and human resources. Gaining knowledge of the status of these dimensions in wards and hospitals can give a purposeful direction to health policymaking, and validly guarantee the health of neonates, as valuable human assets. It is also necessary to hold training courses on this concept for the staff, especially managers.

Limitation and strengths of the study

The interviewees were selected from the equipped and advanced NICUs in the city of Tehran. Due to the limitations and the shortages in some hospitals in other cities in the provision of equipment, funding, and qualified staff, perhaps conducting a similar study on those units yields a different definition of safety culture. This is what makes the generalization of findings a little difficult. One of the limitations of this study was some staff's lack of cooperation to participate in the interview (Especially physicians) due to dissatisfaction with the system and working conditions. Of those invited for interviews from 12 hospitals, only nine physicians participated in the study. Despite these limitations, it is emphasized that the knowledge obtained from this study can be valuable for neonatal health promotion and clinical applications. To develop this concept, it is suggested that future studies be conducted in other therapeutic settings.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences under the ethics code IR.SBMU.PHARMACY.REC.1397.270. The patients/participants provided their written informed consent to participate in this study.

Author contributions

MB and MNo designed the study, reviewed the study materials, and analyzed the data. MNo prepared the ethics submission. MB conducted the interviews. FA-S, HM, and MNa oversaw all aspects of the study's implementation. All authors read and revised the draft and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Hospital organizational change: The importance of teamwork culture, communication, and change readiness

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Background: Hospital organizational change can be a challenging time, especially when staff do not feel informed and ready for the change to come. A supportive workplace culture can mitigate the negative effects allowing for a smooth transition during hospital organizational change. In this paper, we test an exploratory path model by which teamwork culture influences staff attitudes in feeling informed and ready for change, and which are ultimately related to reduced staff burnout. We also examined different types of change communication, identifying the channels that were perceived as most useful for communicating organizational change.

Methods: In 2019, a cross-sectional online and paper-based survey of all staff (clinical and non-clinical) was conducted at a hospital undergoing major organizational change in Sydney, Australia. The survey included items regarding teamwork culture, communication (feeling informed, communication channels), change readiness (appropriateness, change efficacy), and burnout. With a sample size of 153 (62% clinical staff), regression and path analyses were used to examine relationships between variables.

Results: The total effects between teamwork culture and burnout was significant [β (Total) $= -0.37$, $p < 0.001$] and explained through a serial mediation. This relationship was found to be mediated by three factors (feeling informed, appropriateness of change and change efficacy) in a full mediation. Further, change readiness (appropriateness of change and change efficacy) mediated the relationship between feeling informed and burnout. The most useful channels of change communication included face-to-face informal communication, emails, and a newsletter specifically about the change.

Conclusion: Overall, the results supported the predicted hypotheses and were consistent with past research. In the context of large hospital change, staff with a positive teamwork culture who feel informed are more likely to feel change-ready, heightening the chances of successful organizational change and potentially reducing staff burnout. Understanding the pathways on how culture and communication related to burnout during organizational change provides an explanatory pathway that can be used to heighten the chances of a smooth change transition with minimal disruption to staff and patient care.

1. Introduction

A supportive organizational culture is considered a key attribute in enhancing the likelihood of success in a program of organizational change (1–3). Organizational culture is defined in different ways, but for our purposes refers to the shared values, thinking, and behaviors of people in workplaces and organizations (4). This differs from organizational climate, which is defined as the shared understanding of policies, practices, and procedures staff experience and expected behaviors (5).

A supportive organizational culture has been described as a work environment that is: trusting and collaborative; prioritizes safety and teamwork; management is supportive and encouraging; and involves employees in decision making (6). In the case of hospital organizational change, a supportive organizational culture may include ensuring that staff in departments across the hospital feel valued, included in, and informed by management about the changes occurring in the workplace. A notable challenge with improving organizational culture in order to heighten the chances of successful organizational change is that culture is not easily changed – and when it can be altered, it usually takes considerable time and resources (7). A successful organizational change can be defined as an initiative having long-term sustainability, and with minimal disruption to the quality and safety of patient care (8). Given that culture is a known predictor of successful organizational change in healthcare (9) it is important to identify factors that can practically influence culture, to ultimately contribute to successful long-term organizational change.

Previous research has emphasized the importance of teamwork as a key indicator of a supportive organizational culture and as a potential factor contributing to the success of organizational change (10). Fostering a culture of teamwork among hospital staff with shared beliefs of collaboration and cooperation will in turn affect their levels of engagement and participation in collective decision making during a change initiative (11). Conversely, lower levels of teamwork and a stressful work environment have been proposed as antecedents for lower engagement and ability to cope with change; ultimately leading to higher levels of burnout and absenteeism among hospital healthcare workers (11, 12).

Another potential factor that may contribute to successful organizational change is related to communication and how informed staff feel regarding the change initiative. Change management communication is viewed as a crucial element for the sharing of change information to raise awareness and increase support for staff during organizational change. Indeed, past research highlights the importance of communication for positive organizational culture and change (13). Effective communication can allay staff fears and uncertainty regarding the change and can foster confidence in their ability to cope with the change (14). Makay et al. (15) identified that timely and effective communication was positively related to staff feeling ready for change, also known in the literature as change readiness. Change readiness has been proposed as "the cognitive precursor to the behaviors of either resistance to, or support for, a change effort" (pp. 681–82) (15). Recent literature has also identified the psychological impact of change attitudes on staff-wellbeing, with staff who felt "not ready" and uninformed expressing fatigue and burnout (8, 16) as a result of the change.

Change readiness refers to the extent to which employees feel prepared for an upcoming organizational change, i.e., feeling the change is appropriate for the organization and that employees are ready to take on the change initiative (17). At an individual psychological level, change readiness in hospitals consists of two key components: (1) appropriateness (healthcare workers perceive that the change is appropriate) and (2) self-efficacy (healthcare workers perceive that they possess the skills and competencies to successfully implement the proposed change) (8). However, various psychological theories (e.g., social information processing models) remind us that the creation of change readiness extends beyond individual cognitions since it involves social phenomena as well; i.e., an individual's readiness for change is also shaped by the readiness of others, and in particular the team members with whom they work most closely. Indeed, there is a growing body of research examining the role of employees' perceptions of broader contextual variables, including organizational culture, in fostering readiness for change. Jones et al. (18) identified that organizational cultures fostering high levels of teamwork were more ready for change, which in turn, predicted post change implementation success (18). Jones et al. (18) further suggested that such teams fostered cohesion and morale through open communication and participative decision making, indicating potential explanatory pathways through which organizational culture positively shapes organizational change.

In order for staff to feel informed and ready for organizational change it is important that change is communicated using appropriate channels (19). According to past research, the most commonly used and preferred channels of change communication are less formalized, face-to-face mediums (19, 20) including small informal discussions (19) staff meetings, and discussions in focus groups or teams (20). Similarly, in healthcare, emphasis has been placed on the desirability of face-to-face meetings, with a need to target clinical leads, key decision-makers and professional teams covering all individuals and groups across a hospital organization (21). Face-to-face meetings provide the opportunity to solicit suggestions, and for healthcare staff to share their perspectives, tender their views and seek clarifications (22). Further, using multiple channels for change communication is useful, broadly (23) and in healthcare specifically (22) to ensure change information reaches as many staff as possible. However, there is an apparent dearth of the literature examining useful channels of change communication in hospital organizational change—i.e., what channels are most useful to communicate organizational change to hospital staff?

The purpose of this paper was to test an explanatory path model for how teamwork culture influences staff attitudes in feeling informed and ready for change, and ultimately leading to reduced staff burnout. The model was developed from survey responses from both clinical and non-clinical staff, at a time that organizational change was occurring in real-time as their hospital underwent redevelopment. A secondary objective was to examine different types of change communication, to identify the channels that were perceived as useful for the communication of changes during this period of large organizational change (i.e., hospital redevelopment).

Based on previous literature, we hypothesized that:

H1. Teamwork culture will have a significant direct positive relationship with feeling informed and change readiness.

H2. Feeling informed and change readiness will have a significant direct negative relationship with staff burnout.
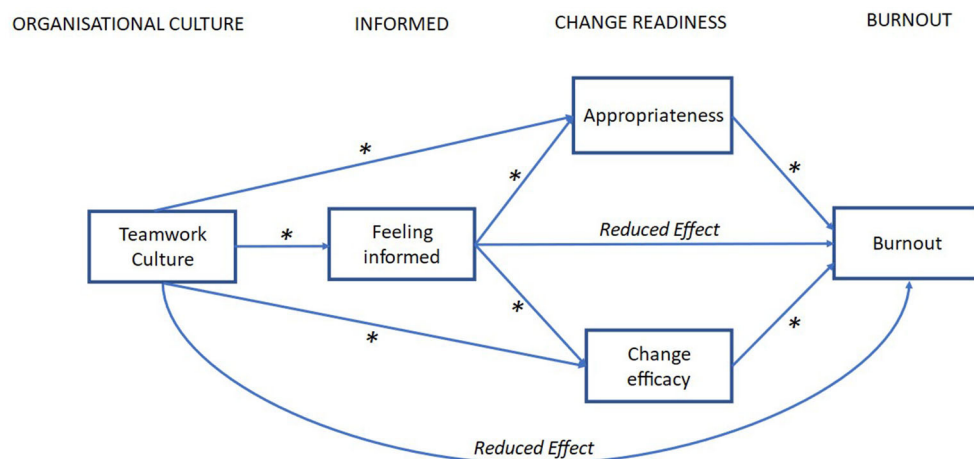
FIGURE 1
Hypothesized explanatory path model for the influence of teamwork culture on burnout and the role of feeling informed and change readiness during organizational change. The model includes nine direct pathways with two serial mediations to two parallel mediators (change appropriateness and change efficacy); * = hypothesized significant effect.

H3. Feeling informed will have a significant, but indirect impact on burnout during organizational change, explained through the mediational role of change readiness.

H4. Teamwork culture will have a significant, but indirect impact on burnout during organizational change, explained through the mediational role of feeling informed and change readiness.

Figure 1 displays the hypothesized serial mediation model.

2. Methods

This study employed a cross-sectional online and paper-based survey of hospital staff from a publicly funded hospital in metropolitan Sydney.

2.1. Participants and setting

Participants were staff (clinical and non-clinical) at a hospital in Sydney, Australia. The hospital was undergoing a multimillion-dollar development including the opening of a new hospital building. More detail on the study setting and the change are reported elsewhere (16, 24). Data collection was conducted before the new hospital building opened while staff were undergoing the orchestrated organizational change. Consent was obtained from all participants (written for those who completed the paper based survey and online for those who completed the online survey). Participants understood that their participation was voluntary, confidential and non-identifiable. Participants were assured that they could withdraw from the study at any time without consequences. No reminders were sent to complete the online survey, and unfinished surveys were not included in the data analysis. The study was approved by the relevant Ethics Committee in Sydney, New South Wales, Australia (reference no: 18/233).

2.2. Survey

The survey was distributed in both online and paper-based forms in July to August 2019. Online surveys were distributed via email to staff from managers and an online all-staff bulletin. Participants were invited to participate by clicking on a link that led to the survey, which was hosted by Qualtrics (25). In case staff preferred filling in a paper-based survey, these were distributed to hospital staff (clinical and non-clinical) by ward managers and departmental directors.

2.2.1. Teamwork culture

To assess teamwork culture the six-item teamwork climate scale from the widely used Safety Attitudes Questionnaire (SAQ) (26) was adopted. Questions were measured on a five-point Likert-type scale (1 = strongly disagree to 5 = strongly agree). In the present study, we found high internal consistency reliability for the teamwork climate scale (Cronbach's $\alpha = 0.81$), similar to that reported by Sexton et al. (26) (Raykov's $\tilde{n} = 0.90$) (26).

2.2.2. Change readiness

The validated Hospital Readiness Questionnaire (HRQ) (8) was used to assess change readiness. Two subscales were included: appropriateness (four items) and change efficacy (four items). Items were rated on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree), with higher scores indicating a greater degree of change readiness. In this study, we found acceptable internal consistency reliabilities for the two HRQ subscales for appropriateness (Cronbach's $\alpha = 0.85$) and change efficacy (Cronbach's $\alpha = 0.74$).

2.2.3. Burnout

Burnout was measured using a 10-item version of the Maslach Burnout Inventory (MBI) (27, 28). Due to the inappropriateness of the third subscale, personal accomplishment, for use in

healthcare settings (28, 29) only two subscales of burnout—emotional exhaustion (five items) and depersonalization (five items)—were used. Items were measured on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). In the present study, the internal consistency coefficients for emotional exhaustion (Cronbach's α = 0.92) and depersonalization (Cronbach's α = 0.86) were both very good.

2.2.4. Feeling informed and channels of change communication

Purpose-designed items were developed to assess how informed staff felt, and what channels of change communication they perceived to be most useful. "Feeling informed" was measured on a four-point Likert scale (1 = very informed, 4 = very uninformed). When asked about useful channels of change communication the following options were provided: chatting with other staff (i.e., face-to-face informal communication), emails, formal presentation, line manager, meeting, newsletter specifically about the change, signs around the hospital, social media, website. These items were created by the research team in collaboration with key stakeholders at the hospital. Specifically, the options for channels of change communication were pre-determined by knowledgeable stakeholders at the hospital. These items were piloted with an expert panel (n = 10; researchers with clinical backgrounds and hospital staff not involved as participants in the study) to ensure that the items were applicable and were modified where necessary to improve clarity.

2.3. Data transformations and analysis

Some items were reversed coded so that higher item-response scores indicated a greater extent of change readiness and positive organizational culture. While originally measured on a four-point Likert scale, "Feeling informed" was dichotomized for more ready analysis (0 = uninformed, 1 = informed).

Hypotheses were assessed using path analysis to examine the direct and indirect relationships between teamwork culture and burnout, and the mediational role of change attitudes (feeling informed, appropriateness and change efficacy) during organizational change. Analyses were performed using the PROCESS procedure V3.5 (30) in SPSS version 27 (31). From PROCESS, Model 81 was used for the path model. To manage bias, a non-parametric bootstrapping analysis was used to test the null hypothesis for the mediations. Indirect pathways were found to be significant if the 95% bias-corrected confidence intervals for the indirect effects does not cross zero. The model was adjusted for age, sex, and the number of years worked at the hospital. To assess how much of an effect was mediated through the indirect pathway we calculated the mediation proportion, defined as the proportion from the indirect effect (the mediator) on the total effects, that is, the indirect effect divided by the total effect (32). To assess for differences between the parallel pathways, a contrast of the indirect effects was tested (30). Usefulness of communication channels were examined using descriptive and logistic regression analysis in SPSS version 27 (31).

3. Results

3.1. Descriptive statistics

Two-hundred and eleven surveys were received; only surveys with no missing data for the variables to be used in the path analysis (teamwork culture, change readiness and burnout) as PROCESS requires complete data for analysis, resulting in 153 usable responses (73% effective response rate). Table 1 summarizes demographic and work characteristics of respondents and Table 2 presents the means, standard deviations, skewness, and kurtosis values, and intercorrelations for all variables included in the path analysis. Skewness and kurtosis values were within acceptable ranges of normality. All bivariate correlations were statistically significant and in the hypothesized direction.

3.2. Path analysis

Path analysis was used to test an explanatory path model of the study variables (see Figure 1). For the direct pathways, as predicted, the results showed significant positive associations between teamwork culture and the feeling informed and change readiness (appropriateness, change efficacy) mediator variables. There were also significant positive associations between feeling informed and change readiness pathways. Additionally, there were significant negative associations between change readiness variables (appropriateness, change efficacy) and burnout. Further, the direct relationship between feeling informed with burnout, and between teamwork culture with burnout were not significant (see Figure 2). As predicted, four out of five indirect pathways were significant (see Table 3 for details). Results for the model showed a significant total effect between teamwork culture and burnout [β (Total) = −0.37, SE = 0.18, p < 0.001], however, the direct effect was not significant [β (Direct) = −0.14, SE = 0.19, p = 0.08], indicating that a full mediation has occurred. The three change attitude mediators, feeling informed, change appropriateness and change efficacy fully mediated the relationship between teamwork culture and burnout indicating that the relationship can be explained through the serial and parallel indirect pathways. To examine whether the contributions of the two change readiness variables were different in the parallel pathways, we tested for differences between the two parallel indirect pathways (TW > APP > BO and TW > CE > BO) through pairwise contrasts. We found no significant difference between these two paths [β (contrast) = −0.005, SE = 0.06, 95% CI (−0.118, 0.118)]. We also examined if the two serial indirect pathways (TW > INF > APP > BO and TW > INF > CE > BO) contributed differently through pairwise contrasts and found no significant difference between these two paths [β (contrast) = 0.007, SE = 0.014, 95% CI (−0.019, 0.038)].

3.3. Channels of change communication

Most staff reported that they felt somewhat or very informed (n = 96; 64.0%) regarding the hospital organizational change. The most commonly reported useful channels of informing staff about the change were: face-to-face informal communication (n = 67, 43.8%), emails (n = 66, 43.1%), and a newsletter

TABLE 1 Demographic and work characteristics of respondents (*N* = 153).

		n	%
Gender	Male	41	27.0
	Female	109	71.7
	Other	2	1.3
Age	18–24 years	8	5.2
	25–34 years	36	23.5
	35–44 years	33	21.6
	45–54 years	44	28.8
	55–64 years	26	17.0
	65+ years	6	3.9
Role	Clinical	93	61.6
	Non-clinical	38	24.8
	Both	20	13.2
Profession	Administration/clerical	20	13.1
	Allied health professional	12	7.8
	Management	17	11.1
	Medical officer/consultant	26	17.0
	Registered nurse/midwife/enrolled nurse	60	39.2
	Other (e.g., cleaning, porter, security, chaplain)	22	14.4
Experience at hospital	< 1 year	15	10.1
	1–3 years	37	24.8
	4–6 years	35	23.5
	7+ years	62	41.6

Responses may not equal 153 due to missing data for demographic variables.

TABLE 2 Descriptive statistics and correlations for study variables.

		M	SD	SK	KU	1	2	3	4	5
Culture	1. Teamwork culture	21.3	6.3	0.2	−0.5	–	0.26*	0.48**	0.38**	−0.41**
	2. Informed	–	–	–	–		–	0.31**	0.33**	−0.15
Change readiness	3. Appropriateness	15.8	4.0	−0.8	0.5			–	0.43**	−0.48**
	4. Change efficacy	17.4	4.8	0.0	0.2				–	−0.49**
	5. Burnout	39.2	15.2	0.1	−0.7					–

*P < 0.05, **P < 0.001.

specifically about the change (*n* = 60; 39.2%). Figure 3 shows the channels of change communication ranked as most useful. Further, most participants indicated that multiple channels were useful (*n* = 101; 66.0%), with less than a third of the sample reporting only one channel as useful (*n* = 47, 30.7%).

Logistic regression analyses were conducted to examine if useful channels of change communication differed across demographic characteristics. First, we examined the likelihood of participants reporting "face-to-face informal communication" as a useful channel of information based on gender, age, role, profession and experience at hospital. The model was statistically significant, $\chi^2(18) = 30.05$, $p = 0.037$, explained 24.8% (Nagelkerke R2) of the variance and correctly classified 69.4% of cases. Staff that had worked at

the hospital < 1 year were 7.26 times more likely to report face-to-face informal communication as a useful means of change communication compared to staff that had worked at the hospital for seven or more years. No other variables were associated with the likelihood of nominating 'face-to-face informal communication' as a useful channel of change information. Further, the likelihood of hospital staff reporting emails as a useful channel of change information did not significantly differ based on gender, age, role, profession and experience at hospital, $\chi^2(18) = 18.57$, $p = 0.419$. Lastly, we found that the likelihood of hospital staff reporting the change specific newsletter as a useful channel of change information significantly differed based on gender, age, role, profession and experience at hospital, $\chi^2(18) = 33.36$, $p = 0.015$, explained 27.5% of the model and correctly classified 71.4% of cases. Allied health

FIGURE 2
Explanatory path model for the influence of teamwork culture on burnout and the role of feeling informed and change readiness during organizational change with regression coefficients (B). $^{**}P < 0.00l$, NS, not significant.

TABLE 3 Indirect effects for the indirect pathways between teamwork (TW) and burnout (BO).

Mediation pathway	Standardized indirect effect	SE	95% CI	Mediation proportion
TW > INF > BO	0.013	0.023	−0.033, 0.062	0.037
TW > APP > BO	−0.104	0.041	−0.188, −0.031	0.283
TW > CE > BO	−0.099	0.040	−0.187, −0.033	0.270
TW > INF > APP > BO	−0.014	0.009	−0.035, −0.001	0.037
TW > INF > CE > BO	−0.021	0.012	−0.049, −0.003	0.056

APP, appropriateness; BO, Burnout; CE, change efficacy; INF, informed; TW, teamwork culture.

professionals were 5.75 times more likely to report the newsletter as a useful channel of change communication compared to nursing staff. Further, staff aged over 65 years were 0.07 and 0.06 times more likely to find the newsletter useful compared to staff aged 25–34 and 35–44 years, respectively.

4. Discussion

The aim of the paper was to test an explanatory path model for how teamwork culture influences staff attitudes in feeling informed and ready for change, and ultimately leading to reduced staff burnout. It also identified perceived useful channels of change communication prior to a large hospital organizational change. Overall, the results supported the predicted hypotheses and were consistent with past research.

The explanatory model found positive and significant relationships between teamwork culture and change management communication variables; feeling informed, change appropriateness and change efficacy. This finding supports the role of a positive teamwork culture leading to better change communication. Effective teamwork and communication in healthcare settings have previously been found to play a crucial role in the delivery of safe and high quality care, through focus on a collaborative culture (33). Collaboration, a central tenet of a positive teamwork culture, leads to not only efficient processes but also improved communication (34).

Additionally, Simoes and Esposito (35) found that communication needs to be "dialogic" for there to be a reduction in resistance to change, further demonstrating the importance of collaboration.

The model also found that the influence of teamwork culture on burnout was indirectly mediated by both feeling informed and change readiness. Poorer teamwork culture was directly associated with burnout during organizational change, however, focus on effective change communication could ultimately mitigate this relationship and contribute to reduction of burnout. The relationship between feeling informed and burnout was also mediated by change readiness. This shows that it is more than just feeling informed that contributes to positive organizational culture in hospital organizational change. Staff also need to perceive the change as appropriate and that they are capable of dealing with the change for there to be a positive impact on organizational culture, and ultimately heighten the chances of a smooth change transition with minimal disruption to patient care. Readiness for change has received much attention in the organizational change literature (35) for its contributary role in successful organizational change (36). This study provides further support for the important role of change readiness in organizational change as a mediator for positive organizational culture in the oftentimes chaotic time of hospital organizational change.

For hospital staff experiencing the early stages of large-scale organizational change, the most useful channels of change communication were face-to-face informal communication, emails, and a change specific newsletter. Face-to-face informal
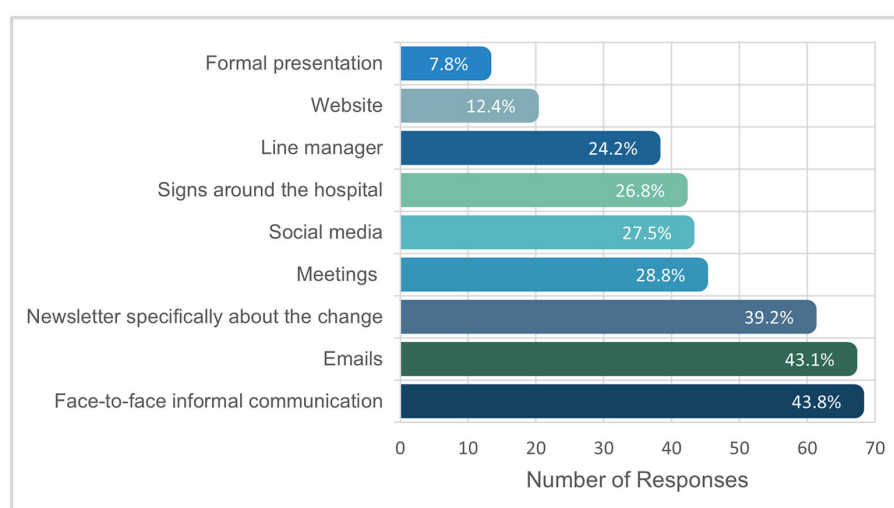
FIGURE 3
Usefulness of channels of change communication.

communication was the most commonly reported useful channel of change communication, particularly so for staff that had worked at the hospital <1 year. This is consistent with theories of communication maintaining that informal communication networks are important during change programs (37). particularly when both the sender and receiver are able to clarify their understanding (38). For new hospital staff, being able to partake in an active, two-way conversation where clarification can be sought is vital to ensure staff feel informed and equipped for the organizational change. Further, this sheds light on another way to ensure hospital staff feel informed in the lead up to organizational change: by leveraging change agents. Change agents, otherwise termed "champions" or "brokers" in the healthcare literature, can be used to transfer information across boundaries (professions, wards, day/night shifts) (39) and are integral in the adoption and diffusion of new phenomena (40–42). Change agents are essential for the success of organizational change because of their collaborative power (i.e., ability to bridge boundaries and pass on information) and advocacy (i.e., spreading a positive message about the change). We also found that most staff ($n = 101/153$) reported multiple channels of change communication as useful (as opposed to only reporting one useful channel), supporting past healthcare literature emphasizing the importance of using multiple channels of change communication for successful organizational change (22). We also found differences between professionals in terms of what channels of change communication were deemed most useful. This reinforces the importance of using diverse and multiple channels of change communication to ensure change-related information reaches as many staff as possible.

4.1. Implications

This study highlights that the way in which organizations communicate with their employees during organizational change can have significant effects on organizational culture and the success of change and *vice-versa*. Key principles to ensure hospital staff feel informed and ready for organizational change include using multiple channels of change communication (e.g., encouraging face-to-face informal communication as well as emails between staff and a change specific newsletter) and preparing key people to be change agents with the brief of face-to-face informal communication among staff and making themselves available for discussion about the change. These recommendations can be used by managerial staff working through hospital change.

4.2. Strengths and limitations
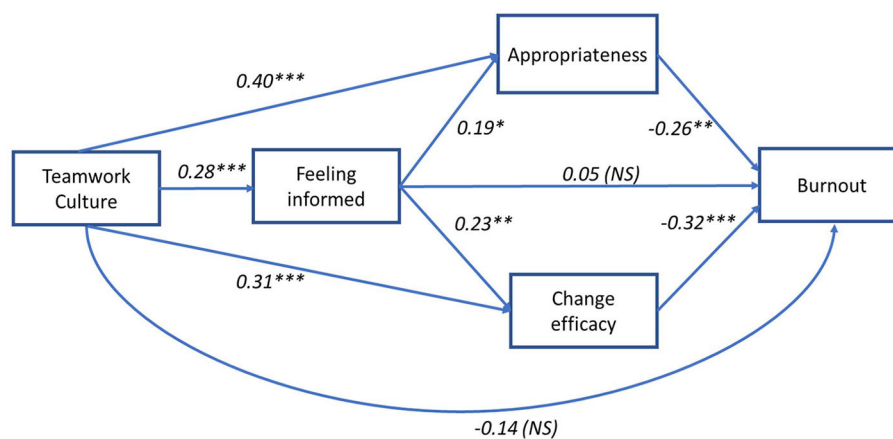
A methodological strength of this study was the use of path analysis to test the influence of teamwork culture on burnout and the role of feeling informed and change readiness during organizational change. This is also one of the first studies to identify and recommend useful channels of change communication in hospital organizational change. A limitation was that the effectiveness of the channels of change communication was not directly measured. There are a lack of appropriate and rigorous tools that assess effective change communication, (43) therefore, we relied on the self-reports of hospital staff *via* an author-developed survey tool to identify which channels they perceived as most useful. Further, the explanatory between teamwork culture and burnout was performed through a cross-sectional survey; as such, it is based on staff perceptions at one-point in time. While the model explains the mediating effects of change attitudes (feeling informed, appropriateness and change efficacy) during organizational change, it does not take into account other factors that may impact burnout, such as workload. This means that the results need to be interpreted with caution until they have been replicated in follow-up longitudinal research. Another limitation is that the findings may be restricted to the contextual subtleties of the hospital and the specificities of the hospital redevelopment. Finally, given that the survey was advertised *via* email within the hospital bulletin

and paper-based surveys were distributed to hospital staff by ward managers and health professional directors, we were unable to calculate a response rate, and we could not determine whether there was a difference between participants and non-participants. Nevertheless, the study was designed to produce nuanced, in-depth data with aspects transferable to other instances of large-scale hospital change. The research is applicable to other hospitals, particularly in Australia's most populous state, New South Wales, where there are approximately 30 large public hospitals that have similar organizational structure in terms of funding, administration and staff skill mix.

Conclusion

In conclusion, this study highlights the importance of positive teamwork culture, as well as change readiness in heightening the chances of successful organizational change and reducing staff burnout. A key implication from this study is that while building a positive organizational culture typically takes time, managers can seek to reduce burnout by improving change communication and ensuring staff feel informed and ready for the organizational change.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the relevant Ethics Committee in Sydney, New South Wales, Australia (reference no: 18/233). The patients/participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Naming the "baby" or the "beast"? The importance of concepts and labels in healthcare safety investigation

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This paper focuses on concepts and labels used in investigation of adverse events in healthcare. The aim is to prompt critical reflection of how different stakeholders frame investigative activity in healthcare and to discuss the implications of the labels we use. We particularly draw attention to issues of investigative content, legal aspects, as well as possible barriers and facilitators to willingly participate, share knowledge, and achieve systemic learning. Our message about investigation concepts and labels is that they matter and influence the quality of investigation, and how these activities may contribute to system learning and change. This message is important for the research community, policy makers, healthcare practitioners, patients, and user representatives.

KEYWORDS

safety investigation, patient safety, inspection, investigation, learning

1. Introduction

Concepts and labels matter. The name we give to an activity can frame and shape how the activity is conducted, what it means to those engaged in it, and what consequences it might have. This is particularly important for responses and investigative activities that can follow patient safety events (1–6). Does it matter if the response to an event is being named as an accident investigation, inspection, exploration, analysis, case, complaint, inquiry—or even a prosecution? The differences between these labels and their connotations are not trivial. Even so, debates about terminology and labels are, perhaps surprisingly, rarely explicit in the field of patient safety.

In this paper, we aim to prompt critical reflection of how different stakeholders frame investigative activity in healthcare: What are the implications of the labels we use? We particularly draw attention to issues of investigative content, legal aspects, as well as possible barriers and facilitators to willingly participate, share knowledge, and achieve systemic learning.

2. What's the difference between concepts and content?

In healthcare systems around the world, a diverse range of organizations and processes may be involved when adverse safety events occur. Table 1 indicates the main Norwegian bodies and their role in response to adverse events. The Norwegian healthcare system is among the first to establish a national independent body to investigate safety events [the Norwegian Healthcare Investigation Board (NHIB)] as a supplement to established regulatory bodies (1, 4).

TABLE 1 Overview of main bodies from the Norwegian context and their role and mandate in following up of adverse events.

Type of body	System level	Purpose for safety event follow up	Sanctioning power	Legal framework for governmental authority	Concept used for accident investigation activity
Norwegian Board of Health Supervision (NBHS)	Organizational and individual scope. Subordinate to the Ministry of Health and Care Services	National, external inspection of the healthcare services performance and patient treatment in accordance with the regulatory principle of sound professional practice	(1) notification about breach of conduct, or (2) administrative sanctions against healthcare personnel and/or healthcare providers and organizations	Norwegian healthcare legislation Act relating to public supervision of health and care services (1984)	Regulatory inspection
County governors (CG)	Organizational and individual scope. Administratively subordinate to the Ministry of Local Government and Regional Development Under supervision of Norwegian Board of Health Supervision (NBHS)	Regional, external inspection of the healthcare services performance and patient treatment in accordance with the regulatory principle of sound professional practice	(1) Notification about breach of conduct, or (2) Administrative sanctions against healthcare personnel and/or healthcare providers and organizations	Norwegian healthcare legislation Act relating to public supervision of health and care services (1984)	Regulatory inspection
Norwegian Healthcare Investigation Board (NHIB)	System-wide scope. Subordinate to the Norwegian Ministry of Health and Care Services.	Independent, multi-level and multidisciplinary investigation, set to promote system-wide learning and patient safety.	Non-punitive, non-sanctioning authority.	Norwegian healthcare legislation Act on the Norwegian Healthcare Investigation Board (2017).	Exploration
The Norwegian System of Patient Injury Compensation	Individual scope. Subordinate to the Norwegian Ministry of Health and Care Services.	Handling of applications in compensation claims from patients. In cases of financial loss as a result of an injury caused by inadequate medical treatment, compensation will be granted (under specific conditions).	No sanctioning authority against healthcare personnel. In cases where the conditions are not met and compensation not granted, there may be an option of submitting an appeal to the National Office for Health Service Appeals.	Norwegian Tort Law and Non-Statutory Law Act on patient injury compensation (2001)	Case; claim
Law enforcement; criminal prosecution	Organizational and individual scope.	Investigation of cases where Norwegian law has been violated.	Criminal sanctions; penalties.	The Penal Code (2005) and other Norwegian laws.	Police investigation and criminal prosecution.

2.1. Regulatory inspection of adverse events

In Norway, regulatory bodies at regional (County Governors) and national (Norwegian Board of Health Supervision) level examine cases of reported patient harm, complaints, and severe adverse events in healthcare. A legal logic underpins the processes that involves assessing whether patients received treatment according to the regulatory principle of sound professional practice and guidelines. If not, sanctions can apply to individuals (warning, restrictions, withdraw license) and organizations (fines, warnings).

Investigations by the Norwegian Board of Health Supervision and the County Governors are often referred to as "inspections" [e.g., (7, 8)]. Healthcare professionals and organizations risk sanctions if they are involved in an adverse event where an inspection reveals a violation of law and regulations. This legal process of "inspection" has been in place for years, but the media still refers to these as "investigations." Some regulatory inspections become high profile cases (9, 10) and the media tends to focus on individual patients, professionals, and managers. From the perspective of learning, information sharing and trust this erroneous labeling of regulatory inspections as "investigations" may be counterproductive: people

may subsequently confuse the role and objectives of these regulatory inspections (which can carry significant legal jeopardy) with other types of investigative activities that are more oriented to learning and systems improvement.

2.2. Independent exploration of adverse events

The recently established Norwegian Healthcare Investigation Board (NHIB) conducts independent investigations of severe adverse events. NHIB decides which cases to investigate and how comprehensive these investigations should be. The purpose of NHIB activities is learning and improvement (4). Notably, the Norwegian concept used when referring to NHIB investigations translates in English to "exploration." The legal framework also uses "explorations" as part of the title and mandate of NHIB. In contrast, the English translation of NHIB's name and title of the law both use the label "investigation." The operationalization of the "exploration" that NHIB conducts is broad, system-wide, multidisciplinary, learning-focused, and does not carry risk of

sanctions for the healthcare personnel or organizations involved. Naming these activities an "exploration" represents a strong framing effect signaling that this is a safe and exploratory process to participate in for professionals. Moreover, the term "exploration" is, in contrast to "investigation," "inspection" or "inquiry," a marker of a more open-minded, tentative, and formative process that accommodates the complex, interactive systems and networks of causality associated with healthcare safety.

3. Concluding remarks and recommendations

Ongoing debates within healthcare on the importance of independent safety investigations, regulatory inspections and legal enforcement highlight the importance of sharing information, facilitating learning, promoting a just culture, building trust and actively involving patients' and families after adverse events (1, 11–17). We believe there is also a need to reflect more systematically on how we name and frame the different activities that follow safety events, and the connotations of these labels in the public domain. Labels, and the concepts and principles they imply, can deeply influence how people interpret and engage with a process, how willing people are to share their knowledge and experiences, and what consequences people expect. We believe there is a need to more clearly articulate and explore the differences between what concepts, labels, and names mean in practice. Naming the "baby" ambiguously, or with a concept loaded with alternative meanings, may lead people to fear a "beast," confusing or distracting them from efforts to share, learn and improve.

Ultimately, how concepts and labels are used in practice and interpreted by different groups is an empirical question. The issues highlighted here warrant close and critical investigation and would form the foundation for a productive research programme. From a more practical and clinical perspective, there are important opportunities for clinicians, patients, managers and regulators to engage in more critically reflective and collective examination of the concepts and labels that are routinely used in relation to adverse events; in particular, it would seem important to refine and clarify the language used by–and to describe the roles of–the different bodies involved after adverse events. Such collective deliberation should not simply be focused in relation to an individual specific adverse event, but should be part of a broader endeavor to develop and improve the systems in place to learn from both disruptive conditions and normal situations.

For organizations and individuals to learn, information must be openly and honestly shared and used in good faith for the purposes of improvement. This can be particularly challenging when clinical staff are exposed to external or supervisory bodies entering the clinical field to collect information about adverse events. As such, it is critically important to carefully design spaces and processes that can enable sharing and learning. At the same time, there is a need to acknowledge the potential limitations and tensions inherent in the processes of external review of adverse events, particularly if those bodies have sanctioning powers, and also if they have the ability to disclose events or information that may risk identifying healthcare staff, patients or organizations, even if particular information characteristics are secured and anonymity is regulated by law.

Overall, based on the arguments advanced here, we recommend that policymakers, regulators, practitioners, media outlets and the research community need to engage in a careful exploration of how language, concepts and labels can deeply support– or impede–the processes they describe. We propose making a terminological shift in the labeling of regulatory and supervisory activities that are aimed at learning and quality improvement, shifting to a language centered on 'systemic exploration'. Such an approach may signal sensitivity to the importance of building public, professional and patient trust and accommodating the complexity and networks of causality associated with adverse events in healthcare.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

SW had the idea and developed the first draft of the article which was further developed in close collaboration with SØ, CM, and JF. All authors contributed to the revision and have approved the final version of the article.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Working conditions, authorizations, mental health, and job satisfaction of physician assistants in Germany

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Objective: This study explores associations among the overall and facet-specific job satisfaction, work-related factors, responsibilities, and mental health of physician assistants (PAs) in Germany to identify factors that prolong the lifetime and wellbeing of PAs in practice and to counteract the shortage of healthcare staff.

Methods: An online survey comprising sociodemographic and work-related items, items from the short questionnaire of general and facet-specific job satisfaction (KAFA), and the Depression, Anxiety, and Stress Scale (DASS-21) were distributed to PAs working in Germany in 2021 (cross-sectional survey design). Descriptive statistics, DASS-21 subscale score analysis, t-test, ANOVA, or Kruskal–Wallis test was used.

Results: PAs ($n = 169$) were working mainly in surgery (23.2%), internal medicine (20.3%), or orthopedics and trauma surgery (17.5%), whereas only a few PAs were working in emergency care, geriatrics, neurology, or oncology. They were responsible for a broad spectrum of medical activities depending on the practice setting. PAs working in emergency care claimed to be the most empowered, followed by PAs in orthopedics and surgery. Almost all PAs carried out documentation, anamnesis, and diagnostic services. Although almost all PAs rated their overall job satisfaction as good, satisfactory, or pleasant (91.6%), single facets of job satisfaction were rated differently. Colleagues and supervisors were assessed very positively, whereas payment and professional activities were rated rather average and development opportunities even worse. PAs working in oncology demonstrated the highest overall job satisfaction, followed by PAs working in geriatrics and emergency care. Overall job satisfaction was significantly negatively associated with depression, anxiety, and stress scores ($p \leq 0.001$, $p \leq 0.05$, and $p \leq 0.05$, respectively). Particularly, female gender, having an urban residence, and PAs working in oncology demonstrated significantly increased anxiety scores. Moreover, depression scores of PAs working in oncology or neurology or with a low net income exceeded critical cutoff values.

Conclusion: Interventions aimed at removing the significant negative correlation among job satisfaction, depression, anxiety, and stress scores are needed. To retain PAs in their jobs, salary, autonomy, and development opportunities should be improved and prevention programs for anxiety and depression should be offered. Remarkably, PAs' overall good job satisfaction was mainly determined by good evaluations of supervisors and colleagues.

KEYWORDS

physician assistant, job satisfaction, depression, anxiety, stress, responsibility, authorization, burnout

Introduction

The first physician assistant (PA) program in Germany started in 2005 in accordance with the trend in other countries of educating PAs to avoid the imbalance between the demand and supply for healthcare (1). PAs are initiated to relieve the healthcare system and its employees by routinely taking on delegable tasks from physicians. Depending on the work experience of PAs and the focus of the practice of the supervising and delegating physician, the tasks and responsibilities of PAs can vary (1, 2). There are currently at least 22 universities of applied sciences in Germany that offer a degree in Physician Assistance (3), and some of them have joined forces to form the German University Association for Physician Assistants (Deutscher Hochschulverband Physician Assistant e.V., DHPA e.V.) (4). A survey of former students of universities belonging to the DHPA showed that PAs were highly satisfied with their choice of career and being fully employed (5). However, PAs are still new in Germany, and their acceptance is slowly being tested in practice (2). Although more than 1,000 PAs are now practicing their profession (3), very little is known about their everyday life and scope of practice in Germany, empowerment, mental health, and job satisfaction.

Job satisfaction is an important concept in occupational medicine and is positively correlated with health and wellbeing (6). A high level of job satisfaction has a positive effect on work performance, health, and behavior at work, and satisfied employees tend to be more productive and creative (7–9). Moreover, employees with greater job satisfaction are less likely to leave their jobs than those who are dissatisfied (6, 10, 11). The general, overall job satisfaction is a multidimensional concept consisting of many components and defined as the employee's overall attitude to the work since employees balance their job satisfaction or dissatisfaction to different parts of the job (facets) and finally form an overall conclusion about the job (6, 7). There were several tools discussed and tested to determine job satisfaction, of which the job descriptive index is one of the best established (6). It includes five facets of job satisfaction: employment, salary, promotion opportunities, supervision, and coworkers. These five facets are included in many methods of surveying job satisfaction (7). Understanding PAs' job satisfaction is important for recruiting and retaining those professionals.

In Germany, the overall shortage of registered healthcare staff is high (12), and the sickness absence value in the healthcare industry is at the top and clearly above the average of all industries in Germany (13), leading to an increased workload, job stress, job dissatisfaction, and even burnout of all healthcare professionals (14, 15). Indeed, several studies confirmed that increased job stress negatively affects job satisfaction and wellbeing and suggested that job dissatisfaction may lead to symptoms of burnout (16–21). It was believed that job satisfaction with one's current position may be a protective factor against burnout (22).

Burnout as a work-related stress syndrome resulted from chronic exposure to job stress and is common among healthcare workers (23, 24). It is characterized by the dimensions of emotional exhaustion, depersonalization, and lack of personal accomplishment (22). The physical and psychological exhaustion associated with different types of burnout were reflected in symptoms of depression, anxiety, and stress (25), and the Depression, Anxiety, and Stress Scale-21 (DASS-21) questionnaire was suggested to be an excellent tool for measuring depression, hyperarousal, and tension in the clinical and non-clinical groups (26, 27). In addition, assessments of facets of job satisfaction were good predictors for less exhaustion, less depersonalization, lack of empathy, and higher personal accomplishment (16). Thus, information obtained by measuring facets of job satisfaction or dissatisfaction can help identify stress indicators and causes of psychological stress and derive appropriate intervention measures (7).

Burnout may lead to broken relationships, drug use (about 25% increased odds of alcohol abuse/dependence), and a nearly doubled risk of suicidal ideation and depression (23, 28, 29). Indeed, a meta-analysis revealed that physicians are an at-risk of suicide profession with a global standardized mortality rate (i.e., the ratio between the observed and expected number of death) by suicides of 1.44 (30). Moreover, a cross-sectional study on Austrian physicians revealed that the odds ratio of suffering from major depression was 2.99 for physicians with mild, 10.14 for physicians with moderate, and 46.84 for physicians with severe burnout in comparison to physicians unaffected by burnout (31). The effects of burnout on medical care workers may result in medical errors and reduced quality of patient care (23, 28, 29). A systematic review including 46 studies described a significant association between burnout and patient safety or burnout and error (32). Moreover, a recent cross-sectional nationwide survey of German prehospital emergency medical services workers demonstrated that burnout is significantly associated with safety outcomes (33). The authors analyzed emergency medical service workers with a low, average, or high degree of emotional exhaustion and depersonalization and demonstrated that the percentage of participants with a high degree of emotional exhaustion and depersonalization was greater for those who reported injuries or errors and adverse events (e.g., 50% of the participants who reported injuries and 44% of those reported errors and adverse events exert a high degree of depersonalization). Moreover, a recent study with physicians and nurses in Germany demonstrated that a shorter disease-related length of stay in the hospital was associated with a lower risk of physician burnout (34). Prevention of burnout and promotion of engagement will be valuable for healthcare teams and society's overall health (35).

A systematic review of the prevalence of burnout among physicians including 182 studies involving 109,628 individuals in 45 countries published between 1991 and 2018 revealed that 67.0% of the studies reported an increased prevalence of overall burnout (36). Moreover, several studies and surveys from recent years demonstrated that medical health workers have an increased prevalence of anxiety, depression, and burnout in comparison to peers in non-medical careers (14, 37, 38). Studies from the U.S. have demonstrated that PAs especially are working in areas with high burnout prevalence such as emergency medicine, primary care, hospice and palliative care, and oncology (35) and appear to develop burnout at levels similar to their physician colleagues with rates of burnout between 34 and 64% (39, 40). In Germany, prevalence rates of burnout among medical staff are reported to be equally high: about 35–38% for general practitioners (14, 41) and up to 40% for a high degree of burnout within the emergency

medical staff (33). In Germany, no explicit data on stress, anxiety, depression, or burnout among physician assistants are available, but poor psychosocial working conditions and a negative influence of working conditions on the quality of care were reported for PAs in Germany (42).

This study aimed to report the overall and facet-specific job satisfaction and mental health of PAs in Germany and link the findings to sociodemographic or work-related factors. Identification of factors that prolong the lifetime and wellbeing of PAs in practice can help to derive appropriate intervention measures to avoid losing highly qualified PAs and shortage of healthcare staff and to sustain patient safety and care. Moreover, the results provide an overview of PA working areas and authorization in Germany to represent the job profile.

Materials and methods

Study design

This study was a cross-sectional survey study conducted from May to July 2020 using the online survey tool SoSci Survey (43). The link to the survey was distributed to PAs working in Germany through the snowball system and by the German University Association for Physician Assistants (DHPA, Deutscher Hochschulverband Physician Assistant e.V.). For snowball sampling, the link to the survey was sent to the working email address of the PA network of the authors and DHPA. In addition, participating PAs were asked to further distribute the link within their network of colleagues.

Participation in the survey was voluntary, and the study participants could have ended the survey at any time and did not belong to a vulnerable group. The data were handled in accordance with the local data protection regulations and were not shared with a third party. Study participants did not receive any compensation for their participation in the survey study. The study was approved by the ethics committee of the HSD University of Applied Sciences, Germany (BEth_54_222). Study participants had no time limit to answer the questionnaire and the time for answering the questionnaire varied between 5 and 8 min.

Questionnaire

The survey consisted of questions assessing sociodemographic (age, gender, family status, and region) and work-related items (net income per month, medical working area, and responsibilities), items from the short questionnaire of general and facet-specific job satisfaction (KAFA, Kurzfragebogen zur Erfassung von Allgemeiner und Facettenspezifischer Arbeitszufriedenheit) by Haarhaus (7), and items from the German version of the Depression, Anxiety, and Stress Scale (DASS-21) (44, 45).

The KAFA was used to evaluate the job satisfaction of study participants. It is based on the Job Descriptive Index (46) and validated for a German sample with satisfactory psychometric properties (7). It included both general and facet-specific job satisfaction in six items with a total of 30 questions related to the work itself, coworkers, promotions, pay, and supervision. In the

actual version of the KAFA, each question had to be rated with a 5-point Likert scale. To shorten the questionnaire, items of the KAFA were reduced without changing the original items. Only one answer per item could be selected.

The DASS-21 was used to monitor depression, anxiety, and stress of study participants. It is a 21-item questionnaire with three 7-item subscales. Each item is scored on a 4-point scale [ranging from never (0) to always (3)]. Subscale scores were calculated as the sum of the responses to the seven items from each subscale multiplied by 2 to get scores equivalent to the 42-item full DASS. The cutoff scores for DASS-21 were taken from Lovibond and Lovibond (44): depression (normal 0–9, mild 10–13, moderate 14–20, severe 21–27, extremely severe 28+), anxiety (normal 0–7, mild 8–9, moderate 10–14, severe 15–19, extremely severe 20+), and stress (normal 0–14, mild 15–18, moderate 19–25, severe 26–33, extremely severe 34). For the cutoff values of 10 for depression, 8 for anxiety, or 15 for stress, an increased expression of these characteristics can be assumed.

Statistical analysis

Characteristics of study participants are presented as mean with standard deviation (SD) for continuous data or proportions for categorical data. The responsibilities of study participants in the medical working area are shown in proportions.

For the evaluation of the information on job satisfaction, the percentage of study participants per item answer was calculated.

For the analysis of DASS-21 subscale scores, the respective items for each subscale were summed up and multiplied by 2, to receive values equivalent to the full version of the DASS-21 (44, 45). To identify differences in DASS-21 subscale scores by gender, region, working unit, responsibilities, how often these responsibilities were carried out, net income per month, and overall job satisfaction, mean values and corresponding SD were calculated and analyzed using t-test and ANOVA. If the requirements for ANOVA were not fulfilled, the Kruskal–Wallis test was used. Statistical analysis was performed using the JASP software package (47), and a p-value of ≤ 0.05 was considered statistically significant.

Results

Characteristics of study participants

A total of 169 PAs [estimated 17% of all German PAs (5)] were included in the final analysis. The mean age of study participants was 30.3 (SD 8.0) years, and 84.0% were women (Table 1). The majority of the participants were single (40.4%), 36.1% were living with partners, and 22.5% were married. A total of 52.7% stated to have a net income of 2,000–2,499 EUR per month, 31.9% ≥2,500 EUR per month, and 10.1% 1,500–1,999 EUR per month. Most of the study participants were working in urban regions.

TABLE 1 Characteristics of study participants.

Characteristics	n = 169
Age—years (SD)	30.3 (8.0)
Gender	
Men	16.0%
Women	84.0%
Family status	
Single	40.4%
In partnership	36.1%
Married	22.5%
Divorced	2.4%
Widowed	0.0%
Net income per month	
≤999 EUR	1.8%
1,000–1,499 EUR	3.6%
1,500–1,999 EUR	10.1%
2,000–2,499 EUR	52.7%
≥2,500 EUR	32.0%
Region	
Urban	62.7%
Rural	37.3%

Authorization and responsibilities of PAs working in different medical areas

Assessing the authorization of PAs depending on the medical field of work (except oncology, for which no data were available) revealed that documentation, anamnesis, and diagnostic services were job responsibilities of nearly all PAs, whereas other job responsibilities differ (Table 2). Surgery participation and, to a lesser extent, after-care were the main job responsibilities of PAs working in surgery or emergency care. It was interesting to note that most of the PAs in orthopedics and trauma surgery were responsible for team coordination (76%). In internal medicine and neurology, a high percentage of PAs (79.3 or 71.4%, respectively) were responsible for patient information. Intervention/counseling, treatment suggestions, as well as medical reporting or diagnostic analysis, were the main responsibilities of PAs in emergency care and, to a lesser extent also, of PAs in geriatrics and surgery.

To be able to give an estimate of which profession has the most powers, the percentages of all powers of a subgroup of PAs were added up and the average percentage was calculated. The average powers are highest in the group of PAs working in emergency care followed by PAs in orthopedics and surgery.

Job satisfaction

Job satisfaction was assessed using the KAFA, which allows only one answer per item. The overall job satisfaction of participating PAs was good (47.1%), satisfactory (29.0%), and pleasant (15.5%; Figure 1A). Few PAs rated their general job satisfaction with meager (7.1%) or terrible (1.3%). Regarding the professional activities (Figure 1B), most participating PAs were rated as appealing to them (54.2%), followed by being challenging (23.9%), and exciting (14.8%). Colleagues (Figure 1C) were mainly seen as pleasant (36.13%), cooperative (29.0%), and enjoyable (23.2%). A total of 40.7% of study participants were satisfied with the payment (Figure 1D). Only 15.5 and 6.5% rated their payment as unfair or poor, respectively. Development opportunities (Figure 1E) for participating PAs indicated a broad distribution, ranging from 21.3% stating good, 25.2% as rather limited, 22.0% as appropriate, and 18.1% as not existing. An additional 13.6% mentioned their development opportunities being performance focused. Superiors (Figure 1F) of most participating PAs were assessed as fair (45.2%) and trustworthy (29.7%).

Job satisfaction of PAs working in different medical areas

The overall job satisfaction was not much different between male and female PAs or PAs working in rural or urban regions (Table 3). Moreover, overall job satisfaction seemed to be rather independent of the net income per month since all pay grades rated their overall job satisfaction as good. Calculation of the job satisfaction per medical working area demonstrated that the majority of PAs working in surgery, internal medicine, emergency, geriatrics, and oncology rated their job satisfaction as good. The small subgroup of participating PAs working in oncology demonstrated the highest job satisfaction, followed by PAs working in geriatrics and emergency care. Working in internal medicine or surgery did not affect job satisfaction compared to colleagues not working in these fields, but PAs working in orthopedics or neurology rated their job satisfaction as lower. Most PAs in neurology rated their job as only satisfactory. Only a few PAs declared terrible job satisfaction, with all of them working in surgery.

Depression-anxiety-stress scale of PAs

Analysis of the levels of depression, anxiety, and stress of participating PAs was determined using the Depression-Anxiety-Stress Scale (DASS-21) (45), and the results are shown in Table 4. The overall study population indicated depression, anxiety, and stress scores of 6.2 (SD 7.2), 4.5 (SD 6.0), and 9.4 (SD 7.4) on the DASS-21 subscales, respectively. With regard to the cutoff values (cutoff value of 10 for depression, 8 for anxiety, or 15 for stress, for which an increased expression of these characteristics can be assumed), there was no increased depression, anxiety, or stress score observed within the group of participating PAs. Taking a closer look at the subgroups, depression score levels exceeded the cutoff value of PAs working in neurology or geriatrics units, having a net income of 1,500–1,999 EUR or assessing their overall job satisfaction as meager. The latter PA subgroup also demonstrated

TABLE 2 Authorization of German physician assistants (PAs) in total and depending on the medical working area.

	Medical area								
	Surgery	Internal medicine	Orthopedics	Emergency	Geriatrics	Neurology	Oncology	Others	Total
Percentage of total PAs	**23.1**	**20.3**	**17.5**	**7.7**	**5.6**	**4.9**	**2.8**	**18.2**	**100**
Authorization									
Documentation	94.0	86.2	92.0	100.0	100.0	100.0	n/a	90.0	**94.6**
Anamnesis	84.9	82.8	76.0	100.0	87.5	85.7	n/a	75.0	**84.6**
Diagnostic services	60.6	75.9	64.0	72.7	87.5	85.7	n/a	72.5	**74.1**
Intervention/counseling	72.7	62.1	64.0	100.0	75.0	57.1	n/a	70.0	**71.6**
Treatment suggestions	42.4	65.5	68.0	100.0	75.0	28.6	n/a	62.5	**63.1**
Medical report/diagnostic analysis	57.6	65,52	40.0	91.0	75.0	42.9	n/a	52.5	**60.6**
Patient information	51.5	79.3	52.0	54.6	50.0	71.4	n/a	62.5	**60.2**
Team coordination	42.4	37.9	76.0	45.5	50.0	28.6	n/a	50.0	**47.2**
Prevention and instruction	45.5	37.9	44.0	54.6	25.0	57.1	n/a	40.0	**43.4**
Surgery participation	84.9	10.4	92.0	27.3	0.0	14.3	n/a	52.5	**40.2**
After-care	45.5	10.4	60.0	27.3	12.5	28.6	n/a	57.5	**34.5**
Other responsibilities	3.0	24.1	16.0	18.2	25.0	14.3	n/a	27.5	**18.3**
Nursing activities	15.2	6.9	20.0	36.4	0.0	0.0	n/a	7.5	**12.3**
Telemedical care	12.1	3.5	24.0	18.2	0.0	0.0	n/a	12.5	**10.0**
Home visits	0.00	0.00	0.0	0.0	0.0	0.0	n/a	0.0	**0.0**
Average of percent authorization	**47.5**	**43.2**	**52.5**	**56.4**	**44.2**	**41.0**	**n/a**	**48.8**	**47.7**

Results were demonstrated as a percentage of total PAs (n = 169; bold) or as a percentage of PAs working in different medical areas. To identify the medical area with the most authorized PAs, the average percent authorization was calculated per each subgroup of PAs (average percent authorization; n/a, not available).

an increased scale score for stress. However, these findings had to be taken carefully as the mentioned subgroups were relatively small.

Scores for depression, anxiety, and stress were significantly dependent on job satisfaction ($p \leq 0.001$, $p \leq 0.05$, and $p \leq 0.05$, respectively). *Post hoc* analysis revealed that those who rated their job as meager had a significantly different depression score compared to those rating good ($p$bonf ≤ 0.001) and pleasant ($p$bonf = 0.029). In addition, anxiety (p = 0.031) and stress levels (p = 0.036) also significantly varied depending on job satisfaction. *Post hoc* analysis of the subscale scores revealed that those who rated their job as meager indicated significantly higher levels compared to those rating good (anxiety: $p$bonf = 0.016/stress: $p$bonf = 0.025). The DASS-21 subscale scores were not significantly related to net income per month.

Based on the Mann–Whitney *U*-Test, analysis of sociodemographic effects on DASS-21 scales revealed that female PAs indicated a significantly higher anxiety score compared to male PAs ($p \leq 0.05$), and PAs working in an urban environment indicated a significantly higher anxiety score compared to PAs in a rural setting ($p \leq 0.05$). In addition, PAs working in orthopedic wards revealed significantly higher anxiety scores ($p \leq 0.05$). The anxiety and stress levels were significantly increased in the subgroup of PAs who were not allowed to conduct anamnesis

(both $p \leq 0.05$). Furthermore, anxiety levels were also significantly increased in the group of participating PAs who were not allowed to perform diagnostic analysis ($p \leq 0.05$).

Discussion

This cross-sectional survey study characterized currently working PAs in Germany, documented the responsibilities, empowerments, and fields of activity for the first time, and demonstrated a relationship between job satisfaction, medical working areas, and depression, anxiety, and stress. Scores for depression, anxiety, and stress were significantly negatively correlated to overall job satisfaction and determined by responsibilities and medical working area.

In Germany, currently working PAs are mainly female, about 30 years old on average, and single or living with partner as usual for this age group (48). 62.7% of the respondents are working in an urban region. The net salary of more than 50% of the respondent PAs is 2,000–2,499 EUR, and about one-third earned more than 2,500 EUR per month, slightly more than the average salary in Germany in 2021 of 4.100 euros gross per month (49), which is about 2.500 euros net per month depending on tax class. PAs are

FIGURE 1
Assessment of Physician Assistants job satisfaction in Germany (percentage response frequencies, $n = 169$). Overall job satisfaction **(A)** and different facets of job satisfaction were assessed: Professional activities **(B)**, colleagues **(C)**, payment **(D)**, development opportunities **(E)**, and superior **(F)**. Only one answer per item **(A–F)** could be selected.
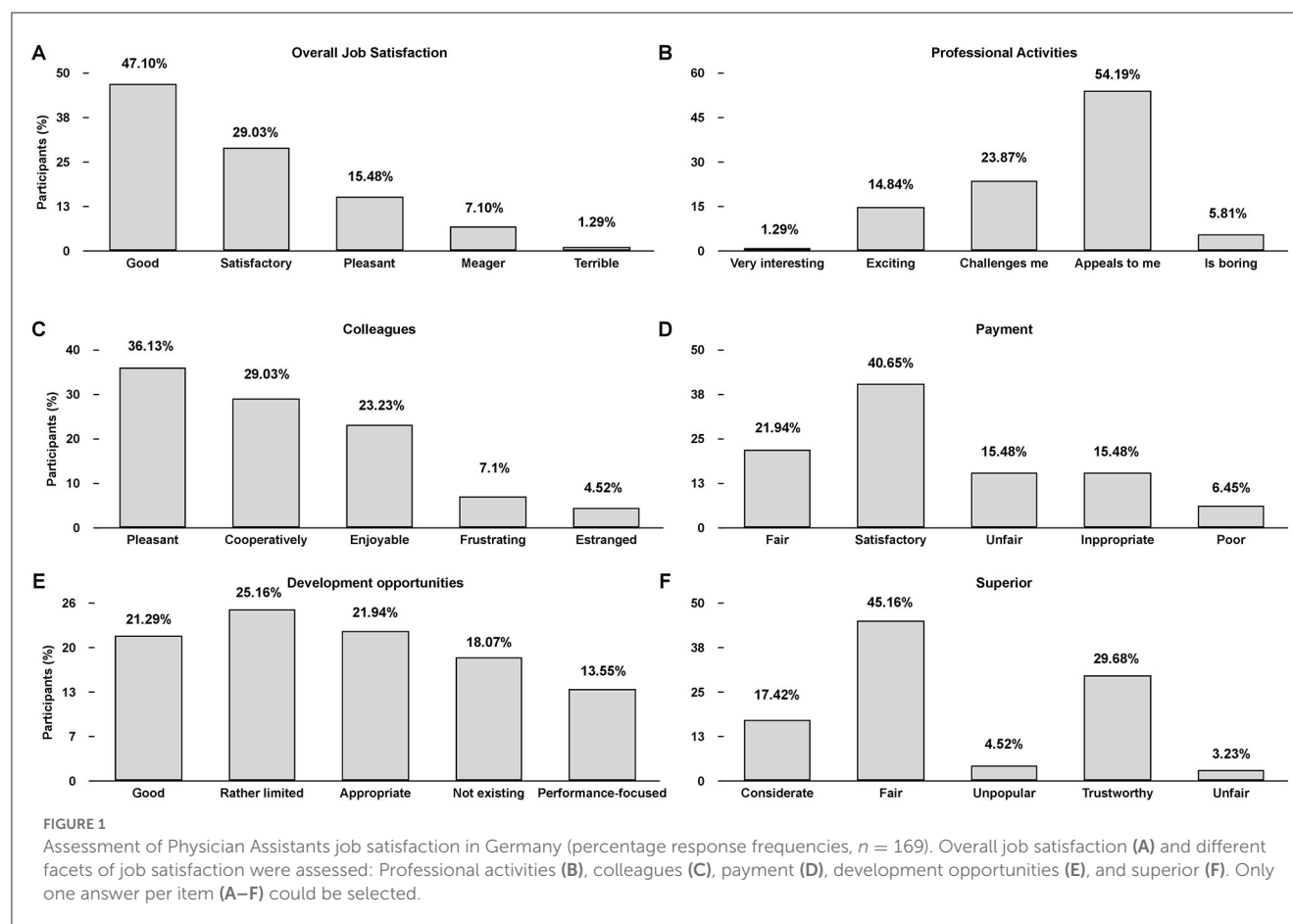
mainly working in surgery, internal medicine, and emergency, but also in orthopedics. Only a few are currently deployed in geriatrics, neurology, or oncology. They share nearly the same profile of authorizations and responsibilities with differences according to medical working area (documentation, anamnesis, and diagnostic services were mentioned most frequently) and rate their overall job satisfaction mainly as good. PAs working in oncology demonstrated the highest overall job satisfaction, followed by PAs working in geriatrics and emergency care.

PA's scores for depression, anxiety, and stress were significantly negatively correlated to overall job satisfaction. Moreover, scores for depression and stress exceed critical cutoff values of PAs with meager overall job satisfaction, highlighting the importance of taking a closer look at the different facets of job satisfaction and the underlying needs and causes. Moreover, in other research, job dissatisfaction and symptoms of burnout were correlated with age and years of practice (35, 50). Thus, one has to take a closer look at the first signs of job dissatisfaction and correlated mental state so as to not underestimate the risks of the young group of PAs in Germany.

Indeed, even slight gradations of high job satisfaction may predict psychological stresses. A survey of PAs in Minnesota demonstrated that, despite high levels of career and job satisfaction, PAs reported moderate levels of burnout, particularly women in primary care (22). In fact, in this study, we also found PA subgroups with increased scores for depression, anxiety, and stress,

although PAs declared their overall job satisfaction as good. We also identified significantly increased anxiety scores of female PAs in comparison to male PAs as well as of PAs working in an urban environment, which was the case for a majority of the respondent PAs in this study. It was not clear why urban PAs reached higher anxiety scores than their rural colleagues, especially since previous studies demonstrated that working conditions were worse in the city. For example, in Germany, rural general practitioners worked significantly more hours per week than their urban colleagues (51). PAs working in rural areas in the U.S. also reported an insufficient physician density, a lack of young recruits in primary care, and a resulting increased workload, whereas their urban colleagues reported a high physician density in urban areas, associated with high competition between general practitioners, a high fluctuation of patients, and a low status of general practitioners (52). In addition, it was assumed that rural PAs possessed a larger scope of practice than urban PAs (53). Since job experience was known to reduce psychological distress and burnout (31, 54), the increased anxiety score of urban PAs in Germany might be a consequence of a lower scope of practice, less responsibilities, and less job experience. Indeed, in this study, anxiety as well as stress scores were significantly reduced in the group of PAs with authorization to take anamnesis, and the anxiety score was significantly reduced in the group of PAs with authorization for diagnostic analysis.

Anamnesis and diagnostic services were the responsibilities of nearly all respondent PAs, as well as documentation. Depending

TABLE 3 Overall job satisfaction in German Physician assistants by gender, region, net income per month, and medical working area.

	Overall job satisfaction				
	Good	Pleasant	Satis-factory	Meager	Terrible
Gender					
Male (n = 21)	47.6	9.5	28.6	14.3	0.0
Female (n = 122)	45.1	17.2	29.5	6.6	1.6
Region					
Rural (n = 54)	40.7	18.5	33.3	5.6	1.9
Urban (n = 89)	48.3	14.6	27.0	9.0	1.1
Net income per month					
≤999 EUR (n = 3)	0.0	0.0	100.0	0.0	0.0
1,000–1,499 EUR (n = 6)	83.3	0.0	16.7	0.0	0.0
1,500–1,999 EUR (n = 14)	50.0	21.4	14.3	14.3	0.0
2,000–2,499 EUR (n = 74)	37.8	16.2	33.8	10.8	1.4
≥2,500 EUR (n = 46)	54.3	17.4	23.9	2.1	2.1
Medical area					
Surgery (n = 33)	48.5	18.2	18.2	9.1	6.1
Internal medicine (n = 29)	48.3	17.2	20.7	13.8	0.0
Orthopedics (n = 25)	40.0	12.0	40.0	8.0	0.0
Emergency (n = 11)	54.5	9.1	27.3	9.1	0.0
Geriatrics (n = 8)	62.5	0.0	25.0	12.1	0.0
Neurology (n = 7)	28.6	14.3	57.1	0.0	0.0
Oncology (n = 4)	100.0	0.0	0.0	0.0	0.0
Others (n = 40)	47.5	17.5	32.5	2.5	0.0

The assessments of job satisfaction are given as a percentage of the PAs (n = total number) in the different subgroups, working (yes) or not working (no) in different medical areas.

on the medical working area of German PAs, responsibilities were slightly different, reaching from intervention/counseling and treatment suggestions to medical report/diagnostic analysis, patient information, team coordination, prevention and instruction, surgery participation, after-care, other responsibilities, nursing activities, and telemedical care (listed according to their percentage frequency). None of the respondent PAs did home visits. In summary, PAs working in emergency care claimed to be those with the most responsibilities, followed by PAs in orthopedics and surgery. However, PAs working in areas with the highest authorization levels (emergency, orthopedics, and surgery) did not necessarily rate their job satisfaction higher.

With regard to depression, anxiety, and stress, no consistent correlation to the medical working area or the number of responsibilities could be detected. Although other studies have shown that nearly all PAs were working in areas with high burnout prevalence (35), in this study, PAs working in orthopedics, neurology, or geriatrics rated their DASS scores as the worst. Depression scores of PAs working in orthopedics were significantly increased in comparison to those of PAs working in other medical areas and PAs working in neurology or geriatrics have depression scores that exceeded the critical cutoff value of 10. Previous studies identified that high workload and a low level of job control/loss of autonomy were associated with a high prevalence of burnout and low rates of job satisfaction among healthcare workers in all three professions (42, 50, 55). Since these subgroups of PAs rated their overall job satisfaction differently and demonstrated different sets of responsibilities, no common cause for increased depression or anxiety could be inferred.

Depression scores also exceeded the cutoff value in PAs with a net income per month of 1,500–1,999 EUR. The number of PAs in these groups was small, but a positive association between financial stress, which might be triggered by income below average here, and depression had already been found in different countries (56). Indeed, most respondent PAs rated their payment more satisfactory than fair, even one-third of PAs rated net income as unfair, inappropriate, or poor. Since PAs declared their overall job satisfaction as good independent of the net income per month and a poor rating of the facet payment, this facet did not have a high impact on the overall rating of job satisfaction. Concerning the satisfying role of payment, previous studies have demonstrated that, although income was often attested to have a strong motivating effect (57), empirical studies only detected moderate correlations between income and job satisfaction (58), and job dissatisfaction with promotion and training opportunities were found to have a stronger impact than workload or pay (7).

Respondent PAs evaluated the facets of job satisfaction as "colleagues and supervisors" very positively, whereas professional activities were rated rather average and development opportunities even worse. Thus, PA's assessment of good overall job satisfaction seemed to be mainly influenced by the good assessment of colleagues and supervisors. This facet seems to be weighted differently since the poorer rating of the other facets cannot explain the overall positive rating. The importance of the social environment to wellbeing and job satisfaction has already been demonstrated in surveys with physicians or physician assistants in the U.S. For example, previous studies demonstrated that PA's overall job satisfaction was associated with satisfaction with one's supervising physician and satisfaction with the community and autonomy (59, 60), and retention in the job (considered a proxy for satisfaction) was closely linked to confidence in clinical abilities and community embeddedness (61). It was shown in other research that leadership quality explained almost half the variation in physician

TABLE 4 DASS-21 subscale scores [mean and standard deviation (SD)] of German PAs related to sociodemographic and work-related factors on mental health.

Variables		Depression mean (SD)	Anxiety mean (SD)	Stress mean (SD)
Gender	Male (n = 21)	7.52 (6.95)	**2.29 (3.36)***	8.86 (6.83)
	Female (n = 122)	6.00 (7.26)	**4.82 (6.29)***	9.46 (7.56)
Region	Rural (n = 54)	5.20 (6.01)	**3.26 (5.43)***	8.19 (6.54)
	Urban (n = 89)	6.79 (7.84)	**5.17 (6.26)***	10.09 (7.88)
Medical area	Internal medicine—no (n = 114)	6.40 (7.51)	4.83 (6.37)	9.51 (7.71)
	Internal medicine—yes (n = 29)	5.52 (5.99)	2.97 (4.06)	8.83 (6.36)
	Orthopedics—no (n = 118)	6.10 (6.96)	**3.90 (5.00)***	9.29 (7.11)
	Orthopedics—yes (n = 25)	6.80 (8.45)	**7.04 (9.13)***	9.76 (8.99)
	Surgery—no (n = 110)	5.89 (7.39)	4.47 (6.49)	9.44 (7.93)
	Surgery—yes (n = 33)	7.33 (6.59)	4.36 (4.14)	9.15 (5.57)
	Emergency medicine—no (n = 132)	6.12 (7.25)	4.49 (6.20)	9.53 (7.53)
	Emergency medicine—yes (n = 11)	7.46 (6.99)	4.00 (3.10)	7.46 (6.20)
	Neurology—no (n = 136)	6.03 (7.05)	4.50 (6.10)	9.31 (7.28)
	Neurology—yes (n = 7)	10.00 (9.87)	3.43 (3.95)	10.57 (10.63)
	Geriatrics—no (135)	5.91 (6.87)	4.27 (5.92)	9.05 (7.11)
	Geriatrics—yes (n = 8)	11.50 (10.89)	7.50 (7.15)	14.75 (10.90)
Responsibilities	Anamnesis—no (n = 28)	7.00 (6.57)	**6.07 (5.35)***	**11.43 (7.01)***
	Anamnesis—yes (n = 115)	6.04 (7.38)	**4.05 (6.12)***	**8.87 (7.48)***
	Diagnostic execution—no (n = 41)	5.71 (6.40)	4.44 (4.35)	9.12 (6.15)
	Diagnostic execution—yes (n = 102)	6.43 (7.54)	4.45 (6.58)	9.47 (7.92)
	Diagnostic analysis—no (n = 62)	7.13 (7.51)	**5.65 (6.99)***	10.32 (8.03)
	Diagnostic analysis—yes (n = 81)	5.53 (6.95)	**3.53 (4.99)***	8.64 (6.91)
	Therapy proposal—no (n = 62)	6.81 (7.57)	5.13 (6.75)	9.74 (7.56)
	Therapy proposal—yes (n = 81)	5.78 (6.95)	3.93 (5.36)	9.09 (7.38)
	Therapy execution—no (n = 47)	6.55 (7.46)	4.98 (6.74)	9.49 (8.16)
	Therapy execution—yes (n = 96)	6.06 (7.13)	4.19 (5.64)	9.32 (7.10)
	Nursing—no (n = 123)	6.59 (7.46)	4.57 (6.34)	9.74 (7.71)
	Nursing—yes (n = 20)	4.00 (5.07)	3.70 (3.39)	7.10 (5.05)
	Patient education—no (n = 54)	5.22 (6.06)	4.59 (4.86)	9.00 (7.19)
	Patient education—yes (n = 89)	6.83 (7.80)	4.36 (6.64)	9.60 (7.61)
	Prevention measures—no (n = 85)	6.94 (7.92)	5.06 (6.78)	9.84 (8.24)
	Prevention measures—yes (n = 58)	5.17 (5.95)	3.55 (4.57)	8.69 (6.07)
	Follow-up examination—no (n = 85)	5.91 (6.46)	3.93 (4.46)	8.78 (6.84)
	Follow-up examination—yes (n = 58)	6.69 (8.24)	5.21 (7.73)	10.24 (8.22)
	Documentation—no (n = 11)	5.82 (6.42)	4.73 (5.39)	9.46 (5.45)
	Documentation—yes (n = 132)	6.26 (7.30)	4.42 (6.08)	9.36 (7.59)
	Surgery participation—no (n = 69)	7.30 (7.65)	4.38 (5.76)	10.35 (8.00)
	Surgery participation—yes (n = 74)	5.22 (6.69)	4.51 (6.27)	8.56 (6.80)
	Team coordination—no (n = 76)	6.42 (6.88)	4.61 (6.05)	9.87 (7.49)
	Team coordination—yes (n = 67)	6.00 (7.63)	4.27 (6.01)	8.81 (7.39)
Net income per month#	≤999 EUR (n = 3)	–	–	–
	1,000–1,499 EUR (n = 6)	3.67 (4.80)	2.00 (4.00)	8.33 (4.63)

(Continued)

TABLE 4 (Continued)

Variables		Depression mean (SD)	Anxiety mean (SD)	Stress mean (SD)
Job satisfaction[#]	1,500–1,999 EUR ($n = 14$)	10.43 (10.23)	5.57 (7.97)	11.29 (8.58)
	2,000–2,499 EUR ($n = 74$)	5.97 (5.79)	5.11 (5.57)	9.35 (6.83)
	$\geq$2,500 EUR ($n = 46$)	5.65 (8.13)	3.44 (6.31)	9.09 (8.43)
	Good ($n = 65$)	**4.22 (6.15)*****	**3.29 (4.28)***	**8.25 (6.54)***
	Pleasant ($n = 23$)	**7.04 (7.38)*****	**4.87 (5.93)***	**9.22 (9.22)***
	Satisfactory ($n = 42$)	**6.43 (7.39)*****	**5.38 (8.26)***	**9.33 (7.57)***
	Meager ($n = 11$)	**13.64 (6.12)*****	**6.91 (4.42)***	**15.27 (7.96)***
	Terrible ($n = 2$)	–	–	–

The p-values of 0.05 or less were considered statistically significant and marked (bold, *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$; [#]Kruskal–Wallis Test). Scale scores exeeding cutoff scores fpr DASS-21 were underlined.

satisfaction scores in physicians with high satisfaction ratings hboxcitepbib24,bib35. Moreover, burnout rates were higher in physicians who rated their leaders unfavorably. Teamwork was among the factors that PAs felt contributed to their satisfaction (35), and team-based practice has been shown to cultivate an environment that reduces symptoms of burnout in primary care (62).

In Germany, PAs are highly dependent on the delegating physician. This might explain the importance of a good supervisor on PA's job satisfaction. The young PA profession was still highly regimented in Germany. PAs should relieve the medical team by taking over delegable tasks (2), and their professional activities were regulated by laws permitting the delegation of medical tasks to non-physician health professionals (63, 64). The scope of practice was determined by a delegation from the supervising physician and varies between practice settings (1, 64, 65). Thus, it was not surprising that PAs face challenges in balancing autonomy and dependence, especially since PAs were highly educated in Germany and patients also felt comfortable seeing a PA instead of a doctor (64). These challenges were of particular importance for job satisfaction and mental health since it has been demonstrated that PA's overall job satisfaction was associated with autonomy (59, 60). In addition, the main areas of application for PAs hardly changed in the last 10 years, where they were already generally deployed within a surgical, internal medicine, and emergency medicine setting (1), suggesting that professional activities and responsibilities remained almost the same. These facts might explain why more than half of the respondents in this study evaluated the professional activities only as appealing to them, and even 5% declared them as boring.

PAs rated development opportunities the worst and least consistently, and the assessments range in roughly equal parts from good to not existing. Indeed, in international comparison, development opportunities in academic settings were low in Germany. Studying PA was a bachelor's degree, whereas in most other countries, PA was a master's degree, which typically follows a bachelor's degree, e.g., in nursing (2). There are only a few options for completing a PA master's degree in Germany, although the desire for a master's program was becoming apparent years ago (1). Moreover, many PAs completed training in a healthcare profession before going to college (2) and training/working as a PA might not be financially beneficial for experienced healthcare workers

(64). Furthermore, in Germany, patients often did not understand the PA title or role because of the limited awareness of the PA profession in the medical field and the public sphere. Thus, the professional recognition of PAs in Germany had to be improved, especially since studies with PAs in the U.S. demonstrated that general misunderstanding of the PA role (role ambiguity) resulted in dissatisfaction (35).

Although medical professionals increasingly viewed PAs very positively, there are still some concerns about PAs expressed in Germany (64). In comparison to the U.S., where the PA's job profile and educational programs are well-established (66), PAs were still new in Germany. In the U.S., PAs have more duties and responsibilities depending on the medical working area, job experience, and state law (67). Within the physician–PA relationship, PAs exercise autonomy in medical decision-making and provide a broad range of diagnostic and therapeutic services. A PA's practice might also include education, research, and administrative servicesTeaching was identified as a protective factor against burnout among emergency medicine PAs in the U.S. and may also serve as a protective measure for clinically practicing PAs (68). Thus, PAs in the U.S. have more authority/autonomy and a larger job profile than PAs in Germany. They also rated their overall job satisfaction high, but about one in five PAs in the U.S. indicated an intent to reduce clinical hours within the next year, and one in three Pas indicated an intent to leave their current clinical practice within the next 2 years (69). Salary, autonomy, job resources, advancement opportunities, and quality of relationships with collaborating physicians and other team members were associated with job satisfaction among PAs in the U.S. (69). We were able to identify almost the same factors in this study determining the job satisfaction of German PAs. Thus, not only in Germany, the factors of job satisfaction might assist policymakers and health administrators in creating welcoming professional employment environments (60).

Conclusion

PAs in Germany were happy in their jobs, mainly because of their colleagues and supervisors, and demonstrated an overall good status for depression, anxiety, and stress, although women

and rural PAs need special support regarding the prevention of anxiety. PA's scope of practice is dependent on the medical working area. Payment, professional activities, and even more development opportunities need to be more appealing. To further establish the job profile in Germany and to retain PAs in their job, the leadership qualities of supervisors should be trained and maintained, team cohesion should be promoted, and clear role allocation should be ensured. Better visibility and acceptance of the job profile could be achieved through clearer national regulations and awareness campaigns. The success of the professional activities and responsibilities of the PAs in everyday life should be observed and reliably evaluated with regard to patient safety and satisfaction to possibly increase the scope of the autonomously executable activities with years of professional experience, after further training and opportunities for advancement.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The study was approved by the ethics committee of the HSD University of Applied Sciences, Germany (BEth_54_222). Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Impact of work-family support on job burnout among primary health workers and the mediating role of career identity: A cross-sectional study

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Objective: In China, medical workers in the primary sector shoulder the task of providing people with the basic medical and public health services, and are the "gatekeepers" of the public health. This study aims to analyze the current situation of job burnout among primary health workers of China, and shed light on the effect of work-family support and career identity on job burnout among them and their relationships. This may provide a new perspective for primary health care institutions and health administrative departments so as to formulate policies to "attract, retain and stabilize" primary health workers.

Methods: A multi-stage sampling method was adopted to select 8,135 primary health workers from 320 primary health care institutions in a province of central China. A descriptive statistical analysis, univariate analysis, Pearson correlation analysis, and mediation effect analysis were applied to analyze the effects of work-family support and career identity on job burnout among primary health workers as well as the mediating role of career identity.

Results: Among 8,135 primary health workers, 4,911 (60.4%) participants had mild to moderate levels of job burnout, 181 (2.2%) participants had severe job burnout, and the burnout detection rate is 62.6%. Work-family support was negatively correlated with job burnout ($r = -0.46$, $p < 0.01$) and positively correlated with career identity ($r = 0.42$, $p < 0.01$). Work-family support ($\beta = -0.346$, $p < 0.01$) and career identity ($\beta = -0.574$, $p < 0.01$) were negative predictors of job burnout respectively. In addition, career identity had a mediating effect between work-family support and job burnout, with the mediating effect contributing 33.7% to the overall effect.

Conclusions: The findings of this study demonstrate that work-family support is a protective factor against job burnout in primary health workers and reveal that career identity is a critical mediating mechanism linking work-family support to burnout. We propose to reduce job burnout by strengthening work-family support (especially work support), enhancing career identity, increasing the number of primary health workers and reducing the workload of existing incumbents, which can provide important practical implications for the future prevention and intervention programs.

KEYWORDS

primary health workers, work-family support, career identity, job burnout, mediation effect

1. Introduction

1.1. The importance of primary health workers in maintaining the health of the residents

Stabilizing the primary health workforce and improving the capacity of primary health services have always been the focus of China's medical and health system reform (1), as well as an important strategy to promote the formation of a hierarchical diagnosis and treatment pattern that can improve the efficiency of health resource utilization. In China, primary health workers bear the heavy responsibility of providing basic medical and basic public health services for the people. They are also the bottom of the network of the entire health service system, and the "gatekeepers" of the public's health (2). However, according to *China Health Statistics Yearbook 2021*, the number of primary health workers per 1,000 resident population in 2020 is only 3.07 (3), far short from the requirement in the *Outline of Medical and Health Service System Planning (2015–2020)*, which states that China should have had at least 3.5 primary health workers for every 1,000-resident population by 2020 (4). In addition, it is difficult to effectively replenish the primary health workers due to the deficiency of the current personnel recruitment system, unattractive remuneration package and career prospect (5). At present, hierarchical diagnosis and treatment system is being gradually promoted; the coverage of family doctor who provide contracted services for residents is increasing; the content of service packages provided by the national basic public health service program has increased from 41 items of nine categories in 2009 to 55 items of 14 categories in 2017 (5); and the COVID-19 epidemic is in the stage of regular management. All these circumstances have imposed new requirements on the quantity and quality of primary health workers. The continuous increase in workload makes medical workers in the primary sector more prone to job burnout, especially in poor areas (6, 7).

1.2. Job burnout and its hazards among primary health workers

Job burnout is defined as a state of physical and emotional exhaustion caused by excessive and sustained levels of work-related stress, characterized by emotional exhaustion (EE), depersonalization (DP), and low personal accomplishment (LPA) (8, 9). Some studies have shown that high burnout among health care workers not only leads to mental and physical health problems such as depression, suicide, sleep disorders, and cardiovascular disease, but also results in poor quality of healthcare and reduced work productivity (10, 11). Within health care organizations, burnout is related to high job turnover and early retirement (12). Wu et al. examined burnout among rural physicians in Jilin Province and found a 65.13% prevalence (13). Liu (14) investigated 650 medical workers in community healthcare centers in Fengtai District and found that the overall detection rate of burnout was 61.53%. The COVID-19 pandemic presents new social and work-related factors that increase the risk of

burnout for health care workers (15, 16). Therefore, under the new situation, it has become an urgent concern and problem to effectively reduce the burnout of primary health workers, summon up their work enthusiasm and stabilize the primary health care teams.

1.3. Work-family support and job burnout

Conservation of resources theory suggests that a lack of work resources is liable burnout (17). Social support is also a resource, and there has been a great deal of research showing that social support is negatively related to burnout levels (18–20). However, the existing social support scales only measure the social support that individuals receive in the work and family domain separately, lacking an examination from a holistic perspective. Li and Zhao (21) argued that work-family support should be a two-way street, so they define work-family support as "the support that employees receive from both the work and family domains during the work process that achieves work-family balance." Karagöl and Kaya (19) assessed burnout, hopelessness, and social support among health care workers during the COVID-19 pandemic and found that their own sense of control over their careers and social support from others were the two factors addressing job burnout, and that family support was the only support addressing the three sub-dimensions of burnout (EE, DP, and LPA) and hopelessness. Wang et al. (20) concluded that perceived social support, especially family support, plays a significant moderating role between emotional exhaustion and subjective wellbeing, and that improving perceived social support could reduce job burnout. Therefore, work-family support should be considered as an influencing factor of job burnout, and we propose hypothesis 1: Work-family support has a significant negative effect on job burnout among primary health workers.

1.4. Career identity and job burnout

Career identity is concerned with the social meaning and value of the work one engages in Wang et al. (22). According to Ashforth and Humphrey (23), there is less contradiction between expressive behavior and emotional experience amongst employees with higher career identity, and the positive emotions generated by career identity enables employees to adapt themselves to the display rules without emotional exhaustion. Onyett et al. (24) concluded that there was a significant negative correlation between career identity and two dimensions (emotional exhaustion and depersonalization) of job burnout. In a study of 53,236 Chinese general practitioners, Zhang et al. (6) found that career identity was negatively associated with job burnout and turnover intention. The higher the level of career identity is, the lower the level of burnout and tendency to quit will be. Therefore, career identity should be considered as an indispensable influencing factor of job burnout, and we proposed hypothesis 2: Career identity has a significant negative effect on job burnout among primary health workers.

1.5. Work-family support, career identity, and job burnout

Although previous studies have shown that medical workers' burnout is related to age, title, education, and working hours, as well as closely related to their own emotional state, career identity, and social support (25, 26), the underlying mechanisms behind these associations are unclear and need to be demonstrated through different research designs. Support, assistance, feedback and appreciation from colleagues, supervisors and families would create a supportive work environment for primary health workers which is conducive to the satisfaction, self-esteem, security and career identity gained from their work, which in turn plays an important role in alleviating job burnout (27). Thus, work-family support may influence job burnout through career identity, and we propose hypothesis 3: Career identity plays a mediating role in the relationship between work-family support and burnout levels of primary health workers.

At present, academics are more likely to study the influencing factors of job burnout from the perspectives of demographic factors and job characteristics (28), but other potential factors (e.g., career identity, work-family support) are studied in isolation, and few studies have combined them together. We assume that there is not only a direct relation between these variables and job burnout, but an indirect mediating effect. Further research is necessary to validate these hypotheses and elucidate the interactions between these parameters. In addition, in terms of research subjects, previous studies have mainly involved teachers (29), nurses (30), social workers (31) etc., but little attention has been paid to the job burnout of primary health workers. Therefore, this study, which focuses on the job burnout of primary health workers who have dual attributes of service and emotional labor, aims to clarify the relationship between work-family support, career identity and job burnout. This study attempts to probe into the influencing mechanism of job burnout of primary health workers and find effective paths to reduce burnout. The evidence may provide a different perspective for primary health care institutions and health administrative departments to develop policies and interventions to "attract, retain, and stabilize" primary health care workers.

2. Methods

2.1. Participants and procedures

Community healthcare centers (CHCs) and township health centers (THCs) are the main institutions providing basic medical and public health services to urban and rural residents. In this study, multi-stage sampling was used to select participants. Firstly, a province in central China was selected (there are 16 prefecture-level cities in this sample province). Secondly, through typical sampling, 10 township health centers and 10 community healthcare centers were selected from each prefecture-level city, with a total of 320 primary health care institutions. Finally, from March to May 2022, all primary health workers (including general practitioners, nurses, public health physicians, pharmacists, etc.) who met the inclusion criteria in the sample primary health care institutions were surveyed by cluster sampling. Inclusion criteria of participants

was: (1) staff who had engaged in primary health services for 1 year or more; (2) informed consent and voluntary to participate in this study.

Once a contact was established with the survey sites, electronic online questionnaires were distributed to them through "WeChat Questionnaire Star" (WeChat is a widely used social media app in China and Questionnaire Star is a mini program within WeChat ecosystem) with the cooperation of the chiefs of the primary health section of each municipal health administration department. The survey was conducted anonymously among all medical workers in primary health care institutions who met the inclusion criteria. A total of 8,339 questionnaires were collected, and duplicate questionnaires were discarded after IP checking. After completeness and standardization of the completed questionnaires were verified (54 repeated filling and 150 missing key information), 8,135 valid questionnaires were finally determined, with an effective recovery rate of 97.5%. All the procedures complied with the ethical standards of the Anhui Medical University Committee (No. 83220442).

2.2. Measurements

2.2.1. Demographic characteristics

Sociodemographic information and job characteristics of primary health workers were collected according to the needs of the study, which included questions concerning gender, age, education level, professional title, years of experience, average annual income and average daily working hours.

2.2.2. Work-family support evaluation scale

The work-family support questionnaire was developed by Li and Zhao et al. (21), which conforms to the Chinese cultural context. After exploratory factor analysis and validation factor analysis, two dimensions (work domain support and family domain support) with a total of 26 items were finalized. Work domain support (18 items) includes items such as "when I encounter pressure and resistance in my work, the work unit can always give encouragement and help," "the work unit can provide us with good welfare benefits," etc. Family domain support (eight items) includes items like "When there is a problem at work, my family can always take on it with me," etc. Each item is scored by Likert 5-level scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score of the Work-Family Support Scale ranges from 26 to 130, with higher scores indicating higher levels of work-family support among primary health workers. In this study, the Cronbach's alpha coefficient of the scale was 0.97.

2.2.3. Career identity evaluation scale

With reference to the Nurse Professional Identity Scale translated and validated by Liu et al. (32) and the Medical Staff Professional Identity Scale developed by Wu (33), the career identity scale suitable for primary health workers was developed after discussion between the subject group and experts. The scale consists of 12 items, and each item is scored by Likert 5-level scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total

score of the scale ranges from 12 to 60, and the higher the score, the stronger the career identity of the primary health workers. The Cronbach's α coefficient of the scale in this study was 0.90.

2.2.4. Job burnout evaluation scale

This study adopted the Maslach Burnout Inventory-General Survey (MBI-GS) translated and revised by Li and Shi (34), with 15 items in total, including three dimensions of emotional exhaustion (EE, five items), depersonalization (DP, four items), and low personal accomplishment (LPA, six items). The scale applies a seven-level rating scale ranging from 0 (never) to 6 (every day). Higher scores on the EE and DP subscales indicate the higher degrees of job burnout, while LPA is inversely correlated with job burnout. The total score of the MBI-GS ranges from 0 to 90. The score of each dimension was the mean of its corresponding item score, and the composite score of burnout scale was (0.4*EE + 0.3*DP + 0.3*LPA). A composite score <1.5 was judged as no burnout, 1.5–3.5 as mild to moderate level of burnout, and >3.5 as severe burnout (35). The Cronbach's α coefficient of the scale in this study was 0.88.

2.3. Data analysis

All analyses were performed in SPSS 26.0 with the significance level set to 0.05 (two-tailed). Measurement data were described using mean ± standard deviation ($X ± S$); count data were described using utilization or composition ratio (%). Statistical differences in outcome indicators (work-family support, career identity and job burnout) between two subgroups were compared using t-test, those differences between three or more subgroups were compared using ANOVA, and rank sum test was used when data did not satisfy the homogeneity of variance. Pearson's correlation analysis was used to test the relationship between work-family support, career identity and job burnout. The SPSS PROCESS macro 4.0 was used to test the mediating effects. Since the bootstrap methods have the most precise confidence intervals (CI) for indirect effects, the bootstrap estimation procedure (using a specified bootstrap sample of 5,000) was used to test the mediating effect of career identity in the relationship between work-family support and job burnout. The mediating effect was considered statistically significant when the bootstrap 95% CI did not include 0.

3. Results

3.1. Characteristics of the participants

Among the 8,135 primary health workers, 2,618 participants (32.2%) were male and 5,517 participants (67.8%) were female, mostly aged between 26 and 55 (89.9%), whose workplaces were mainly township health centers (69.8%), and whose education status was mainly college diploma (43.1%) and bachelor's degree (36.5%). The professional title of them was mainly junior (54.9%), the average annual income of them was mostly 50,000–100,000 CNY Yuan (41.9%), and the average daily working hours is above 8 h (52.3%). There were 3,043 participants (37.4%) who did not

experience any burnout, 4,911 (60.4%) with mild to moderate level of burnout, and 181 (2.2%) with severe burnout (see Table 1 for further details).

3.2. Differences in scores across different groups

The results of the study showed that gender, age, education level, professional title, years of experience, average annual income and average daily working hours of primary health workers were independent influencing factors for work-family support ($p < 0.05$). Gender, age, professional title, years of experience, average annual income and average daily working hours were independent influencing factors for career identity ($p < 0.05$). Age, education level, professional title, years of experience, average annual income and average daily working hours of primary health workers were independent influencing factors of job burnout ($p < 0.05$; see Table 1 for further details).

3.3. Correlation between work-family support, career identity and job burnout

Inter-correlations, means, standard deviations and reliabilities of all variables were calculated to explore associations among different variables. The correlation analysis verified hypothesis 1 and hypothesis 2. The mean scores for each item of work-family support, career identity and job burnout for primary health workers were 3.76 ± 0.72, 4.27 ± 0.52, and 1.84 ± 0.84, respectively. Pearson correlation analysis revealed that work-family support was negatively correlated with job burnout ($r = -0.46$, $p < 0.01$) and positively correlated with career identity ($r = 0.42$, $p < 0.01$). Compared to work domain support, family domain support had a stronger effect on career identity. Career identity was negatively associated with job burnout ($r = -0.48$, $p < 0.01$). Work-family support and career identity were negatively correlated with all three dimensions of job burnout (see Table 2).

3.4. Mediation effect analysis

The study hypothesized that career identity of primary health workers played a mediating role in the influence of work-family support on job burnout. The results of Table 3 show that the three models were statistically significant and the coefficients of each pathway had a significant effect ($p < 0.001$) when controlling the variables like the age, education level, professional title, working years, average annual income and average daily working hours of primary health care personnel. The results of the bootstrap mediated effect test showed that the bootstrap 95% CI for the indirect effect was (-0.191, -0.162), excluding 0. Since the signs of ab and $c^{'}$ were the same sign, it indicated that there was a partial mediated effect, i.e., career identity played a partial mediating effect between work-family support and job burnout among primary health workers, confirming hypothesis 3. The contribution rate of the mediating effect to the total effect was: Effect $M = ab/c = 33.7\%$

TABLE 1   Univariate analysis and description of each scale ($n = 8{,}135$).

Variables	N	Work-family support		Career identity		Job burnout	
		$X \pm S$	$t/F/\chi^2$	$X \pm S$	$t/F/\chi^2$	$X \pm S$	$t/F/\chi^2$
Gender							
Male	2,618	99.91 ± 18.63	7.38**	51.46 ± 6.38	2.28*	27.45 ± 12.80	−1.11
Female	5,517	96.65 ± 18.59		51.12 ± 6.11		27.78 ± 12.58	
Workplace							
CHCs	2,454	98.03 ± 18.57	1.04	51.27 ± 6.22	0.41	27.56 ± 12.87	−0.54
THCs	5,678	97.56 ± 18.71		51.21 ± 6.17		27.73 ± 12.55	
Age group (years)							
≤25	509	95.66 ± 18.98	116.93**	48.99 ± 6.30	163.55**	31.37 ± 12.93	258.83**
26–35	2,319	94.98 ± 19.22		50.34 ± 6.45		30.44 ± 12.96	
36–45	2,608	97.73 ± 18.74		51.82 ± 6.06		26.75 ± 12.63	
46–55	2,386	100.17 ± 17.76		51.85 ± 5.91		25.48 ± 11.81	
≥56	313	102.17 ± 16.61		51.79 ± 5.83		25.63 ± 11.11	
Education level							
High school or below	1,636	101.12 ± 17.40	105.07**	51.15 ± 5.93	0.74	25.62 ± 11.83	74.82**
Junior college	3,504	97.98 ± 18.89		51.25 ± 6.28		27.55 ± 12.80	
College	2,972	95.54 ± 18.76		51.25 ± 6.25		28.93 ± 12.74	
Master or above	23	91.13 ± 19.09		50.61 ± 6.05		30.91 ± 12.69	
Professional title							
Senior	29	101.07 ± 17.77	6.27**	53.55 ± 4.48	124.17**	24.14 ± 10.80	6.76**
Vice-senior	346	97.14 ± 18.72		52.33 ± 6.10		26.75 ± 12.47	
Middle	2,440	96.65 ± 18.17		52.27 ± 5.77		26.80 ± 12.17	
Primary	4,467	97.81 ± 18.88		50.75 ± 6.25		28.30 ± 12.81	
None	853	100.25 ± 18.73		50.19 ± 6.73		27.42 ± 13.09	
Years of experience (years)							
≤3	873	97.04 ± 18.61	113.22**	49.60 ± 6.48	53.31**	30.04 ± 13.09	198.54**
4–10	1,802	95.06 ± 19.60		50.24 ± 6.46		30.31 ± 13.19	
11–20	2,029	96.13 ± 18.52		51.64 ± 5.99		27.68 ± 12.20	
≥21	3,431	100.19 ± 17.95		51.91 ± 5.96		25.69 ± 12.14	
Average annual income (CNY)							
<30,000	1,257	97.01 ± 19.72	8.07*	50.28 ± 6.80	54.54**	28.42 ± 13.33	9.77*
30,000–50,000	3,059	98.13 ± 18.91		51.01 ± 6.17		27.53 ± 12.88	
60,000–10,000	3,410	97.40 ± 18.11		51.64 ± 5.95		27.70 ± 12.20	
≥110,000	409	99.13 ± 17.98		52.35 ± 6.12		26.28 ± 12.27	
Average daily working hours (hours)							
<7	269	100.84 ± 18.35	29.26**	50.95 ± 6.34	19.29**	27.63 ± 12.66	18.16**
7–8	3,613	98.68 ± 18.21		50.98 ± 6.02		26.94 ± 12.24	
9–10	3,133	96.62 ± 18.84		51.38 ± 6.23		28.23 ± 12.85	
≥11	1,120	96.80 ± 19.44		51.65 ± 6.60		28.49 ± 13.24	

*$p < 0.05$.
**$p < 0.01$.
CHCs, Community Healthcare Centers; THCs, Township Health Centers.

TABLE 2 Means, standard deviations, and correlations among all variable.

Measures	Mean	SD	1	2	3	4	5	6	7	8
Work-family support	3.76	0.72	(0.97)							
Work domain support	3.61	0.84	0.97**	(0.97)						
Family domain support	4.08	0.70	0.72**	0.52**	(0.94)					
Career identity	4.27	0.52	0.42**	0.36**	0.43**	(0.90)				
Job burnout	1.84	0.84	−0.46**	−0.41**	−0.41**	−0.48**	(0.88)			
EE	1.75	0.99	−0.47**	−0.46**	−0.32**	−0.30**	0.66**	(0.93)		
DP	1.10	1.02	−0.49**	−0.46**	−0.38**	−0.40**	0.75**	0.69**	(0.90)	
LPA	2.43	1.38	−0.18**	−0.13**	−0.25**	−0.36**	0.76**	0.07**	0.25**	(0.92)

1–3, work-family support and its dimensions; 4, career identity; 5–8, job burnout and its dimensions. Reliability coefficients (Cronbach' α) in parentheses along main diagonal.
EE, emotional exhaustion; DP, depersonalization; LPA, low personal accomplishment.
Analyses based on n = 8,135.
**p < 0.01.

TABLE 3 Model testing of mediations.

Model[a]	Outcome various	Predictors	Fitting index		Coefficient significance		
			R^2	F	β	t	p-value
1	Job burnout	Work-family support	0.226	338.54	−0.522	−44.94	<0.001
2	Career identity	Work-family support	0.203	295.92	0.307	42.47	<0.001
3	Job burnout	Work-family support	0.324	487.16	−0.346	−28.86	<0.001
		Career identity			−0.574	−34.39	<0.001

[a] Age, education level, professional title, years of experience, average annual income and average daily working hours of primary health workers were introduced into the model as control variables.

(see Table 4). A schematic representation of the mediating effect of career identity between work-family support and burnout is shown in Figure 1.

4. Discussion

4.1. Variable description and differences

Health care professionals are generally considered to be one of the highest-risk groups experiencing burnout, given the emotional strain and stressful work environment of providing care to sick or dying patients (36). The results of this study showed that the burnout rate among primary health workers was 62.6%, a level between community physicians (61.53%) and rural physicians (65.13%) in previous studies (13, 14), and higher than the burnout rate among clinicians in the United States (35%−54%) (36–38). This is because in China, primary health care workers are responsible for both primary medical care and public health service, which means that in addition to their medical duties, they also need to undertake preventive care, patient rehabilitation and chronic disease management, health management and other tasks (39). The high-pressure, high-load work environment and highly stressful practices overtax the energy as well as the physical strength of primary health workers, leading to higher levels of burnout at work. In this study, particular attention is paid to primary health workers aged 25 years or below with a bachelor's degree or above, primary title, <3 years of working experience, low annual income

and average daily working hours >10 h. This study tries to help them cope with the contradiction between high expectations on reality and stressful dilemmas at work in a reasonable way. Young primary health workers with high education degree often have higher expectation of salary, higher expectation of work prospect and stronger desire for fulfilling self-worth. However, since they have just stepped into the society, they have to confront the fact of low salary, low professional title and long working hours. This will undoubtedly put them under greater pressure, and easily lead to psychological disparity and job burnout.

The mean item score of work-family support for primary health workers was 3.76 ± 0.72, which was at an upper middle level, with the level of work domain support slightly lower than that of family domain support. Further analysis found that the two items with the lowest scores were both in the workplace support domain (see Supplementary Table 1), namely "the work unit provides us with information about caring for the elderly and educating children" and "the work unit can provide us with good welfare benefits." This suggests that primary health care institutions should increase material and welfare support for medical personnel, especially the support of the family, to reduce the impact of work on the family. By contrast, the two items with the highest scores were both in the family support domain, which was "My family always encourage me when I am tired from work" and "My family always do more housework when I am busy at work at a certain time." This is particularly Chinese characteristic. In China, the health care professions are held to a higher ethical standard, advocating "sacrificing individual interests for public

TABLE 4 Results of testing the mediating effect of career identity between work-family support and job burnout.

Work-family support → Job burnout	Effect	Boot SE	BootLLCI	BootULCI	Effectiveness ratio (%)
Total effects	−0.522	0.012	−0.545	−0.499	–
Direct effects	−0.346	0.012	−0.370	−0.322	66.3
Indirect effects	−0.176	0.008	−0.191	−0.162	33.7

FIGURE 1
Schematic representation of the mediating effect of career identity between work-family support and burnout. *a*, *b*: mediating effect of intermediary variable career identity; *c*′: direct effects; *c*: total effects; **p < 0.01.
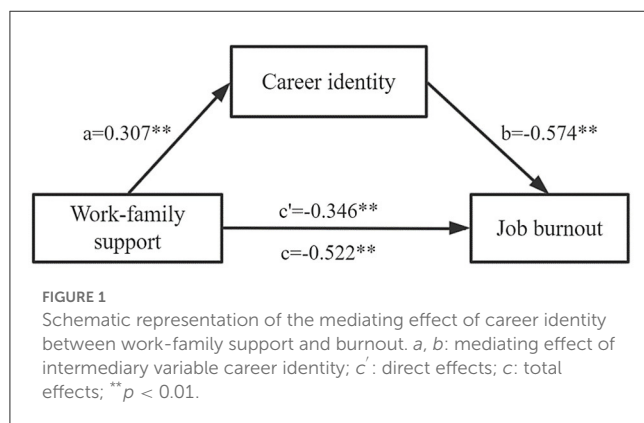
collective benefits, and sacrificing personal feelings for duty" (40). They are supposed to give priority to work when it happens to be a conflict between personal family and work. At this point, shifting family responsibilities to social support networks (e.g., parents, spouse) or seeking paid support becomes an unavoidable option, and other family members will share more family responsibilities to support the medical personnel's career. However, the emphasis on work responsibilities at the expense of sacrificing individual family needs of medical personnel is an over-exploitation of their professionalism and can easily lead to job burnout (41).

The items of career identity have an average score of 4.27 ± 0.52, which is at a high level. It shows that the primary health workers affirm the professional value and professional significance of grassroots work and are willing to dedicate themselves to the cause of grassroots health for life. Such high ideals and beliefs are the strong pillars that support them to stay at the grassroots and serve the needs of people's health. This study found that primary health workers with older age, higher professional titles, longer years of experience, higher annual income, and longer average daily working hours had a higher sense of career identity.

4.2. Work-family support affects job burnout

This study found that work-family support was negatively related to job burnout and its three dimensions, validating hypothesis 1, which is consistent with previous research findings (19, 42). Hobfoll's conservation of resources theory states that social support as a feature of the environment is an important resource to alleviate job burnout (43). When primary health care workers gain support from their work domain, such as primary health care institutions creating a good working environment, improving

working conditions, and providing good welfare benefits, it makes them feel valued and experience a higher sense of security and belonging (44). When higher-level needs are fully satisfied, they will devote more time and energy to their work for the purpose of self-actualization, thus reducing the occurrence of job burnout. Furthermore, a study by Vignoli et al. (45) found that organizations were effective in mitigating work-family conflict when they provided employees with a range of family-friendly support policies. This also suggests that resources from the work domain not only save primary health workers the resources they need to manage work-family conflicts, but also bring potential resources from the family domain to help primary health workers cope with the demands of their work and become more focused on their tasks with enthusiasm. This study revealed that primary health workers who obtained more support from the family domain had lower levels of burnout, similar to the findings of Bakker and Shin (46, 47). When primary health workers are still burdened with higher intensity household chores after work or when their worries at work are not understood by their families, their level of psychological relief and relaxation will be even lower, negatively affecting their work engagement the next day.

4.3. The mediating role of career identity in work-family support and job burnout

This study not only creatively establishes the relationship between work-family support and job burnout but also reveals the effect path between them. The results demonstrate the mediating effect of career identity on the relationship between work-family support and burnout, confirming hypothesis 3.

The results show that work-family support for primary health workers positively predicts career identity. Primary health workers with higher levels of work domain support and family domain support are adept at using organizational and family support to break through difficulties as quickly as possible, even when they encounter difficulties at work, and in the process, their stress tolerance and sense of career identity are enhanced. This study further found that family domain support received by primary health workers contributed more to their career identity than work domain support from organizations, leaders, colleagues, etc. During the COVID-19 epidemic, many health care workers said that the understanding and support of their families was their inexhaustible motivation to stay on the front line of the fight against the epidemic (47).

The mediating effect test revealed that the career identity of primary health workers partially mediated the effect between work-family support and job burnout. When individuals have a higher

level of career identity, they would devote more time, energy, and vitality to their work, and job dissatisfaction due to inadequate work support and family support may be reduced or even eliminated (48). Thus, it is clear that the hindering effect of work-family support on job burnout is partially achieved by strengthening career identity, and this pathway provides another perspective to explain the mechanism of job burnout.

4.4. Recommendations for alleviating job burnout among primary health workers

In response to the findings, this paper proposes countermeasures to reduce and alleviate job burnout among primary health workers in three aspects: enhancing work domain support, strengthening family domain support and improving career identity.

In terms of work domain support, according to Herzberg's two-factor theory, there are two groups of factors that influence people to be motivated to work: the first are hygienic factors and the second group are called motivating factors. Therefore, for one, primary health care institutions should make efforts to reduce workload, raise salary levels, promote teamwork, improve physical working conditions, and increase the number of primary health workers (49). For another, it is important to focus on motivating primary health workers, including a sense of job accomplishment, being acknowledged for their work, improving job evaluation system and increasing the level of participation in decision-making. For example, in the past, the proportion of medical personnel with intermediate and senior titles was smaller at the grassroots level, but now we can gradually increase their proportion, optimize the job settings, and smooth the promotion channels for grassroots talents (50).

In terms of family domain support, primary health workers and their family members can receive regular psychological counseling, stress management and family education (47). At the same time, primary health workers should increase communication with family members, especially when the workload is heavy. Good communication helps to obtain more understanding and support from families so that they can devote more energy to their work. In addition, given that work and family are two inseparable matters among employees, organizations need to cultivate a family-supportive working environment. Primary health care institutions and health administrative departments can consider implementing supportive policies and flexible work arrangements for primary health workers who suffer from family-to-work interference.

The career identity of primary health workers cannot be obtained without the acknowledgment and appreciation of their profession by society and the public (51). Therefore, the government should advocate that the whole society should care and respect medical personnel, especially elderly medical workers, rural doctors and grassroots health workers who are on the front line of fighting against epidemics, etc., so as to create a good societal atmosphere of respecting doctors and valuing health care cause (40). More importantly, the career identity of primary health workers can be improved by strengthening and implementing the primary care system, promoting the capacity of family doctor

who provides contracted services, providing quality services to the contracted residents (52), enhancing the trust and satisfaction of residents in primary services (53), and improving the stickiness and dependence on primary health workers. In addition, school education should be strengthened to emphasize the career identity and ethics education of medical students in school. For example, career planning training should be conducted to encourage medical students to integrate their future prospect with the development of health care industry.

As last, it is also necessary to increase the number of primary health workers and to reduce the workload of existing incumbent staff. It is suggested that tuition-waived training of rural-oriented medical students should be carried out (54). Relevant administrative departments and medical schools should make full use of existing medical higher education resources for fresh high school graduates, using order-based training mode such as signing employment agreements with them before entering school and providing financial assistance for tuition during school. When they graduate, they are sent to work at the grassroots health care sector. In this way, a mass of primary health workers who are willing to take root in the grassroots and serve the people will be cultivated.

4.5. Limitations

This study has some limitations. First, the study was based on cross-sectional data without a follow-up survey of primary health workers, which may limit the ability to identify causal relationships between work-family support, career identity, and job burnout among primary health workers. Second, the current job burnout scale for primary health workers is not mature enough to be applied in China, and lacks clinically validated thresholds or critical values for burnout diagnosis, which may have subtle errors in the estimation of burnout rates. Finally, in the follow-up work, we can continue to conduct relevant studies on primary health workers in different provinces of China to make the results more representative.

5. Conclusion

Studying the job burnout of primary health workers and its influential factors as well as formulating measures to alleviate burnout are of vital importance to stabilize the primary health workforce, which would improve the quality and efficiency of services in primary health care institutions, and achieve health for all. Identifying solutions to alleviate job burnout among primary health workers is of interest to both researchers and practitioners alike (36, 44, 55). This study investigated the current status, influential factors, and internal correlates of work-family support, career identity, and job burnout among primary health workers. Primary health workers were found to have high career identity, and their perceived work-family support (especially from the work) was far from adequate and burnout rates were high. Moreover, findings of this study demonstrate that work-family support is a protective factor against job burnout in primary health workers and

reveal that career identity is a critical mediating mechanism linking work-family support to burnout.

The findings of this study provide more empirical evidence for the two-way support relationship of work-family support. Furthermore, they contribute to a better understanding of the interactive mechanisms between work-family support and job burnout, and to clarifying the mediating role of career identity on the association, which provides the necessary theoretical basis for improving previous single-dimensional studies. In addition, we are concerned about the group of primary health workers working in rural areas and communities, and propose to reduce job burnout by strengthening work-family support (especially work support), enhancing career identity, increasing the number of primary health workers and reducing the workload of existing incumbents, which can provide references for primary health care institutions and health administrative departments to develop policies and intervention measures to attract and stabilize talents.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

The studies involving human participants were reviewed and approved by Biomedical Ethics Committee of Anhui Medical University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

DY drafted the manuscript. QM and JY framed the concept and designed the study. GF and DF conduct the data collection and material preparation. DY and MH performed the data analysis. HW and YC contributed to the production of some content of the draft. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1115792/full#supplementary-material

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Psychological workplace violence and its influence on professional commitment among nursing interns in China: A multicenter cross-sectional study

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Background: Psychological workplace violence (WPV) is the primary form of workplace violence suffered by nursing interns. Psychological WPV not only damages the physical and mental health of nursing interns, but also has a negative impact on their work quality and career choice.

Aim: To investigate the characteristics and types of psychological WPV suffered by nursing interns in China, analyze the influencing factors of psychological WPV among nursing interns, and explore the influence of psychological WPV on the professional commitment of nursing interns.

Methods: The subjects were 1,095 nursing interns from 14 medical colleges in Shandong Province. The data were collected electronically using the psychological WPV against nursing interns questionnaire and the professional commitment scale of nursing. The frequency and component ratio were used to describe the incidence and characteristics of psychological WPV. Binary logistic regression was used to analyze the influencing factors of psychological WPV, and linear regression investigated the influence of psychological WPV on the professional commitment of nursing interns.

Results: In the study, 45.0% ($n = 493$) of nursing interns suffered at least one incidence of psychological WPV during clinical practice, mainly discrimination and verbal abuse. Patients and their relatives were the main perpetrators of psychological WPV. Discrimination and lack of trust were the two main reasons behind psychological WPV. Furthermore, 75.9% of psychological WPV incidents were not effectively reported. Logistic regression showed that clinical internship duration, place of family residence, and hospital level were the influencing factors of psychological WPV among nursing interns. Linear regression results showed that psychological WPV had a negative effect on nursing interns' professional commitment.

Conclusion: Psychological WPV against nursing interns is highly prevalent in China, negatively impacting their professional commitment. It is suggested that colleges should introduce courses for nursing interns to understand and cope with psychological WPV before entering clinical practice, and hospitals should establish a mechanism to prevent, cope with, report, and deal with psychological

WPV to effectively reduce the incidence of psychological WPV against nursing interns, improve their ability to cope with psychological WPV, and enhance their professional commitment.

1. Introduction

The lack of clinical knowledge, nursing skills (1) and ability to deal with clinical emergencies make nursing interns a high-risk group for workplace violence (WPV) (2). WPV is further categorized into physical WPV and psychological WPV. Psychological WPV refers to the deliberate use of power over another person or group, including the use of threats and force, which may cause harm to physical, mental, spiritual, moral, or social development, and includes abuse, bullying/siege, harassment, and threats (3). A UK study of WPV among nursing interns found that about 42.2% of interns had experienced bullying/harassment in the past year (4). A survey on WPV among 1,017 nursing interns in Hong Kong showed that 30.6% had experienced verbal abuse (5). In Turkey, nearly 91.6% of nursing interns had experienced verbal violence (6). In a study of WPV among 954 nursing interns in China, 38.5% had experienced verbal abuse and 14.8% received threats (2). These findings show that psychological WPV has become the primary form of WPV among nursing interns. Researchers believe that the prevalence of psychological WPV is underestimated compared to physical WPV (7).

WPV has many negative physical and psychological consequences for nursing interns (8). A Scottish survey on verbal violence among 950 nursing interns found that anxiety, fear, and vulnerability were the most common symptoms during and after the violence, while a small number of nursing interns felt guilty and incompetent (9). Furthermore, nursing interns exposed to WPV showed higher symptoms of traumatic stress, and their daily life was also affected (10). WPV also has a negative impact on the quality of work and career choices of nurses. A qualitative study by Smith et al. showed that nursing interns who experienced harassment felt that the quality of care provided to patients had decreased (11). Nursing interns' high violence level and experience negatively impact their professional identity, enthusiasm for clinical internship, and work quality (2, 12). Compared with nursing interns who had not experienced verbal violence, those who suffered from verbal abuse had an increased intention to leave (5). About 20% of nursing interns who experienced harassment had considered leaving the nursing profession (13). So far, the current situation and consequences of psychological WPV among nursing interns have not been systematically studied (14).

The professional commitment of nurses refers to the positive attitude and behavior of nurses who identify with their major and are willing to make corresponding efforts, which reflects the status of nurses' identification, loyalty, and devotion to the nursing profession (15, 16). The higher the professional commitment of nurses, the higher the job satisfaction (17, 18), and the lower the work pressure (19) and turnover intention

(20, 21). Studies have confirmed that the level of professional commitment of nurses is affected by psychological WPV (22, 23). Nurses exposed to verbal violence had lower levels of professional commitment than nurses who did not suffer verbal violence (24). Furthermore, research suggests that bullying experienced by young nurses influences professional commitment through the mediating role of emotional exhaustion (25). The level of professional commitment of nursing interns can predict the level of professional commitment after they become registered nurses (26). Therefore, it is important to study the professional commitment of nursing interns for the stability of the nursing team and the improvement of the quality of nursing services (27). Previous studies have confirmed that the professional commitment of nursing interns is affected by the clinical environment (28). However, there is little research on whether the professional commitment level of nursing interns is affected by psychological WPV.

This study aims to comprehensively understand the types and characteristics, causes, and coping methods of psychological WPV suffered by nursing interns in China, analyze the influencing factors of psychological WPV among nursing interns, explore the influence of psychological WPV on nursing interns' professional commitment, provide a reference for the development of prevention and treatment measures for psychological WPV against nursing interns, and further improve the level of professional commitment of nursing interns.

2. Materials and methods

2.1. Participants and data collection

The study is a multi-center cross-sectional study. Medical colleges with a separate nursing department were set as the standard, and 14 medical colleges in Shandong Province were selected. A convenient sampling method was adopted, and junior/senior nursing students who were clinical interns from April 2021 to July 2021 were selected for the survey. Inclusion criteria: (a) the major was nursing; (b) students were clinical interns; (c) clinical practice duration ≥6 months; (d) informed consent. Exclusion criteria: nursing interns who were unable to participate in the survey for various reasons, such as sick leave or personal leave.

The survey was conducted anonymously through the questionnaire star platform (Sojump). The investigators were teachers from the 14 medical colleges and were trained by the researchers before the survey. The investigators explained the purpose and significance of the study and the method of filling in the questionnaire to the respondents, and gave unified guidance for any problems faced by the nursing interns during the survey.

2.2. Measures

2.2.1. Demographic factors

Demographic factors included age, sex, educational background, hospital level, duration of clinical internship, whether the nursing intern is an only child, and place of family residence.

2.2.2. Psychological workplace violence questionnaire

By referring to the Chinese Version of Workplace Violence against Nurses Questionnaire compiled by Chen (29), the questionnaire on WPV developed by WHO (30), and the Chinese Version of Workplace Psychologically Violent Behaviors Instrument (31), the researchers compiled the questionnaire on psychological WPV against nursing interns. The questionnaire consists of 12 items divided into two parts. Part one contained types and frequency of psychological WPV suffered by nursing interns (3 items). Part two contained characteristics, coping mechanisms, and effects of psychological WPV suffered by nursing interns (9 items). To ensure the validity of the questionnaire, five experts with experience in WPV were invited to evaluate the content validity. The item-level content validity index was 0.78–0.86, the scale-level content validity index was 0.82, and the Cronbach's alpha coefficient was 0.93.

2.2.3. Professional commitment scale

The professional commitment of nurses scale compiled by Taiwan scholar Lu (15) and later revised was adopted (32). The scale is divided into three dimensions: willingness to make effort (13 items), maintaining as a membership (8 items), and belief in goals and values (5 items), with a total of 26 items. The scale measured an individual's willingness to identify with the nursing profession, devote themselves to the nursing profession, and stay in the nursing profession. The 4-point scale was rated from 1 being "very unsure" to 4 being "very sure." The total score of professional commitment was the sum of individual item scores. The higher the scale score indicates that nurses have more satisfactory professional commitment. The Pearson correlation coefficient of the retest reliability of the scale after 3 weeks was 0.89, and the Cronbach's alpha coefficient was 0.94. In this study, the Cronbach's alpha coefficient ranged from 0.89–0.95 for the scale and its three dimensions.

2.3. Statistical analysis

SPSS 26.0 software was used to analyze the data. Qualitative data were described by frequency and component ratio, while quantitative data were represented by mean ± standard deviation. The Chi-square test and independent samples t-test were used to analyze the influence of demographic factors on psychological WPV. The independent samples t-test analyzed the differences in professional commitment between the Psychological WPV and no Psychological WPV groups. The influencing factors of psychological WPV were analyzed through binary logistic regression, and the influence of psychological WPV on the professional commitment of nursing interns was analyzed using linear regression. The difference was statistically significant when $p < 0.05$ on both sides.

2.4. Ethical considerations

This study was approved by the Ethics Committee of the Provincial Hospital Affiliated to Shandong First Medical University (Ethics Number: 2022-561). All nursing interns in the survey signed an informed consent form. In accordance with the provisions of the Declaration of Helsinki, the personal data of the respondents were kept strictly confidential and their privacy was maintained.

3. Results

3.1. Participant characteristics

A total of 1,300 questionnaires were sent out and 1,095 valid responses were collected, with an effective response rate of 84.3%. The average age of nursing interns was 21.15 ± 2.50 years and the average internship duration was 7.82 ± 1.65 months. The interns included 951 (86.8%) females. Of the nursing interns, 839 (76.6%) practiced in Grade III-A hospitals; 232 (21.3%) were an only child, and 710 (64.8%) had families living in rural areas. The demographic characteristics of the nursing interns are shown in Table 1.

3.2. Types and incidence of psychological WPV against nursing interns

Among the 1,095 nursing interns, 493 (45.0%) had suffered at least one form of psychological WPV during clinical internship. The top three most prevalent forms of psychological WPV included discrimination (618; 56.4%), verbal abuse (387; 35.3%), and being despised and ignored (293; 26.8%); 227 (20.7%) nursing interns suffered more than two types of psychological WPV. The results are shown in Table 2.

3.3. Characteristics, coping mechanisms, and influence of psychological WPV suffered by nursing interns

In further analysis of psychological WPV against the 493 nursing interns, it was found that 54.8% of psychological WPV incidents occurred in the first 1–3 months of clinical internship. The top three perpetrators of psychological WPV were relatives of patients (386; 78.3%), patients (374; 75.9%), and nurses (184; 37.3%). Majority of the psychological WPV incidents (419; 85.0%) occurred between 8:00 to 16:59 h. Furthermore, 56.9% cases of psychological WPV could be attributed to discrimination against the nursing interns and 34.4% cases indicated a lack of trust in their abilities. In the face of psychological WPV, 50.9% of nursing interns chose silence, and 75.9% of violent incidents were not reported. The results are shown in Table 3.

TABLE 1 Demographic characteristics of nursing interns with and without psychological WPV experience (*N* = 1,095).

Variable	Mean (SD)/number (%)	No psychological WPV (*n* = 602)	Psychological WPV (*n* = 493)	χ^2/F	P
Age	21.15 (2.50)	21.20 ± 2.92	21.20 ± 1.85	−0.69	0.49
Gender					
Male	144 (13.2)	87 (14.4)	57 (11.5)	1.98	0.16
Female	951 (86.8)	515 (85.5)	436 (88.4)		
Clinical internship duration	7.82 (1.65)	8.04 ± 0.92	7.42 ± 2.17	6.88	<0.01
Hospital level					
Grade III-A hospital	839 (76.6)	421 (69.9)	418 (69.4)	33.82	<0.01
Other	256 (23.4)	181 (30.1)	75 (12.4)		
Educational level					
<Bachelor degree	557 (50.9)	303 (50.3)	254 (42.2)	0.15	0.7
≥Bachelor degree	538 (49.1)	299 (49.7)	239 (48.5)		
Only child	232 (21.3)	136 (22.6)	96 (19.5)	1.58	0.21
Family residence					
Rural	710 (64.8)	368 (61.1)	342 (69.4)	8.08	<0.01
Urban	385 (35.2)	234 (38.9)	151 (30.6)		

WPV, workplace violence.

TABLE 2 Incidence rate of psychological WPV (*N* = 1,095).

Variable	Number (%)
Psychological WPV	
Yes	493 (45.0)
No	602 (55.0)
Types of psychological WPV	
Discrimination	618 (56.4)
Verbal abuse	387 (35.3)
To despise and ignore	293 (26.8)
Bullying	105 (9.6)
Isolation and alienation	73 (6.7)
Harassment	70 (6.4)
other	77 (7.0)
Frequency	
0	602 (55.0)
1	266 (24.3)
2–3	144 (13.1)
>3	83 (7.6)

WPV, workplace violence.

3.4. Characteristics of nursing interns with and without psychological WPV experience

The univariate analysis showed that the incidence of psychological WPV was higher among nursing interns with short internship duration, who practiced in Grade III-A hospitals, and who lived in rural areas than those with long internship duration, who practiced in hospitals below Grade III-A hospitals, and who lived in cities ($p < 0.01$ for all parameters). The results are shown in Table 1.

3.5. Professional commitment of nursing interns with and without psychological WPV experience

The *t*-test results showed that the scores of professional commitment were higher for nursing interns who did not suffer psychological WPV than for those who experienced psychological WPV ($p < 0.01$). The results are shown in Table 4.

3.6. Logistic regression results for factors influencing psychological WPV in nursing interns

Logistic regression analysis was conducted to explore the predictive factors of psychological WPV among nursing interns. Psychological WPV was the dependent variable, and internship duration, internship hospital, place of family residence, and participation in activities were taken as independent variables. The results showed that long duration of clinical practice and living in urban areas were the protective factors of psychological WPV among nursing interns, and practice in Grade III-A hospitals was the risk factor for psychological WPV (Table 5).

TABLE 3 Characteristics of psychological WPV (*n* = 493).

Variable	Number (%)
Internship duration	
1–3 months	270 (54.8)
4–6 months	187 (37.9)
>6 months	98 (19.9)
Department	
Emergency department	254 (51.5)
Outpatient department	203 (41.2)
Inpatient ward	155 (31.4)
Intensive care unit	67 (13.5)
Other	58 (11.8)
Perpetrator	
Relatives of patient	386 (78.3)
Patient	374 (75.9)
Nurse/head nurse	233 (47.2)
Doctor	81 (16.4)
Cleaner/security	68 (13.8)
Nurse students	35 (7.1)
Other	101 (20.4)
Occurrence time	
8:00–16:59	419 (85.0)
17:00–21:59	74 (15.0)
22:00–7:59	63 (12.8)
Cause	
Discrimination against nursing interns	280 (56.9)
Lack of trust in nursing interns	170 (34.4)
Nursing interns' lack of effective communication	101 (20.6)
Low-level education of perpetrator	118 (23.9)
Nursing interns' lack of knowledge and skills	97 (19.6)
No reason	54 (11.0)
other	40 (8.1)
Coping strategies	
Suffer in silence	251 (50.9)
Ask classmates/friends for help	168 (34.1)
Patiently explained	152 (30.8)
Ask nursing teacher for help	121 (24.5)
Ask family for help	64 (13.0)
Treat the perpetrator in the same way	33 (6.7)
Other	197 (40.0)
Report situation	
No report	374 (75.9)
Intern captain/classmates	183 (37.1)

(Continued)

TABLE 3 (Continued)

Variable	Number (%)
Nursing teacher	140 (28.4)
Head nurse/nursing department	45 (9.1)
College teacher	26 (5.3)
Reason for not reporting	
Normal phenomenon	265 (53.8)
Reporting doesn't solve the problem	168 (34.1)
Unwilling to report	120 (24.3)
No reporting mechanism	71 (14.4)
Fear of retaliation	64 (13.0)
Fear of ridicule	17 (3.4)
Other	9 (1.8)
Impact of WPV	
Decline in work enthusiasm	356 (72.2)
Want to leave the department	259 (52.5)
Want to change profession	191 (38.7)
No influence	185 (37.5)
Absenteeism	52 (10.5)
Nursing errors and increase in mistakes	42 (8.5)
Other	70 (14.2)

WPV, workplace violence.

3.7. Linear regression results for the impact of psychological WPV on nursing interns' professional commitment

Multivariate linear regression analysis showed that psychological WPV influenced nursing interns' professional commitment and associated dimensions. See Table 6 for details.

4. Discussion

The study investigated 1,095 nursing interns in 14 medical colleges in the Shandong Province of China, which contains 35 hospitals in 20 cities, representing to a certain extent the incidence level of psychological WPV against nursing interns in China. The results showed a psychological WPV incidence rate of 45.0% among Chinese nursing interns, which is similar to the findings for nursing interns in Australia (33) and the United Kingdom (4), and is higher than the incidence (28.1%—31.3%) of psychological WPV against Chinese nurses (31, 34). This result could be attributed to the inconsistent survey tools used in the investigation. Moreover, compared with nursing interns, nurses have richer clinical experience and are more likely to gain the trust of patients and their families when dealing with clinical routine or emergency problems. The higher the trust in nurses' abilities, the lower the incidence of violence (35). As for the type of psychological violence, discrimination ranks first, followed by verbal abuse, which is

TABLE 4 Professional commitment of nursing interns with and without psychological WPV experience.

Variable	Average score	No-WPV (n = 602)	WPV (n = 493)	F	P
Total scale score	2.65 ± 0.69	2.72 ± 0.67	2.57 ± 0.73	3.41	0.00
Willingness to make effort	2.71 ± 0.80	2.79 ± 0.77	2.62 ± 0.82	3.48	0.00
Maintaining as a membership	2.61 ± 0.82	2.69 ± 0.78	2.51 ± 0.86	3.58	0.00
Belief in goals and values	2.91 ± 0.77	2.97 ± 0.74	2.83 ± 0.8	3.00	0.00

WPV, workplace violence.

TABLE 5 Factors influencing psychological WPV among nursing interns (N = 1,095).

	B	S.E.	Wald	P	Exp (B)	95% CI	
Grade III-A hospital	0.56	0.16	11.70	<0.01	1.75	1.27	2.41
Clinical internship duration	−0.05	0.06	65.67	<0.01	0.60	0.53	0.68
Place of family residence—Urban	−0.30	0.14	4.74	0.03	0.74	0.56	0.97
Constant	2.79	0.65	18.48	<0.01	16.24		

CI, confidence interval; WPV, workplace violence.

TABLE 6 Influence of psychological WPV on professional commitment of nursing interns.

	B	SE	Beta	T	P
Professional commitment	−0.19	0.04	−0.14	−4.37	<0.01
Willingness to make an effort	−0.23	0.05	−0.14	−4.53	<0.01
Entry into professional career	−0.23	0.05	−0.14	−4.43	<0.01
Professional value identification	−0.19	0.05	−0.12	−3.39	<0.01

WPV, workplace violence.
Adjust for age, sex, only child, educational level, clinical internship duration, place of family residence.

inconsistent with other research results (9, 36). This is because patients and their families prefer to be cared for by experienced nurses, which affects the clinical operation opportunities of nursing interns and makes them feel discriminated against. This may also be why nursing interns chose patients and their families as the main perpetrators of psychological WPV. Notably, nurses accounted for more than a third of the perpetrators, indicating that horizontal violence within organizations is widespread amongst nursing interns (37, 38). The first 3 months of the internship are the high-incidence period of psychological WPV, which is the stage of clinical learning and adaptation for nursing interns, preventing nursing interns from comprehensively imbibing the skills required to deal with clinical problems. Most of the psychological WPV incidents against nursing interns occurred during 8:00–16:59 h, which could be attributed to the heavy nursing workload and relative shortage of nurses in China (39). When patients' needs are not met, the incidence of violence significantly increases (40).

When faced with psychological WPV, most of the nursing interns chose silence and tolerance; only 24.1% of the nursing interns reported psychological WPV. The reason why nursing interns choose not to report Psychological WPV is the belief that it is a common phenomenon in clinical practice and will not be dealt with justly after reporting. These findings suggest that the current clinical environment of nursing interns needs to be improved as there is no comprehensive mechanism for preventing, reporting, and dealing with psychological WPV for nursing interns. Moreover, the nursing interns were punished

by the leaders/teachers after reporting incidents of psychological WPV (9), resulting in the failure to take appropriate measures to deal with psychological WPV. Faced with psychological WPV, nearly three-quarters of nursing interns' enthusiasm for work decreased, more than half hoped to change the department, and one-third had the idea of changing careers. This indicates that although psychological WPV does not directly damage the health of nursing interns (41), it greatly reduces the confidence and enthusiasm of nursing interns for nursing work and negatively affects their professional identity. This was confirmed through the analysis of influencing factors of professional commitment in this study.

The regression analysis of psychological WPV showed that the duration of clinical internship and family residence in urban areas were protective factors of psychological WPV. In the long-term clinical practice, nursing interns can master more clinical skills and correctly deal with patients' problems, reducing the risk of psychological WPV. In China, compared with nursing interns living in rural areas, interns living in cities have better educational resources (42), enabling them to develop more comprehensive coping skills and strain capacity. These skills have certain advantages in dealing with nurse-patient conflicts; thus, these nursing interns are less likely to suffer from psychological WPV. Compared with nursing interns in lower-level hospitals, nursing interns in Grade III-A hospitals are more likely to suffer psychological WPV. This could be attributable to the fact that patients have more demands and higher treatment

expectations from the medical staff in higher-level hospitals, and nursing interns who lack comprehensive knowledge and skills find it difficult to meet patient needs. This is consistent with the finding that lower patient satisfaction leads to higher psychological WPV (43).

This study showed that the professional commitment of nursing interns was at a medium level, which was consistent with other research results (23, 44). The group with experience of psychological WPV had lower overall scores in professional commitment and its three dimensions than the group with no experience of psychological WPV. The regression results also showed that psychological WPV affects the professional commitment of nursing interns. The higher the level of psychological WPV, the lower the level of professional commitment, which is consistent with the results of studies on nurses (22, 23). According to Ecological Systems Theory, individual development is caused by the interaction between oneself and the environment (45). The professional commitment of nursing interns is bound to be affected by the clinical internship environment. Psychological WPV, as an adverse factor, will affect the relationship between nursing interns and patients. The worse the nurse-patient relationship, the lower the professional commitment level (46).

This study find that lack of trust is one of the main reasons for the high incidence of psychological WPV among nursing interns, and effective nurse-patient communication can improve the nurse-patient relationship and reduce the incidence of psychological WPV. Compared with other nurse-patient communication training, researchers found that the use of phenomenologically-based communication training for nursing interns has more advantages (47), which can effectively improve the trust relationship between nursing interns and patients. Effective post-incident support can improve employee outcomes after WPV occurs (48), a greater emphasis on supportive organizational practices are required for reduce the outcomes. It is suggested that hospital administrators formulate perfect procedures for the prevention, reporting, and handling of psychological WPV so as to create a good learning environment for nursing interns. Nursing interns who suffer from psychological WPV should be provided with regular psychological counseling to ensure their physical and mental health (24) so as to enhance their professional commitment to nursing.

The study also has some limitations. First, this study is a cross-sectional study using a convenient sampling method. Information is not available on nursing interns who decided not to participate in the study, so our study may have selective bias. Meanwhile, the nursing interns may have reported only those incidents of psychological WPV which hurt them deeply; therefore, the actual incidence rate of psychological WPV may be higher than that reported in this study. Future studies should conduct prospective data collection on psychological WPV among nursing interns. Secondly, the influence of psychological WPV on the career of nursing interns is multifaceted. This study only discusses the influence on professional commitment; whether psychological WPV affects the employment choice of nursing interns is the subject of future research.

5. Conclusion

About half of Chinese nursing interns experience psychological WPV, with discrimination and verbal abuse being the primary forms of psychological WPV. Furthermore, the majority of psychological WPV incidents are not reported. The level of psychological WPV suffered by nursing interns differs based on hospital level, clinical practice duration, and place of family residence. Psychological WPV not only reduces the work enthusiasm of nursing interns, but also affects their professional commitment to nursing. It is suggested that colleges should add courses on understanding and coping with psychological WPV for nursing interns, and hospitals should encourage nursing interns to report violent incidents so as to build a healthy and harmonious professional environment. Meanwhile, managers should take targeted measures to prevent and deal with violence to stabilize nursing teams.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

This study was approved by the Ethics Committee of the Provincial Hospital Affiliated to Shandong First Medical University (Ethics Number: 2022-561). All nursing interns in the survey signed an informed consent form. In accordance with the provisions of the Declaration of Helsinki, the personal data of the respondents were kept strictly confidential and their privacy was maintained.

Author contributions

JL and DK contributed to the study design, implementation, and analysis. JL, YL, and ZY contributed to manuscript writing. JZ, QX, FG, and AG contributed to the statistical design and data collection. XL, XZ, and CD contributed to the analysis of the data. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Creating healthy workplaces in healthcare: Are we delaying progress by focusing on what we can do rather than what we should do?

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All the available evidence points to the fact that healthcare is under considerable stress, and while change is urgently needed there is no quick fix; systemic and sustained changes in organizational cultures within healthcare are required. Moreover, the fragility of healthcare systems globally has been starkly exposed by the Coronavirus 2019 pandemic. We have gathered enough evidence to know what is driving poor wellbeing, and how these processes impact on quality of care and patient safety. Indeed, we have a good idea of what we need to do to improve the situation. Therefore, this begs a simpler question; If we know how to create healthy workplaces, why is it so difficult to achieve this in healthcare? In the following perspective paper, we will argue that we can do better if we address the following three issues: (1) we are ignoring the real problems, (2) limited successes that we are achieving are moving us further from tackling the real problems, (3) culture change is accepted as crucial, but we are not accepting what the evidence is telling us about healthcare culture. Tackling burnout is useful and necessary, but we must increase dignity among healthcare employees. Moreover, we need to train line managers to recognize and facilitate the need of employees to feel competent and be appreciated by others, while helping them set wellbeing boundaries.

KEYWORDS

healthy workplaces, mental health of employees, burnout, healthcare, patient safety

1. Introduction

All the available evidence points to the fact that healthcare is under considerable stress. For example, in the United Kingdom (UK) a recent report from the International Public Policy Observatory (IPPO) estimates that the financial cost to the NHS of poor wellbeing is £12.1 billion a year (1). Moreover, the fragility of healthcare systems globally has been starkly exposed by the COVID-19 pandemic, with emerging evidence that during COVID healthcare workers from Black, Asian and Minority Ethnic (BAME) groups had a significantly increased risk of mortality when compared to white healthcare workers (2). At a community level, COVID has created a hole in the informal social prescribing networks utilized by primary care to support patients and their families (3). Moreover, the complexity of the COVID problem has been highlighted by recent research indicating that the natural propensity of co-workers to socialize together means that healthcare professionals are at triple the risk of developing COVID-19 infection when comparing co-worker exposures with

patient sources (4). Thus, gathering with your work colleagues can be dangerous during a pandemic—even though this maybe the time when you need support most. The pandemic should have alerted policymakers to the fact that creating healthy workplaces is a necessity for the sustainability of healthcare, and an opportunity to address the unavoidable link between healthcare employees' mental health and the quality of healthcare delivery (5).

We have gathered enough evidence in healthcare to know what is driving poor wellbeing, and how these processes impact on quality of care and patient safety (6). Indeed, there is a plethora of studies on the drivers of burnout (7–9), the mechanisms of burnout (10–13) and reviews of burnout interventions in healthcare (14–16). Thus, it could be argued that we have a good idea of what we need to do to improve the situation. However, this begs a simpler question; if there is guidance on how to create healthy workplaces, why is it so difficult to achieve this in healthcare? In the following perspective paper, we will argue that creating healthy workplaces in healthcare can be realized sooner if we address the following three issues: (1) we are ignoring the real problems, (2) limited successes are moving the field further from tackling the real problems, (3) evidence points to the fact that culture change is crucial, but we are not accepting what the evidence is telling us about healthcare culture.

2. Are we ignoring the real problems?

Suggesting that researchers are ignoring the real problems is a strong claim. However, a realist review of interventions to promote mental health and happiness among health workers (17) concluded that there are three main barriers. First, lack of engagement from employees was the most common reason for interventions failing; second, the majority of studies were from high-income countries; third, most of the studies targeted one type of healthcare workers (with nurses being the most common). Moreover, a further review of two recent papers— a study protocol (18) and an intervention study (19)—indicates that these problems are continuing. These two recent papers demonstrate an understandable pragmatism toward funding what can be done rather that what should be done. Firstly, the protocol refers to an organizational redesign intended as a system-level intervention, targeting the whole hospital on the level of the organization (18). However, while the intervention is multi-component, it will only target the two major clinical professions— nurses and physicians. The second study (19), which was an intervention study among academic radiologists, demonstrated that self-reported burnout was unchanged or worsened over time across a range of departmental initiatives that were intended to improve culture, workplace efficiency, work-life balance, and personal wellness. The authors reflected on the reasons why the initiatives failed and reported that "our leadership lunches and social events with leadership were poorly attended" (19). These two recent papers mirror the problems identified by the review (17), in showing a focus on a narrow set of employees and a failure to explore the lack of engagement.

The realist review of interventions (17) indicates that interventions have reduced the hospital to the product of its frontline care staff (i.e., physicians and nurses), and ignored the

equally important distal roles that impact both the wellbeing of staff and patient safety of a hospital. For example, the out-sourcing of cleaning staff in hospitals, meaning employees are more detached from the organization, has been linked to higher levels of health care–associated infections in both the UK (20) and United States of America (21), with the UK study also indicating that outsourcing was associated with fewer cleaning staff per hospital bed, worse patient perceptions of cleanliness and worse staff perceptions of availability of handwashing facilities. Put simply, it is perverse that organizational interventions place such little importance on the diverse roles that contribute to the effective functioning of a hospital, such as cleaning staff, catering staff, administration staff, healthcare assistants and support staff. Additionally, interventions don't account for the social, economic and historical factors that influence the degree to which staff and patients experience the hospital as an unhealthy environment. Most recently, the obsession with focusing on "what can be done" has been identified as the self-limiting factor in quality improvement initiatives, where improving organizational-level quality measures is prioritized over the healthcare professionals' emotional experience (22). The majority of interventions and protocols reported in high-ranking journals reflect well-designed, pragmatic, doable and measurable approaches to designing interventions. However, the interesting question is whether this pragmatic approach has fallen foul of the social sciences' metaphysical obsession with method—leading to measure-ability always trumping meaningfulness [see Robinson (23), for a full discussion].

To make progress in creating healthy workplaces, the crucial factor is to understand better the most effective way to embed interventions that are informed by bottom-up experiences (not just top-down). Recent evidence from industry indicates that domain experts exhibit a feasibility preference, focusing on the feasibility of a solution as the primary indicator of its quality, while discounting riskier but more novel solutions (24). Thus, in healthcare focusing on what experts perceive as "feasible" rather than what is needed runs the risk of treating the symptoms rather than the drivers of unhealthy workplaces. Congruently, Clarkson (25) describes the typical Plan-do-Study-Act approaches (26) in quality improvement as dangerous on the basis that our approach to healthcare redesign tends to ignore the first element of the design process (i.e., Need, Problem, Solution)—why do we *need* to change something? Accordingly, healthcare can rush toward problems and solutions, which is probably rooted in the pathogenic approach to training. This leapfrogging over the "need" is characteristic of our approach to burnout in healthcare.

Burnout should be considered as a symptom of a dysfunctional organizational system, a starting point not an end one, inviting us to investigate why the workplace is unhealthy. Assessing the range of burnout profiles (see Figure 1) rather than a simplistic burnout/no burnout dichotomy is a more sensible and evidence-based approach to burnout. There is a need to move from a burnout-centric approach in healthcare to a healthy workplace-centric one, especially when one considers that only 10–15% of employees fit the true burnout profile (as measured by the Maslach Burnout Inventory), meaning if interventions target heterogenous groups, they are mudding the water as to their efficacy (27). Burnout prevalence rates within healthcare can vary considerably among organizations and medical specialties from 17 to 69%,

(1), and this compounds the problem of comparison, as different approaches to classifying burnout have been used in healthcare (28). Assessing the different profiles of burnout (see Figure 1) enables the investigation of factors driving each of the different profiles. For example, developing interventions that seek to address employees' need for fairness will look very different from those seeking to address employees' need for a sense of community in a workplace.

3. Are limited successes problematic?

Interventions that result in limited success (e.g., reduced burnout among front-line staff) risk becoming the victim of their own success—meaning that healthcare organizations will be less motivated to engage in the long-term sustainable goal of healthy workplaces if we can extinguish some fires at the front-line. There is a reality outside of well-designed interventions where healthcare workers need to use foodbanks and will be less able to meet rising energy bills (especially in the UK) (29). Income inequality is an environmental stressor that is associated with higher levels of burnout, with research indicating that psychological demands placed on employees as a result of job insecurity are compounded when they occur in a context of economic inequality (30). Equally, financial stress has been linked with suicidal thoughts and behaviors in the general working population (31). Indeed, organization-level interventions (aiming to increase employee control) do not protect employees from poor working conditions (32). Congruently, data from the first wave of the pandemic among UK health workers indicated that groups at higher risk of experiencing poor mental health included women, younger staff and nurses (33), meaning those most likely to have less resources and greater demands. Should the approaches to healthcare wellbeing not also address the precarity pandemic that is a significant source of stress for a large number of healthcare employees? What is the point of burnout interventions if the main cause of stress is day-to-day survival in and out of work?

While the full fallout of COVID-19 is not yet known, there is some initial evidence that people have recalibrated their needs, and that healthcare workers feel that they are quite literally on the front-line, alone (34). The recent evidence on the impact of COVID indicates increased anxiety and stress among both clinicians and affiliated health workers (35–37) which can't augur well for patients in the future. The pandemic has revealed that policymakers and healthcare organizations need to become much better at protecting the wellbeing of healthcare workers, regardless of the cost. Evidence that on some occasions the needed Personal Protective Equipment (PPE) couldn't be provided during the pandemic, and staff were requested to be silent about it (38, 39), must have sent a powerful signal about the expectations that healthcare staff would keep going regardless of the pandemic. Moreover, the macroeconomic measures necessitated by the pandemic (e.g., Furlough schemes) indicated that money can be found when it is really needed. These aforementioned aspects of the pandemic make it easier to appreciate why healthcare workers are considering a career change and/or weighing up their commitment to their job (40–42).

Local change initiatives in healthcare organizations focused on a narrow range of day-to-day working practices will not provide the impetus needed to signal to healthcare workers that wellbeing and dignity are valued priorities. A review of the evidence on how changes to organizational and management practices can improve staff wellbeing in healthcare and primary care reveals a dearth of whole organization approaches and lack of long-term evaluation (1). Simply repeating the obvious fact that better designed interventions are needed (i.e., longitudinal studies) masks a more interesting inquiry into why healthcare staff would be reluctant to participate in wellbeing initiatives in the first place and don't have the energy, time and inclination to be "dragged" into more extensive full-scale efforts (43, 44). In this regard, the willingness of individuals to be a facilitator in an intervention is highlighted by a recently published cluster randomized control trial of mindfulness to reduce mental health problems and promote wellbeing in UK schools (45). No evidence was found to support the use of mindfulness with school children, but the interesting aspect of the research was the reflection of the researchers that teachers may not have been the best people to deliver the intervention (for a myriad of reasons). The trial, which was methodologically rigorous, is a good example of how ignoring the context can condemn a promising intervention. This chimes with a recent realistic review of interventions to improve wellbeing and decrease burn-out among critical care healthcare professionals (46), which found that contextual factors such as ethnicity, workload, and work schedules played a crucial role in determining the effectiveness of interventions. More specifically, the detailed review highlighted the need to tailor interventions according to the reported needs of participants and incorporate authentic engagement. As the old adage goes, no plan survives contact with the enemy – the reality of healthcare can unmask the limitations even of the most rigorously designed intervention.

4. Culture change is crucial, but we are not accepting what the evidence is telling us about healthcare culture

Healthcare workers are highly intrinsically motivated to do their job and positively impact the patients they serve (47–49). However, healthcare workers are especially prone to the detrimental effects of emotionally disturbing work, due to the higher call intensity of their occupation (50). The drive for healthcare employees to "keep going" and "get the job done" has a dark side referred to as pathological altruism, which includes behaviors that attempt to promote the welfare of another but can have pernicious long-term consequences for the care giver (51). Healthcare can exploit the professional ethic of healthcare professionals which results in a form of dysfunctional professionalism that supports maladaptive healthcare structures in education and practice (52), and which can influence staff at all levels. Is it any surprise that these highly motivated individuals feel numb toward interventions that seek to increase their "resilience" or "engagement"?

Employee silence in healthcare is a big elephant in the room (53). Healthcare is not yet ready to deal with a basic conundrum about organizational behavior; why do professionals who are highly dedicated to their work choose to remain silent

How should we measure burnout?	
A number of survey instruments exist, but the most widely used is the Maslach Burnout Inventory (MBI). In all versions, the MBI yields three scores for each respondent: exhaustion, cynicism, and professional efficacy. Combining the scores reveals different profiles of burnout.	
Burnout	negative scores on exhaustion, cynicism, and professional efficacy
Overextended	strong negative score on exhaustion only
Ineffective	strong negative score on professional efficacy only
Disengaged	strong negative score on cynicism only
Engagement	strong positive scores on exhaustion, cynicism, and professional efficacy
How should we use burnout to better understand (un)healthy organizations?	
Healthcare organizations should not measure burnout in isolation. They should combine its findings with those of other tools to determine the likely causes of the five profiles. Each profile can have different causes and consequences with the organization.	

FIGURE 1
Profiles of burnout (27).

on critical issues that they recognize as being professionally and organizationally significant? Speaking up interventions in healthcare achieve disappointing outcomes because of a professional and organizational culture which is not supportive of speaking-up (54). Healthcare employees understand that Healthcare is intolerant of mistakes, and leaders are rewarded for "moving on" before the extent of the problem becomes un-manageable (55). Thus, interventions and policies, which do not address or account for the range of economic and social conditions pushing the need to "move on" are unlikely to succeed, especially among a healthcare workforce that feels undervalued, underpaid and under-supported. Additionally, few studies have fully exploited the potential of Public-Patient Involvement (PPI) and the co-production of interventions and policies with the relevant stakeholders [see Taylor et al. (56), for a good example of PPI involvement]. Co-production with interdisciplinary stakeholders has the potential to create a different narrative

concerning healthcare worker wellbeing where healthcare delivery is connected with staff wellbeing, and patients can be at the forefront of demanding that healthcare workers are not required to "keep going"—no matter what.

5. What can we do differently?

The three questions tackled in this perspective paper—ignoring whole organization solutions, limited successes that address symptoms not causes, and an inability to deal with deeply embedded cultural problems (e.g., employee silence, the hidden curriculum) —are inhibiting progress toward creating healthy workplaces. Burnout is a clue that we are not valuing or adequately protecting the wellbeing of a highly motivated workforce. Tackling burnout is useful and necessary, but the bigger challenge is to increase dignity among healthcare employees, no matter how difficult it is to measure and translate it into a policy and/or

an intervention. A good starting point is to utilize the fact that healthcare leaders at all levels are *de facto* acting as "sensegivers" and "sensemakers" for their employees (53). Congruently, there is a need to train line managers how to set wellbeing boundaries (e.g., taking adequate breaks) for themselves and their employees. Not even a pandemic has transformed the level of resources that healthcare workers and patients deserve, beyond symbolic clapping (57).

The problems that have been identified in the Quality Improvement (QI) field in healthcare are relevant to creating healthy workplaces. For example, QI has made notable progress in many areas, but the holes in QI have been identified as: too much attention to individual professional behavior over systems, less attention of QI in mental illness and disability, the ongoing muting regarding social inequalities in healthcare and the lack of research and evaluation in education and training (58). Not repeating the mistakes of QI when creating healthy workplaces can inform our approach. Progress in creating healthy workplaces can be achieved if we accept the advice of Greenhalgh (59) that we should never abandon the narrative-interpretive paradigm and try to get by on "evidence" alone and we should engage pragmatically with the multiple uncertainties involved and offer a flexible and emergent approach to exploring them (60).

Creating healthy work environments within healthcare needs to appreciate the unique way that healthcare professionals are educated and socialized (61). For example, a common experience among healthcare staff is a feeling that they are unable to share their concerns, and their managers are reluctant to have honest informal conversations, a situation exacerbated by social distancing required during the pandemic. Thus, silence is the result of such "protective hesitancy" as both may not feel it is "psychologically safe" to have such discussions (44, 62, 63). The hidden curriculum suggests that the induction period for many young physicians is characterized by a toxic performance culture, whereby adversity is viewed as "character building" and emotional repression is valorized (64, 65), that results in medical students reporting inaction in the face of emotionally challenging situations (66, 67). Regulatory bodies have an important role to play here, and in this sense, can be virtual components of the organization; thus, we need them as full partners in creating healthy workplaces. Only "whole organization" approaches that include all staff and stakeholders have the potential to sustainably address the worker wellbeing public health challenge.

We can do two things differently going forward. Firstly, the three problems we have identified reflect the fact that healthcare can suffer from a silo-mentality. There is a significant lack of experience in genuine interdisciplinary collaboration by the relevant scientific fields (i.e., public health, architecture, occupational health, ergonomics, nutrition, etc.,) on building healthy workplaces. This is a good place to start. Secondly, individual approaches to the problem have dominated in comparison to organizational approaches, with the latter considered complex and difficult to implement. Let's make them less complex by co-producing them with healthcare employees and patients to see if they are actually feasible.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

AM and OL contributed to the conception and writing of this paper. Both authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Workplace health in anesthesia team: A qualitative study in Iran

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Background: All anesthesia providers, including nurse anesthetists and anesthesiologists work in a stressful environment with diverse tasks. The profession is characterized by high workload, both dependent and independent job descriptions, and unpredictable conditions. This study was designed and conducted to explain the factors affecting the workplace health of Iranian anesthesia teams.

Methods: Twenty anesthesia team members including nurse anesthetists and anesthesiologists from 7 different hospitals were enrolled in this phenomenological research. The data were collected in 2022. Semi-structured interviews were used for data collection, and the transcripts were analyzed using qualitative content analysis.

Findings: The most notable theme emerging from the data which was found to affect workplace health was consistency of anesthesia team. Other themes derived from the data included team tranquility and physical well-being.

Conclusion: The participants' emphasis was more on behavioral and managerial factors affecting workplace health, and desirable interpersonal cooperation to create a suitable work environment for them was more prominent. These findings can raise the awareness of chief nurse anesthetists and planners to provide more effective teamwork, modify the job description structure, and reduce staff conflicts.

KEYWORDS

nurse anesthetist, anesthesia team, workplace health, occupational, health nursing, anesthesiologist

1. Introduction

All anesthesia providers, including nurse anesthetists and anesthesiologists work in a stressful environment with diverse tasks. The profession is characterized by high workload, both dependent and independent job descriptions, and unpredictable conditions (1). Studies show that long-term stress has significant physical and psychological consequences for health care workers, which can affect their health and quality of life, and may even affect patient care (2, 3). Working in a stressful environment can lead to an unbalanced life (4, 5).

Based on WHO's definition of workplace health, there is an emphasis on the cooperation of employees and managers to create a process of continuous workplace improvement and promotion of health, safety and stability. Also, "Physical work environment", "Psychosocial work environment", "Personal health resources" and "Enterprise community involvement" are seriously affected in the anesthesia work environment (6).

In Iran like most other countries, there are two different anesthesia care providers, namely nurse anesthetists and anesthesiologists. A nurse anesthetist has a bachelor's degree in anesthesia. They take care of patients' anesthesia needs before, during, and after surgery with the assistance, advice and supervision of anesthesiologists. When anesthesiologists and nurse anesthetists work together, the nature of their interactions can affect their patient care (7, 8). Due to their many overlapping skills, when it comes to allocation of work tasks, nurse anesthetists and anesthesiologists may have conflicts. However, high efficiency and a sense of well-being could be promoted among team members by a good team climate (9). Staff motivation can be affected by differences between members of the anesthesia team. Also, individual, interpersonal and organizational factors, as well as conflicts, unequal power relations and mistrust among anesthesia staff can affect how they respond to everyday conflicts (10). Effective workplace relationships are essential for a healthy workplace (11). Nurses want a desirable interdisciplinary relationship since an effective nurse-physician relationship is one of the hallmarks of a satisfying and productive work environment (12, 13). This mutual relationship has been described as the basis of mutual trust, power and respect between the parties in a workplace (14). Chief nurse anesthetists have a special responsibility to prepare the grounds for team members to interact with each other, and as a result patient safety and outcomes could be optimized (15, 16). The relationship between nurse and chief nurse anesthetist and peer relationships are very important for a healthy workplace. The role of the chief nurse anesthetist determines the work environment and affects its dynamics (17, 18). Various studies have reported significant levels of incivility and aggression in the anesthesia team workplace (19, 20). Aggression in the workplace is a serious problem that is on the rise and is a major concern because of the wide range of consequences including a negative work environment and reduced employee well-being. Behaviors that contribute to aggression in the workplace include backstabbing, negative criticism, lack of support, unwillingness to help, social deprivation, and isolation (20). All of these factors seriously upset the work environment and create an unhealthy atmosphere. Nurse anesthetists work in a unique environment and have responsibilities beyond the scope of nursing, which places them in a unique position, separate from others in the nursing profession. Working in an unhealthy workplace is expected to increase the likelihood of burnout among these health professionals (21). This situation is more serious for nurse anesthetists in Iran because they do not have a general nursing background and enter directly into the four-year program of anesthesia nursing to receive a bachelor's degree. This seems to be the root of most of their problems and conflicts at workplace and their greater differences with general nurses. Therefore, long working hours, stressful workplace environment, and nurse-physician relationship can negatively affect the health of nurse anesthetists at work, due to psychosocial stressors and cultural factors. To the best of our knowledge, no study has examined the factors affecting the specific work environment of anesthesia teams in Iran. Unlike most other countries, nurse anesthetists in Iran are relatively independent of the general nursing staff in terms of both their education and organizational affiliation, and the lack of disciplinary and managerial support for them is evident. Therefore, the present study was conducted to explain the factors affecting the health of the workplace of anesthesia teams in Iran. To this aim, the current research lends itself to provide answers for the following research questions:

1. What is the nurse anesthetist and anesthesiologists' perspectives on health of the workplace in anesthesia environment?
2. What factors (Including individual, interpersonal, managerial, and organizational) affect the health of work environment of nurse anesthetists and anesthesiologists?

2. Methods

A phenomenology design was employed in the study to deepen our understanding of a healthy work environment in a natural setting. Personal interviews were conducted, and qualitative content analysis was performed. By careful examination and constant comparison, qualitative content analysis delves into the depth of individuals' experiences of specific phenomena. Its primary goal is to provide knowledge and understanding of the phenomena under study.

2.1. Setting

The participants of this study were selected from among all anesthesia care teams who worked in seven different hospital anesthesia departments in Ahvaz. All 7 hospitals were affiliated with Ahvaz Jundishapur University of Medical Sciences (AJUMS) and they were in almost the same in terms of environmental, managerial, and organizational conditions including employee salaries and benefits. The participants were eligible to participate in the study if they: were anesthesiologists or nurse anesthetists with more than 2 years of clinical experience and had the ability to speak Persian to participate in the interviews. The exclusion criteria was having speech disorder or prior relationship with the research team. The number of staff in each department ranged from 15 to 50. Initial contact with the potential participants was made by written invitations placed in boards of the anesthesia departments in operating rooms explaining the study objectives and asking them to contact the lead researcher *via* telephone if interested in participating. Thirty-eight employees (32 nurse anesthetists and 6 anesthesiologists) responded of whom 20 were chosen using a purposive sampling method allowing maximum variation in terms of age, gender, and experience to reflect the genuine structure of the anesthesia team in Iran. Sampling continued until data saturation (10). To achieve maximum diversity in terms of the participants interviewed, data collection was initiated with nurse anesthetists and then extended to the anesthesiologists.

2.2. Ethical considerations

This study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (Ref. ID: IR.AJUMS.REC.1399.702), and an introductory letter was given to the lead researcher to conduct the study in the designated centers.

Before starting the study, the lead researcher introduced himself to the participants, and they were briefed on the objectives of the study, the voluntary nature of participation in the study, withdrawal from the study at any time, the reason behind voice recording, information confidentiality, and the accessibility of information for all participants. Finally, informed consent was obtained from all participants.

2.3. Data collection

Qualitative, intensive, in-depth and semi-structured interviews were used to collect the required data. The interview guide included a number of open questions to allow participants to express their perceptions and experiences in detail. At the beginning of each interview, the participants were asked to discuss their experience of health in relation to their work environment. They were then asked to describe their perceptions and experiences about the factors (including individual, interpersonal, managerial, and organizational) that affect the health of anesthesia teams' work environment. Focusing on the anesthesia team structure, the main questions were asked to extract ways to contribute to a better health-promoting work environment. The participants were also asked to give clear and tangible examples of their experiences. The transcript of the audiotaped interviews was written on the same day by the first author and was used as the original data. Data collection was conducted over 6 months from May 2022 to November 2022. Each interview was conducted in one session in a private room at the operating rooms unit after the working shift. Each session lasted from 40 to 90 min. To prevent the negative impact of participants' exhaustion on the interview, the interviews were conducted at the end of a shift when the workload of the participant was low or when the operating room was not active.

2.4. Data analysis

Data were analyzed through content analysis following Lewis and Malecha (22). Each step of the content analysis was first performed by one person (the interviewer) and then discussed and checked with colleagues in the next stage. This method of analysis includes the following steps:

(1) The content of the recorded interviews was transcribed verbatim and reviewed by the researchers several times to reach a general understanding.
(2) Words, sentences, or paragraphs that were linked in terms of content were regarded as semantic units. The semantic units were summarized based on their content.
(3) The semantic units reached a level of abstraction and conceptualization and were labeled by codes according to the concept underlying them.
(4) The codes were compared according to their similarities and differences and classified with specified labels in more abstract classes.
(5) Finally, by comparing different classes with deep and careful reflections, data content was introduced as the theme of the study.

2.5. Rigor of the study

The Lincoln and Guba (23) criteria were used to measure the rigor of the study (23). Strategies were adopted to ensure the credibility of the data: tape-recording and verbatim typing of transcripts, prolonged engagement of the researcher in the study (May to November), member check by participants to approve the interpretations of the researchers, and checking the preliminary categories by an expert chief nurse anesthetist and two faculty members of anesthesiology department. As far as dependability was concerned, coding of the interviews was carried out again by another co-author who had experience in coding qualitative data. Moreover, the researchers documented the research details to allow for the possibility of external review.

3. Findings

A total of 20 participants including 14 nurse anesthetists, 3 chief nurse anesthetists and 3 anesthesiologists from 7 different hospitals were interviewed. Of the 20 participants enrolled in this study, 12 were females and 8 were males. Table 1 shows the demographic data of the participants.

From the deep and rich descriptions provided by the participants, 1,084 semantic units were extracted. After several reviews, the semantic units were summarized and classified on the basis of similarity. They were then summarized once again into three main themes and eight conceptual and abstract subthemes. The three main themes included consistency of the anesthesia team, team tranquility, and physical well-being (Table 2).

3.1. Consistency of anesthesia team

Participants considered the consistency of anesthesia teams as one of the most important strategies to promote workplace health. The anesthesia team operates in a stressful and unpredictable environment that is influenced by various individual, organizational and managerial factors. Lack of stability and acting based on personal taste on the part of both anesthesiologists and nurse anesthetists will negatively affect the results of their actions and lead to conflicts at workplace. Participants identified three key strategies effective in consistency the anesthesia team, namely perceptive and adaptive management, stability in team composition, and adherence to the defined job description.

3.1.1. Perceptive and adaptive management

The main emphasis of most participants was on the management of anesthesia staff. In Iran, every operating room has a chief nurse anesthetist who is responsible for all activities of anesthesia nurses, including allocation of staff into operating rooms, coordination of the anesthesia team, and resolving possible problems and conflicts. Chief nurse anesthetists are on a regular morning shift every day and monitor staff performance. Arranging anesthesia teams in operating rooms according to the type of surgical procedure and assigning anesthesia

TABLE 1 Demographic characteristics of participants.

Demographic characteristics of participants	Nurse anesthetist n = 14	Chief nurse anesthetist n = 3	Anesthesiologist n = 3
Age			
21–30	4	0	0
31–40	5	0	1
41–50	5	2	1
50–60	0	1	1
Gender			
F	9	2	1
M	5	1	2
Experience in OR			
<5 years	4	0	0
6–10 years	5	1	1
>10 years	5	2	2

nurses to the teams of each anesthesiologist are among their important responsibilities.

> "The work of the chief nurse anesthetist is very influential in the structure of our team. It is important how tactfully he distributes the staff in the operating rooms. If the chief nurse anesthetist knows the staff well and knows the capabilities and personality traits of the staff, the most successful teams could be formed." (Nurse anesthetist No 3)
>
> "Experienced and knowledgeable chief nurse anesthetists prevent a lot of conflicts and frustration among staff by properly dividing the workforce." (Nurse anesthetist No 7)

From the participants' point of view, it was important for chief nurse anesthetists to pay close attention to the details of verbal and non-verbal behaviors of the staff as well as their motivations and abilities, and to have timely intervention when problems arise in promoting workplace health. In order to increase nurse anesthetists' satisfaction with their job, chief nurse anesthetists need to meet their physical and mental needs and establish balance between the newcomers and the experienced staff.

> "Chief nurse anesthetists should not only focus on their routine tasks, but also be meticulous and able to identify the needs of their employees." (Chief nurse anesthetist No 2)

3.1.2. Stability in team composition

In this study, the participants were selected from 4 university hospitals and 3 non-university hospitals. In university centers, although nurse anesthetists are fixed members of the anesthesia team, the presence of anesthesia residents as well as anesthesia nursing students in the operating rooms causes frequent changes in the composition of the anesthesia teams. In non-university

TABLE 2 Study themes.

Theme	Sub-themes
Consistency of anesthesia team	• Perceptive and adaptive management • Stability in team composition • Adherence to the defined job description
Team tranquility	• Coworker trust • Avoiding conflicts • Interpersonal justice
Physical well-being	• Operating room structure • Workplace accommodations

centers, however, both anesthesiologists and nurse anesthetists are fixed members and are only distributed in different work shifts, leading to more stability in the composition of the members of the teams. This difference allowed the researcher to examine the frequent changes in the composition of the anesthesia team from the participants' point of view. The participants pointed out that when working with the same people in the team for a long period of time, they gain a good understanding of each other's level of theoretical knowledge, practical skills, and personality traits. This leads to an improved communication and greater coordination in the performance of the anesthesia team, making the staff feel less stress.

> "Mutual recognition and trust come from constant collaboration. I have been working with nurse anesthetists here for almost 5 years. We know what to expect from each other and we have a stress-free environment." (Anesthesiologist No 1)

3.1.3. Adherence to the defined job description

A common problem for members of the anesthesia team is the overlap between the duties of anesthesiologists and

nurse anesthetists. According to the participants, the following were the common problems associated with job description: lack of any precise definition of job descriptions, ineffective briefing of employees on their job description, lack of adequate supervision over proper implementation of job description, and as a result, lack of commitment of most anesthesia staff to their performance. Doing things that are outside the scope of specific job descriptions often leads to neglecting certain tasks, and under such circumstances, everyone waits for someone else to take the initiative and do that task. In addition, other consequences of undefined job description, from the participants' point of view, were conflicts between members of the anesthesia team, which will ultimately lead to increased stress.

> "Here we do not know exactly what is considered as our duty and what counts as the duty of anesthesiologists. We have to adapt ourselves with different anesthesiologists whose expectations are different. This causes confusion and boredom." (Nurse anesthetist No 6)

3.2. Team tranquility

The second theme derived from the participants' experiences was Team tranquility. According to the participants, a calm and less stressful environment is a basic condition for the optimal performance of the team and creating a healthy atmosphere in the workplace. They pointed to three important strategies for achieving such an atmosphere: coworker trust, avoiding conflicts, and interpersonal justice.

3.2.1. Coworker trust

Anesthesia teams are formed by a limited number of members, often including only a nurse and an anesthesiologist. At university centers, anesthesia residents and anesthesia nursing students may be added to these. The team members work together frequently and continuously, and by increasing their knowledge of each other's capabilities and expectations, a feeling of mutual trust is created between them. From the participants' point of view, this trust provides comfort while providing care at the patient's bedside. Of course, there is a degree of distrust when it comes to working with newcomers. Also, a comparison between the experiences of university staff (where there is frequent changes in the clinical rotations of residents and students) and the private centers (where the team structure is almost fixed) shows the formation of more trust between team members in the latter.

> "There are far fewer problems when staff work together for long periods of time. They know each other's working style better and can trust each other in certain situations." (Chief nurse anesthetist No 1)
>
> "Here we have both a resident and a nursing student. There isn't such a thing as a fixed anesthesia team, and members change every day. This does not allow for the establishment of appropriate work relationships and mutual trust." (Anesthesiologist No 3)

3.2.2. Avoiding conflicts

Due to the dense and busy nature of the anesthesia work environment, interpersonal and interdisciplinary conflicts are commonplace. According to the participants, the way staff cope with conflicts is different. However, conflict avoidance was introduced as a more successful solution than conflict resolution. They believed that in a situation where the staff are less likely to get involved in an atmosphere of controversy and competition, conflicts along with subsequent discomfort and stress are less likely to occur. The more intra- and inter-team conflicts are controlled, the more tranquility will be created in the anesthesia team.

> "Experience has taught me that I should not argue with my co-workers or the anesthesiologists. I'd better get over some issues. That way I feel more relaxed. This is because I am the one to be harmed in conflicts." (Nurse anesthetist No 11)
>
> Employees are responsible for keeping their work environment healthy. Some are always looking for competition and tension and behave inflexibly. These conflicts make things difficult for all of us." (Nurse anesthetist No 5)

3.2.3. Interpersonal justice

Members of the anesthesia team noted fairness and being fair in behavior as important factors contributing to interpersonal justice. Justice-based behavior was sought by chief nurse anesthetists, colleagues, and the organization. The participants believed that chief nurse anesthetists' observance of equality in patient allocation and distribution of personnel to different shifts and their fair division of tasks and facilities are effective on the well-being of the anesthesia team members.

> "I try to be as fair as possible in allocating nurse anesthetists into operating rooms. If we always leave longer and more difficult surgeries to certain employees, they will be under a lot of pressure. They would compare themselves to their colleagues and this would disturb their peace and lessen their motivation." (Chief nurse anesthetist No 2)

Our findings showed that another aspect of justice lies in the treatment of anesthesiologists with nurses. They may exhibit different behaviors depending on the level of experience, their intimacy with the nurse anesthetists, or the mental background they have of these nurses.

> "Some anesthesiologists do not treat us all the same. They are too hard on novice nurses and give them less practical help. I can't make sense of this inequality and it upsets me." (Nurse anesthetist No 12)

Also among the statements of the participants there were hints of dissatisfaction with organizational inequality between them and other nurses. They described the anesthesia workplace as too crowded, busy, and stressful compared to other wards, and believed that they were not appreciated for their efforts.

3.3. Physical well-being

Physical well-being, defined as the feeling of comfort and physical security in the operating room space, was considered as an effective factor in the health of the workplace. According to the participants, the two main aspects of physical health were operating room structure and workplace accommodations.

3.3.1. Operating room structure

The experiences of the anesthesia team members showed that the structure of the operating room has a significant role in facilitating their activities and controlling their fatigue and exhaustion. For example, proximity of operating rooms to the nursing station and the lounge can reduce frequent staff walking. In their view, sufficient operating room space for anesthesia staff to move around the patient's bed without disturbance, and the availability of anesthesia equipment and drugs, lead to less energy expenditure and more focus on patient care.

> *"Architectural design standards must be carefully observed in the structure of the operating room. For example, in some centers, the distance between operating rooms is too great, and on busy days I have to cover two or three rooms at the same time. Frequent walking this route is very tedious and time consuming."* (Anesthesiologist No 2)

Others insisted on providing ample space for rest, meetings, and anesthesia counseling. Due to the restricted space of the operating room and the constant presence of the anesthesia staff during an 8-h shift, the participants noted the importance of effective air conditioning and adequate lighting in reducing fatigue and stress.

> *"Our workplace has limited space with a lot of equipment and staff. What's more, there is no opportunity to leave the ward to relieve fatigue and take a breather. It will be very difficult to bear."* (Nurse anesthetist No 8)

3.3.2. Workplace accommodations

Workplace accommodations were identified as any the availability of any equipment which contributes to the well-being of anesthesia staff in the operating room. Long hours of standing on the patient's bedside leads to fatigue and eventually getting bored with the work environment. The participants insisted that they needed to rest and relax between surgeries. This was said to be achieved by providing facilities such as a roomy lounge equipped with facilities for eating and drinking. Also, the use of ergonomic chairs for long sitting on the patient's bedside was a major factor in promoting physical health from the perspective of the interviewed anesthesia staff.

> *"Colleagues in each shift find short opportunities between operations to rest, which must be a comfortable room with sufficient facilities. A room with a bed and facilities for serving drinks and watching TV in those few short minutes; this helps a lot to refresh the staff."* (Chief nurse anesthetist No 1)

4. Discussion

The most important finding of the present study was the emphasis on maintaining team unity in the promotion of health in the workplace. As nurse anesthetists and anesthesiologists work together to provide anesthesia care, a platform for close and ongoing interdisciplinary collaboration is created. Most of the health threats involve the entire anesthesia team, and health promotion strategies should be sought in the management of the anesthesia team.

Consistency of the anesthesia team as one of the main themes of this study means formation of stable anesthesia teams and establishment of interpersonal relationships between their members. While nurse anesthetists are independent professionals, their performance depends largely on the competence, skills and willingness of anesthesiologists to cooperate with them to provide optimal care during anesthesia (24). To date, most attempts to understand the complex nature of the physician-nurse anesthetist collaboration have been subjective and speculative (25). The nurse anesthetists' level of dependence on anesthesiologists and their expectations from them vary depending on their personality, ability, and experience. This leads to inconsistencies and conflicts, which are ultimately followed by stress and unhappiness in the team. Nurses anesthetists and anesthesiologists have many overlapping skills, so assignment of tasks can be a source of conflict (21). However, the team atmosphere can increase efficiency and a sense of well-being in team members (15).

In this study the effective techniques of chief nurse anesthetists in controlling this condition were defined as perceptive and adaptive management. The managerial capabilities of chief nurse anesthetists in a complex and dense anesthesia work environment play a vital role in improving the health of team members. Chief nurse anesthetists' purposeful planning and tactful organization of forces to form anesthesia teams leads to stability in team composition. The distribution of forces and patient allocation should be based on not only their level of knowledge, ability, and experience but also the surgical procedure and anesthesia methods used. This helps to form strong anesthesia teams with the least change in composition. Chief nurse anesthetists have a special responsibility to create opportunities for team members to communicate with each other and thereby enhance patient safety and outcome (26). By the same token, Dexter and Franklin introduced management as the organizer of the situation and emphasized the role of chief nurse anesthetists in creating a healthy and supportive work environment, from both collaborative and health-promoting perspectives (27). Adherence to the defined job description in this study indicated the unclear and inconsistent demarcation of the duties of nurses and anesthesiologists. In other words, while the anesthesiologist is responsible for the technical and medical treatment, the nurse anesthetist has to take care of the patient's general safety. However, in practice, many tasks that are legally within the range of responsibilities of anesthesiologists are performed by anesthesia nurses. This gives rise to a hidden competition in the members of the anesthesia team that can distort the identity and independence of each member (28).

Another theme of the study was Team tranquility, which generally emphasized an atmosphere of trust, justice, and

collaboration in the operating room among anesthesia colleagues. Coworker trust and avoiding conflicts are directly related and largely indicative of the same thing, namely team tranquility. Interpersonal trust is built upon members' knowledge of each other's expectations as well as ensuring each other's professional skills and competence (29). Anesthesiologists generally rely more on nurse anesthetists who are aware of their skills, and this gives the overall peace of mind. From the participants' point of view, this is significantly effective in reducing conflicts in anesthesia teams (30). In this regard, Hancock et al. have reported negative team dynamics including poor communication, lack of trust and respect, and violence in the ICU as a factor for burnout of nurses and doctors (31). Another part of the concept of avoiding conflicts depends on the personality of the anesthesia staff. People who are inherently forgiving and patient work more easily in anesthesia teams (32). Interpersonal justice as a complement to the other two sub-themes was further emphasized by the participants as the responsibility of the nurse anesthetists in any ward. Chief nurse anesthetists can create a healthier atmosphere among their staff by observing justice while assigning tasks to the staff. This includes taking into account the number of patients, the type of surgery, and the shift plan, which will prevent many conflicts in anesthesia teams (27). Almodibeg et al. also found that incompetent managers with unfair and unsupportive behavior are considered sources of workplace stress for nurses in the operating room, which is consistent with the results of the present study (33).

Finally, the physical health of the anesthesia workplace was defined by the members as the feeling of comfort and physical security in the operating room. They considered the structure of operating rooms to be the most important cause of fatigue and burnout, and stated that the necessary criteria for the easy travel and settlement of colleagues and their communication with each other were not observed in most surgical places. This seems to be more related to the architectural design of the operating room. Davies et al. stated that the successful performance of anesthesia team members relies on optimization of the ergonomics of the operating room, and if due attention is not paid to these details, their performance will be disrupted. According to their results, temperature, humidity, adequate lighting, and visibility or availability of equipment needed by the anesthesia team member in the operating room are influencing factors in this regard (34). Moreover, amenities are not equally distributed in all operating rooms. Due to the nature of their job, anesthesia personnel have more free time, especially in the evening and night shifts where patient load is less, and adequate rest and relaxation can save them energy to serve possible emergency surgeries in the evening and night shifts.

Our study is worthwhile in that it dealt with a little understood phenomenon and came up with important findings. However, there are a number of limitations that should be addressed. First shortcoming of this study is self-selection bias. The greater likelihood of participation of interviewees with good speaking skills may have affected our results. Given the large number of nurse anesthetists participating in this study, there is a possibility of bias in the findings. In fact, more than half of all participants were nurse anesthetists, and this may have skewed the results toward their attitudes as opposed to those of the anesthesiologists. Of course, more anesthesiologists were supposed to be recruited to alleviate this limitation, but due to their OR cases and schedules, this was not possible.

Despite these limitations, the present study is worthwhile due to the credibility of data analysis. Credibility was enhanced in this study as only one researcher who had no affiliation with the institutions or the participants conducted the interviews. Also taking field notes to capture information and verification of transcript accuracy enhanced the credibility of this study.

5. Conclusion

In the present study, interviews were conducted with all members of the anesthesia team, including anesthesiologists, nurse anesthetists, and chief nurse anesthetists, in order to explore the factors affecting workplace health from their perspective. Findings showed that the participants' emphasis is more on behavioral and managerial factors and that desirable interpersonal cooperation in creating a suitable work environment for them is more prominent. These findings can raise the awareness of chief nurse anesthetists and planners to provide more effective teamwork, modify the job description structure, and reduce staff conflicts. Further studies should include senior chief nurse anesthetists, including anesthesiologists and nurse anesthetists.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ahvaz Jundishapur University of Medical Sciences. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Incidence, knowledge, attitude and practice toward needle stick injury among nursing students in Saudi Arabia

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Background: Needle stick injuries constitute the greatest threat to nursing students during clinical practice because of accidental exposure to body fluids and infected blood. The purpose of this study was to (1) determine the prevalence of needle stick injuries and (2) measure the level of knowledge, attitude and practice among nursing students about needle stick injuries.

Methods: Three hundred participants undergraduate nursing students at a private college in Saudi Arabia were included, of whom 281 participated, for an effective response rate of 82%.

Results: The participants showed good knowledge scores with a mean score of 6.4 (SD=1.4), and results showed that students had positive attitudes (Mean=27.1, SD=4.12). Students reported a low level of needle stick practice (Mean=14.1, SD=2.0). The total prevalence of needle stick injuries in the sample was 14.1%. The majority, 65.1%, reported one incidence in the last year, while (24.4%) 15 students reported two incident of needle stick injuries. Recapping was the most prevalent (74.1%), followed by during injection (22.3%). Most students did not write a report (77.4%), and being worried and afraid were the main reasons for non-reports (91.2%). The results showed that female students and seniors scored higher level in all needle stick injuries domains (knowledge, attitude and practice) than male students and juniors. Students who had needle stick injuries more than three times last year reported a lower level of all needle stick injury domains than other groups (Mean=1.5, SD =1.1; Mean=19.5, SD =1.1; Mean=9.5, SD =1.1, respectively).

Conclusion: Although the student's showed good knowledge and positive attitudes in NSI, the students reported a low level of needle stick practice. Raising awareness among nursing students and conducting continuing education related to sharp devices and safety and how to write an incident reporting is highly recommended.

KEYWORDS

needle stick injury, nursing students, incidence, knowledge, attitude, practice

Background

Nearly all nursing students experience some adverse effects or challenges in their clinical or training placement that compromise their safety or the patient's safety (1). One primary challenge nursing students face is needle stick injuries (2). Needle Stick Injury (NSI) is a nonintentional wound or injury that results from needles connected with Intravenous (IV) and blood transfusion sets (3). Exposure to contaminated needles may expose those injured to the potential risk of pathogens such as Hepatitis B (HBV), Hepatitis C (HCV) and Human Immunodeficiency Virus (HIV), with a post-exposure transmission rate of 30%, 5–10, and 0.4%, respectively, (4).

Percutaneous exposure to body fluids and blood during sharp equipment and needle stick infection is considered the main occupational hazard for mortality and morbidity risk of pathogens in the clinical environment (5). The risk of exposure and transmission to blood-borne pathogen infections through needle sticks and sharp injuries is very high among healthcare students, specifically nursing students (6–8). The prevalence of NSI among nursing students varied in numerous studies worldwide, ranging from 11.8 to 85.0% (6, 9). In recent systematic review showed prevalence of NSI in developing countries was significantly higher than in developed countries among nurses (10). Alsabaani et al. found that the prevalence of needle stick injury among healthcare workers in Saudi Arabia was 11.57% (11). In a recent study conducted among healthcare workers in Saudi Arabia, the prevalence of needle stick injury was 22.2% (12).

Most NSI incidents occurred through drug preparation, administration, recapping, holding syringes without a suitable container, opening needle caps, suturing and blood sampling (12–15). Other causes include inadequate staff, lack of training, lack of experience with infection-control standards, and insufficient appropriate resources (16, 17).

Several psychological consequences of NSI have been noted. For example, a systematic review found that depression, fear, and anxiety were the main psychological effects of NSI among nursing students, and the study suggested that students in their clinical fields need more support and counseling services after being exposed to injury (18). Another study in a psychiatric trauma clinic reported that exposure to NSI can create mental problems (19). Thus, policymakers and teachers need to direct their attention to the mental and physical consequences of NSI.

The National Institute for Occupational Safety and Health has issued prevention guidelines for healthcare providers and students to control needle stick injuries (20). Post-exposure prophylaxis plays a significant role in preventing a person from HIV, HBV and HCV and their chronicity (21). Therefore, promptly reporting an incident is crucial for a student or healthcare personnel; failure to do that may result in catastrophic consequences (19). Using safer devices, administering Hepatitis B vaccination, pre-exposure prophylaxis and administering post-exposure prophylaxis contribute to decreasing the incidences drastically and are cost-effective (20).

Most studies conducted in Saudi Arabia included healthcare workers and ignored the nursing students. In fact, the nursing students are more vulnerable to NSIs because of their lack of clinical experience. The current study aimed to address this issue by (1) assessing the prevalence of NSI and (2) measuring the level of knowledge, attitude and practice among nursing students about NSI.

Methodology

Study design

This cross-sectional and descriptive study was conducted among undergraduate nursing students.

Sample size and study setting

The study was performed in a private college in Saudi Arabia. This college has seven branches in Saudi Arabia (Riyadh, Jeddah, Najran, Abha, Tabuk, Al Madinah Al Munawwarah and Dammam) and includes more than 440 undergraduate nursing students. G* power software was used to calculate the sample size. Based on an estimated effect size of (d) = 0.7, $\acute{a}$ = 0.05, power = 0.95, the required sample size was estimated at 254 to run a paired sample t-test. Three hundred students were asked to participate, of whom 281 participated, for a response rate of 82%. In literature reviews, as a general rule, a sample size of 200–300 is considered sufficient for this type of study (22, 23). This study specifically focuses on students from the second to the final year, which is their clinical practice time, where they are at high risk of contracting NSI through a particular procedure–for instance, applying intravenous cannula and venipunctures, among others.

Data collection tool

The researchers prepared the questionnaire based on NSI studies (6, 8). The questionnaire had four parts. The first part consisted of two parts, the first part asked for demographic data such as gender, age, year of study, previous education of NSI, the second part were related Prevalence of NSI such as number of NSI incidences last year, how the incidences occurred, writing an incident report and reasons for not reporting. Part two comprised eight knowledge questions related to general information about NSI, such as definitions of NSI, common causes, sharps containers, and knowledge about blood-borne diseases. Each question included two options (True, False). The true answer was scored 1, while the false answer was 0. The total knowledge score could range from 0 to 8, where a higher score represents a higher knowledge level. The third part comprised seven statements related to attitudes toward NSI perceptions. Responses were from 1 to 5, using a 5-point Likert-type scale ("Strongly Agree 5," to "Strongly Disagree 1"). The positive score ranged from 5 to 35, where a higher score represents a higher knowledge level. The last part contained statements about five practice-related needle stick injuries, including standard precautions and vaccination status for the protections, preventions precautions about NSI and what you should do after an incidence occurs Post-exposure prophylaxis (PEP). These statements used a 5-point Likert-type scale (always 5, often 4, sometimes 3, rarely 4, never 5), with a total score ranging from 5 to 25, where a higher score represents a higher practice level.

Three doctors of nursing and infection control reviewed the content validity and item language to evaluate whether the questionnaire items effectively captured the most information students need to prevent NSI. The review committee recommended that the questionnaires cover most NSI prevention information, the language being easy to understand and straightforward. A pilot was conducted with information from ten respondents. The questionnaires had good reliability and internal

consistency with Cronbach's alpha of 0.80, 0.71, and 0.72 in terms of knowledge, attitude and practice categories, respectively. A good degree of inter-rater inter-observer reliability was found between questionnaire items. The average interclass correlation coefficient was 0·81 with a 95% confidence interval from 0·79 to 0·86 [$F=4·5$, $p=0·01$].

Data collection

After the ethical approval was secured from the ethical review committee at the university where the study was held, with reference number (2022/77/10), the researchers recruited students through an online survey widely used for surveys worldwide. An online survey in Google forms was sent to students *via* social media such as Facebook and WhatsApp. Information, including the study's aim and link attachment, was sent along with instruments to guide the participants in filling out the survey. Agreement to participate in the study was obtained when the participants completed the online survey. Reminders were sent frequently to remind students to fill out the survey. The study was open from January until December 2022. The study was open from January until December 2022. To prevent the duplicate submission of the survey, participants could only fill out the survey once.

Statistical analysis

The data were imported from the online survey into the Statistical Package for the Social Sciences (SPSS) Version 20. Descriptive statistics percentage, frequency, mean, and standard deviation were calculated. Independent t-tests and a One-Way Analysis of Variance (ANOVA) were applied to compare the means of total knowledge with sample characteristics. A value of p of <0.05 was considered significant.

Results

A total of 281 students completed the electronic survey, which gave an overall 81.5% response rate. The mean age was 24.9 (SD = 1.3) years. Most participants were female students 65.3% ($n=176$). Of the total sample, 46.1% ($n=108$) were in their fifth year of study. Of the 281 students, ($n=68$) reported having experienced needle stick injuries. Regarding previous NSI education, 59.5% of them had previous education. The total prevalence of NSI among our sample was 14.1%. The majority of students $n=47$ (65.1%) reported one incidence in the last year, while $n=15$ (24.4%) students reported two incidences. Recapping incidents occurred the most (74.1%) which is considered as a wrong practice, followed by during injection (22.3%). Most students did not write a report (77.4%) and being worried and afraid were the main reasons for non-reports (91.2%; Table 1).

Total NSI knowledge scores for the participating students ranged from 1 to 8, with a score of 6.4 (SD = 1.4). The range of correct answers to each question ranged from 76.2 to 92.2, which was 77.0% of the highest possible score. "Safer devices and technics and gloves are needed to avoid needle stick accidents" received the highest correct answer percentage (92.2%). The lowest correct answers percentage (75%) was for the item "is the maximum capacity for a sharps container" (76.2%; Table 2).

Table 3 shows the mean for the attitude of needle stick injury among nursing students. In general, results showed that students

TABLE 1 Sample characteristics.

A. Sample characteristics	N	%
Gender		
Male	105	34.7
Female	176	65.3
Age		
18–22	128	47.8
23–27	85	27.5
28	68	21.7
Study year		
Second year	25	5.5
Third year	51	20.5
Fourth year	97	27.9
Fifth year	108	46.1
Previous education about needle stick injuries (NSI)		
Yes	175	59.5
No	106	40.5
B. Prevalence of NSI		
No. of NSI incidence last year ($N=68$)		
Once	47	65.1
Twice	15	24.4
More than two	6	10.5
How incidence occurred ($N=68$)		
During injection	13	22.3
While recapping	48	74.1
Wound suturing	4	2.2
Lumber puncture	3	1.4
NSI Incidence report ($N=68$)		
Inform clinical instructors	3	2.5
Write a report	16	20.1
Did not write a report	49	77.4
Reasons for not reporting ($N=49$)		
Did not know the standard	11	7.2
Neglected	4	1.6
Worried and afraid	34	91.2

had positive attitudes (Mean 27.1, SD = 4.12). For example, two-thirds of students had taken a hepatitis B vaccination. Likewise, 60.2% reported that they worried about NSIs, and 72.4% believed that an NSI was preventable. Only half of the students were more concerned about patient care. Most students perceived NSI as the most common event (79.8%). Finally, 60.4% of students agreed that NSI was neglected.

Students reported a low level of needle stick practices ($M=14.1$, SD = 2.0). Half of the students always recapped needles before discarding them (50.1%). Approximately one-third of the students reported wearing gloves before venipuncture/injections (35.4%). Only one-quarter of the students reported using one-handed recapping, using PPE during procedures, and rinsing with soap and water after NSI (23.6, 22.8, 20.6%), respectively (Table 4).

TABLE 2 Knowledge of needle stick injury.

	Statement	Options		%
1	Needle stick injury is defined as wounds caused by needles that accidentally puncture the skin.	T	240	89.1
		F	41	10.9
2	Recap of the syringe after performing nursing interventions is recommended to decrease the risk of needle stick injury (False*)	T	49	12.8
		F	232	87.2
3	Hepatitis B can be prevented by vaccine?	T	211	81.5
		F	70	18.5
4	Safer devices and technics and gloves are needed to avoid needle stick accidents?	T	258	92.2
		F	23	7.8
5	Hepatitis B & C, HIV, are the blood-borne pathogens that health care providers are most commonly exposed to when they experience NSI?	T	225	82.1
		F	56	17.9
6	75%, is the maximum capacity for a sharps container?	T	199	76.2
		F	82	23.8
7	Wash area with soap and water is recommended to decrease the risk of infection immediately after experiencing NSI	T	205	78.8
		F	76	21.2
8	Dispose in a sharps container practice is recommended to decrease the risk of injury?	T	222	81.8
		F	59	18.2

The total knowledge, attitude and practice scores were compared among nursing students. The results showed that female students and seniors scored higher in all NSI domains than male students and juniors. Students who reported NSI incidences more than three times in the last year had a lower level of all NSI domains than other groups ($M = 1.5$, SD $= 1.1$; $M = 19.5$, SD $= 1.1$; $M = 9.5$, SD $= 1.1$, respectively; Table 5).

Discussion

Needle stick injuries constitute the greatest threat to nursing students during clinical practice because of accidental exposure to body fluids and infected blood affect the patient safety (24–26). The current study demonstrated significant results related to nursing students in terms of knowledge, attitudes, and practices related to needlestick injuries. Notably, the students had adequate knowledge of NSI. This result aligns with a study conducted in Northern Cyprus, where participants showed inadequate knowledge (27) and contrasted with international studies that showed the students had inadequate knowledge (8, 28, 29). Such a high score indicates that nursing students in the current study had sufficient knowledge regarding NSI, confirming that the nursing school offered special courses such as infection control to students before starting clinical practice (30). More than half of the nursing students were senior students and had previous education about NSI, meaning they have high exposure to the causes and risk factors of needle stick injuries.

Participants' attitudes toward NSI were positive and dissimilar to a previous study (31) but similar to a national study that showed positive attitudes toward NSI among healthcare providers (21). Students' positive attitudes confirm that nursing schools are the proper place to raise students' awareness and behavior in terms of NSI attitudes before transmission in clinical practice and enhance their decision-making skills (32).

Regarding post-exposure treatment for NSI and methods of prevention practice, the mean was low. For example, less than half of the participants reported consistently engaging in post-exposure

treatment for NSI, and this finding is consistent with previous studies (8, 28). Inadequate post-exposure treatment for NSI practice has been considered the most significant risk of NSI, leading to unsafe practice during clinical practice (33, 34). However, preventive and post-exposure measures topics should be taught and mandatory in all nursing schools' curriculums before starting clinical practice (35).

The total prevalence of NSI among our sample was 14.1%. These percentages are lower than different studies, such as Germany (21.4%) (36) and Taiwan (18.2%) (37). A recent systematic review and meta-analysis showed that the prevalence of NSI among nursing students in Asia countries was higher than in Europe (39.7%) (38). Failure to recap the needles was reported as a common cause of NSIs, similar to several studies (6, 8). Finally, many students did not fill out an incident report because they were worried and feared being blamed. Under-reporting NSI is a major clinical challenge that may have undermined the validity of existing data regarding this issue (38, 39).

In the current study, the results showed no significant differences in NSI domain scores between the participants regarding genders, although females demonstrated higher scores on all domains than male students. These results were similar to study nursing students in Turkey, where students showed a different level of NSI knowledge (40). Conversely, Jordanian nursing students did not show significant differences in knowledge of NSI (8). The varied level of knowledge among the students may be related to infection control courses and contents in the different nursing schools.

Our study shows that senior nursing students had better scores than junior students, similar to (8). These results can be because senior nursing students had more experience in infection control practices and had taken more courses. This result emphasized that infection control courses would be better given a preparatory year to ensure that students had adequate knowledge before shifting to clinical practice.

In this study, nursing students with more than three incidences in the last year of NSI showed lower overall NSI knowledge domains than other groups. This result may be explained because students were inexperienced or stressed while carrying out invasive procedures. Underdeveloped skills and lack of clinical experience may be associated

TABLE 3 Attitude of needle stick injury.

	Attitude items	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
		N	%	N	%	N	%	N	%	N	%
1	Hepatitis B vaccination have taken	175	70.3	50	15.1	20	5.7	15	3.2	21	5.7
2	Worried about NSI	45	14.5	158	60.2	36	11.7	23	7.5	19	6.1
3	NSI is preventable	181	72.4	55	13.8	10	1.6	20	6.4	15	5.8
4	More concerned on patient care	87	25.5	140	50.1	15	8.8	22	9.4	17	6.2
5	NSI is most common event	201	79.8	54	10.3	10	3.8	10	3.8	6	2.3
6	Report NSI immediately	205	80.2	66	16.8	10	3.0	0	0	0	0
7	NSI is neglected	88	28.6	159	60.4	15	4.1	10	3.8	9	3.1

TABLE 4 Practice of needle stick injury.

	Statement	Always		Often		Sometimes		Rarely		Never	
		N	%	N	%	N	%	N	%	N	%
1	Recap needles before discarding	150	49.1	65	25.7	44	16.5	15	6.7	7	2.0
2	Wear gloves before venipuncture/ injections	100	35.4	135	46.5	20	7.4	10	4.6	16	6.1
3	One hand method of recapping done	67	23.6	48	17.4	64	23.1	17	5.7	85	30.2
4	Use PPE during procedures	61	22.8	45	18.4	33	10.4	54	19.8	88	28.6
5	Rinse with soap and water after NSI	55	20.6	28	7.3	35	11.6	52	20.4	111	40.1

with an increased risk of NSIs among health professional students (41–43). However, the risk of NSIs is linked with clinical skill and may also be associated with the frequency of procedures and inherent hazards and influences individual health management (44, 45).

This study had limitations. Using online surveys in data collection could lead to inaccurate results and recall bias. Because the study was conducted in one private university and one nursing faculty with different branch, this may reduce the generalizability of our findings. Nonetheless, this study helps fill a knowledge gap because there are few studies in nursing education in Saudi Arabia about injuries and safety issues. Future studies, including students in healthcare professions, are highly recommended.

Conclusion

Although the student's showed good knowledge and positive attitudes in NSI, the students reported a low level of needle stick practice. The exposure of nursing students to needle stick injury and its non-reporting remains a persistent challenge. Raising awareness among nursing students and conducting continuing education related to sharps devices and safety is highly recommended. Policymakers should implement several initiatives to reduce NSI incidences, such as safe injection practices, safety precautions, reporting systems, and the use of post-exposure prophylaxis.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

TABLE 5 Comparisons of needles stick injuries mean score and selected demographics.

	Knowledge M (SD)	t	P	Attitude M (SD)	t	P	Practices M (SD)	t	P ***
Gender *									
Male	4.1 ± 1.1	5.20	0.94	20.3 ± 2.1	4.22	0.81	10.3 ± 1.4	3.20	0.84
Female	5.2 ± 1.3			21.6 ± 2.8			11.6 ± 2.8		
Previous education about NSI *									
Yes	5.7 ± 2.3	1.87	0.01	22.3 ± 2.2	1.8	0.03	11.8 ± 2.4	2.6	0.03
No	2.8 ± 1.5			19.2 ± 1.8			10.5 ± 1.1		
Year of Study **									
Second year	2.2 ± 1.4	1.20	0.01	22.8 ± 1.5	2.30	0.02	10.9 ± 1.8	1.96	0.02
Third year	3.1 ± 2.1			20.5 ± 1.7			11.8 ± 2.2		
Fourth year	3.6 ± 1.5			25.5 ± 1.4			12.2 ± 1.2		
Fifth year	4.7 ± 1.1			26.3 ± 1.2			14.5 ± 1.8		
No. of NSI Incidence last year**									
Once	3.8 ± 1.9	1.5	0.13	21.3 ± 1.9	2.9	0.22	10.3 ± 1.7	1.8	0.18
Twice	2.1 ± 1.7			19.8 ± 1.3			9.8 ± 1.2		
More than Three	1.5 ± 1.1			19.5 ± 1.1			9.5 ± 1.1		
How incidence occurred **									
During Injection	2.5 ± 1.9	1.66	0.15	22.1 ± 2.6	1.87	0.11	12.1 ± 1.3	3.0	0.03
While Recapping	3.1 ± 2.1			19.2 ± 1.3			9.7 ± 1.2		
Wound Suturing	2.3 ± 1.9			21.5 ± 1.9			10.5 ± 1.7		
Lumber Puncture	1.6 ± 1.1			20.4 ± 1.7			10.9 ± 1.8		

*Independent t-tests; **ANOVA; ***Significant at $p \leq 0.05$.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Issues and complexities in safety culture assessment in healthcare

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The concept of safety culture in healthcare—a culture that enables staff and patients to be free from harm—is characterized by complexity, multifacetedness, and indefinability. Over the years, disparate and unclear definitions have resulted in a proliferation of measurement tools, with lack of consensus on how safety culture can be best measured and improved. A growing challenge is also achieving sufficient response rates, due to "survey fatigue," with the need for survey optimisation never being more acute. In this paper, we discuss key challenges and complexities in safety culture assessment relating to definition, tools, dimensionality and response rates. The aim is to prompt critical reflection on these issues and point to possible solutions and areas for future research.

KEYWORDS

safety culture, safety climate, patient safety, survey, healthcare benchmarking

1. Background

Each year, millions of patients worldwide suffer injuries, disabilities, and even death due to unsafe medical practices (1–3). A recent retrospective cohort study from 11 US hospitals identified at least one adverse event in 24% of hospital admissions (1–3). This has led to the increasing recognition of the concept of safety culture, as it is argued to form the foundation for the safe delivery of high-quality healthcare (4).

The term "safety culture" was first conceptualized by the International Nuclear Safety Advisory Group as a response to the defective processes that contributed to the 1986 Chernobyl nuclear power plant disaster (5). Since then, the concept has been embraced by several high reliability, safety critical industries, such as aviation and nuclear power, and is considered a pivotal factor for the safety performance of organizations. More recently, the focus on building a culture of safety moved to the healthcare industry (6), where the promotion of a culture of safety has become one of the pillars of the patient safety movement (2). With growing recognition of the importance of safety culture in healthcare, the need for robust assessment measures became evident (7), and in turn, initiatives to improve and assess safety culture proliferated (8, 9). In part, growth in this area has developed in parallel with increasing external pressure from accreditation, regulation, and other safety agencies for healthcare organizations to undertake regular safety culture assessments (10).

Safety culture assessment is used in healthcare for several key reasons, chief of which are: (1) to diagnose safety culture to identify areas for improvement and raise awareness about patient safety; (2) to evaluate patient safety interventions and track change over time; (3) to conduct internal and external benchmarking; and (4) to fulfill directives or regulatory

requirements (2). Notably, improving safety culture has become a significant priority for the Organization for Economic Co-operation and Development (OECD), especially as healthcare systems have faced additional safety concerns due to the implications of the COVID-19 pandemic (11). In 2020, the OECD compared the safety culture results of 16 countries, in an attempt to harmonize approaches, standardize methodologies, improve comparability of safety culture data over time, and to contribute to international benchmarking efforts (11). This work has revealed the heterogeneous nature of how healthcare staff perceive patient safety in their work environments, and has afforded opportunities to best practices regarding efforts to improve safety culture (11). Despite such efforts, several challenges persist in the measurement and intervention of safety culture that must be considered, including variability in definitions, tools, dimensionality, and response rates. In this paper, we have drawn on recent literature and experiences in patient safety culture assessment to critically appraise each of these issues and then suggest possible solutions and areas for future research.

2. Challenges

2.1. Definitional issues

Safety culture is arguably a poorly articulated concept, whereby many different definitions are apparent both within, and outside of, the healthcare domain (12). For example, there have been over 51 distinct definitions proposed, leading some researchers to refer to the concept as having, "the definitional precision of a cloud" (13, 14). This lack of cohesion has led to the development of various frameworks, each built upon varying definitions in how to conceptualize and extract meaning from the concept (14, 15).

Compounding the issue of definitional equivocality, many researchers also mark a distinction between safety *climate* and safety *culture*. While safety culture is argued to denote more longstanding, engrained behaviors, practices, beliefs and values within an organization, safety climate is proposed to embody people's *perceptions* of their organization (its procedures, practices, and the kind of behaviors that are tolerated or rewarded) at a given time (16–18). Following this, some argue that it is easier to measure safety climate than culture; if climate is considered a more temporal state of safety at a discrete point in time, it is thus more measurable. However, many others use the terms safety culture and safety climate interchangeably within the research literature (14, 19, 20). For the purposes of this paper, we use the term safety culture to include both culture and climate.

The most commonly used definition of safety culture was proposed by the Health Safety Commission (1993): "The product of individual and group values, attitudes, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety programmes" (p. 339) (12). However, some suggest that the broadness of such a definition weakens its scientific utility, indicating that much greater precision is required (21). So here lies another challenge; although the Health Safety Commission's definition may provide some guidance on which constructs to examine when assessing safety

culture, the specific values, attitudes, competencies and behaviors and how to measure them is still not clear (15). Consequently, this has led to the development of many different tools, and in particular surveys, with each attempting to measure the complexities of safety culture (4, 12, 22). Indeed, surveys are particularly attractive as they are practical and time-efficient tools for gathering large amounts of data in a reliable and reproducible manner; thus supporting comparison and international benchmarking efforts. The anonymity usually involved in this form of data collection also makes them appealing for quality improvement, as they facilitate the contributions of staff who may be uncomfortable expressing their views openly (14, 15).

2.2. Variability in tools

Growing interest in safety culture has been accompanied by a proliferation of tools, each deriving from differing conceptualizations of safety culture (23). At least 220 different safety culture or safety climate surveys have been identified across industry sectors (24). The multitude of surveys has led to numerous systematic reviews of the available tools both within and outside of healthcare. Within healthcare, there is wide variability in the number of dimensions (ranging from one to 12) and items (ranging from 10 to 74 items) that the tools contain, and their validity, and adaptability for use in multiple settings (8), with no one tool emerging as the gold standard (12). The most widely employed surveys employed in safety culture research, and arguably the most validated, as identified in a recent safety culture review, are the Hospital Survey on Patient Safety Culture (HSOPS) (25), the Safety Attitudes Questionnaire (SAQ) (26), the Patient Safety Culture in Healthcare Organizations Survey (PSCHO) (9), and the Safety Climate Scale (27). However, again each of these questionnaires assesses a different number and combination of dimensions (ranging from one to 12), vary in length (ranging from 13 to 48 items), and have been designed for particular settings or contexts (28).

Scoring of commonly employed surveys, such as the HSOPS (25), presents further challenges as results can vary depending upon the strategy and computational method selected. While the Agency for Healthcare Research and Quality (AHRQ) recommends for HSOPS that the percentage of positive responses be computed to interpret the 12-dimensional scores, two alternative aggregation methods have been identified in the literature, leading to potential bias when comparing results between studies, hospitals and countries (29). Notably, Giai et al. (29) identified the heterogeneity of results obtained by the three scoring approaches used to assess safety culture in a French university hospital, showing that dimensional score values, as well as their corresponding rankings, varied considerably across the different scoring methods. For example, for the HSOPS dimension "teamwork within hospital units" the score for the worst performing department based on percent positive scores, increased by more than 10% using averaged individual sums (29). This study highlights that healthcare decision makers must consider comparing HSOPS results within and between organizations with great caution, and that agreement must first be reached on a consistent scoring approach.

Additionally, different versions exist for numerous safety culture surveys, including short and long versions (e.g., SAQ 36-item short form and SAQ 60-item full-form), and versions for specific contexts (e.g., HSOPS for hospitals, medical offices, ambulatory surgery centers, nursing homes, and community pharmacies). Further, both the HSOPS and SAQ have undergone major revisions in recent years. The HSOPS 2.0 was released in 2019 and involved deleting, rewording and adding multiple items (25). Furthermore, in 2019, the SAQ was superseded by the Integrated SCORE (Safety, Communication, Operational Reliability & Engagement Survey) (30), which removed one of the original dimensions and added a number of others with a greater focus on staff wellbeing, an issue to be discussed further in this paper. Brian Sexton, co-developer of the SAQ, stated that the older surveys needed to be updated as "they were not intended for use in today's healthcare environment" and had "limited evidence of reliability and validity" (31). However, the Integrated SCORE, also co-developed by Sexton, is no longer freely available, so it is unclear the extent to which this survey will be taken up by hospitals and researchers. On the other hand, transition to the HSOPS 2.0 appears to have been more positive, with countries including Australia developing their own context-specific version (the A-HSOPS 2.0) and a toolkit developed to support its implementation (32). This raises the question though of how comparable the results are between different survey versions, particularly when it comes to international benchmarking.

Further, while the use of questionnaires is practical for simply capturing data from a larger group of participants or staff, one major issue is that the exclusive reliance on quantitative data fails to capture and expose rich insights into the dimensions of culture (33). For example, questionnaires tend to only capture superficial artifacts and beliefs, rather than the underlying shared assumptions which are argued to comprise the culture of an organization (34). Consequently, some researchers argue that a more valid approach to assessing safety culture is to incorporate qualitative methods in addition to questionnaires to enable greater exploration of the identified dimensions (8, 15). However, these approaches typically require more researcher involvement and resources, such as participating in fieldwork, directing narrative interviews, or conducting observational research (12). Some questionnaires, including the HSOPS 2.0 and SCORE, recognize the need for mixed-method assessment, and also recommend the inclusion of qualitative, open ended questions at the end of the survey.

2.3. Inconsistency in dimensionality

Safety culture is multi-faceted, and the tools which are employed to measure the concept are typically based upon the assessment of several inter-related attributes or dimensions (16, 35). However, much like the ambiguities that manifest in the definition of safety culture (36), researchers are yet to reach a consensus on the underlying dimensions that comprise safety culture (12), thereby highlighting yet another challenge faced in the field. For example, while some narrowly define safety culture as focusing on the key dimensions of unit and organizational leadership's prioritization

of safety (37); others more broadly conceptualize safety culture to include sub-dimensions such as learning, reporting, and blame orientation (21, 38, 39). Sometimes, more distant dimensions are also included, such as job satisfaction (26) and staffing (2). Furthermore, dimensions comprising safety culture are usually considered highly context dependant (40), varying by industry and even organization (41).

In an attempt to identify the fundamental dimensions of safety culture in healthcare, Flin et al. (16) reviewed 12 quantitative studies in healthcare of safety culture to identify its fundamental dimensions. The 73 safety culture dimensions identified across these 12 studies were re-categorized by the researchers into 10 distinct themes: management/supervision; safety systems; risk perception; job demands; reporting/speaking up; safety attitudes/behaviors; communication/feedback; teamwork; personal resources (such as stress); and organizational factors. In this study, management commitment to safety emerged as the most frequently measured safety culture dimension. More recently, Halligan and Zecevic (12) reviewed 113 articles which explored the dimensions of safety culture in healthcare. In this study, they found that the six most frequently cited dimensions were: leadership commitment to safety, open communication founded on trust; organizational learning; a non-punitive approach to adverse event reporting and analysis; teamwork; and a shared belief in the importance of safety. Organizational learning was identified as an important theme that was not specifically identified as a separate dimension in the Flin et al. review (16). However, for both reviews there was a lack of detail on how dimensions were identified, and in turn how they mapped to the safety culture tools they reviewed.

In a more recent systematic review assessing the dimensions of safety culture, Churruca et al. (15) assessed 694 studies (including quantitative, qualitative and mixed-methods studies) to identify the most commonly utilized approaches to assessing safety culture in healthcare, and the dimensions of safety culture captured through these processes. A comprehensive thematic analysis identified 11 dimensional themes present across studies, including: leadership; perceptions of safety; teamwork and collaboration; safety systems; prioritization of safety; resources and constraints; reporting and just culture; openness; learning and improvement; awareness of human limits; and wellbeing (15). Table 1 provides a summary of the 11 themes and the number of studies identified incorporating each theme. As shown in this table, the most commonly assessed dimensional themes present in over half of the current approaches to assessing safety culture include: leadership; perceptions of safety; teamwork and collaboration; safety systems; prioritization of safety; and resources and constraints (15).

As shown in Table 1, staff wellbeing has been the least frequently assessed dimensional theme, present in less than a quarter of available tools (15, 42). While safety culture improvement efforts have traditionally been concentrated on interdisciplinary teamwork and patient safety education, recent research has identified that addressing staff wellbeing factors, especially health care worker burnout, may also play an important role (43–46). Burnout refers to the ongoing and unmitigated stress response that results in symptoms of depersonalization, emotional exhaustion, and a decreased sense of personal accomplishment (47). Burnout is one of the most prevalent staff wellbeing problems

TABLE 1 Safety culture dimensional themes.

Theme	Definition	No. studies/surveys used in (%)
Leadership	Leadership, their support, and commitment to safety.	85 (77.3)
Perceptions of safety	Perceptions of how safe the organization is.	65 (59.1)
Teamwork and collaboration	Working together as a team and coordination of care among staff.	61 (55.5)
Safety Systems	Systems, procedures and processes exist that facilitate patient safety (eg, rewards, reporting systems).	58 (52.7)
Prioritization of safety	Shared belief, behaviors and norms in which staff in the work area prioritize and value safety.	59 (53.6)
Resources and constraints	Resources for safety including staffing, equipment, lack of time and training.	58 (52.7)
Reporting and just culture	Willingness to report and a culture that does not assign blame.	54 (49.1)
Openness	Open communication, staff feeling comfortable to express their issues or concerns and question behaviors.	54 (49.1)
Learning and improvement	A focus on learning from mistakes, responding to, and improving systems.	51 (46.4)
Awareness of human limits	Awareness of individual ability to be safe and how that can be limited by various factors (e.g., fatigue).	24 (21.8)
Wellbeing	Job satisfaction, burnout and other psychosocial factors.	17 (15.5)

% calculated on n = 110; results adapted from Churruca et al. (15).

that healthcare professionals currently face, given the challenges imposed by the nature of clinical work, time constraints, lack of control over work processes, and the higher work demands elicited from the COVID-19 pandemic (45, 48). Recognizing that >30% of frontline healthcare staff are experiencing burnout, Sexton et al. added a greater focus on staff wellbeing to the Integrated SCORE (31). However, further work is needed to understand whether staff wellbeing should be studied as a dimension or outcome of an organization's safety culture.

2.4. Response rates

Another challenge when using questionnaires to assess safety culture is the need to obtain sufficient response rates. Low response rates are particularly problematic as they can increase bias, where non-responders may be systematically different from responders (49). An overall response rate above 60% is often believed to be needed in order to establish sufficient reliability and validity of the data captured (50). Some researchers argue that anything less is considered more of an assessment of "*opinion*" rather than "*culture*" (51).

Low response rates are increasingly being reported due to duplicative survey efforts, creating survey fatigue, and isolated datasets that do not produce a consistent snapshot of safety culture (50, 52, 53). Since the COVID-19 pandemic, additional time constraints, lack of resources and survey fatigue are being reported, and thus the need for survey integration has never being more acute (31).

3. Conclusions and recommendations

Although safety culture surveys offer practical and time-efficient tools appealing to quality improvement and international benchmarking efforts, there remains no "gold standard" for measuring safety culture, with no one survey comprehensively

evaluating all the important aspects of safety culture (8). Furthermore, variations in survey versions and scoring methods limits the capacity for comparison across studies and counties, which is a factor that makes surveys appealing in the first instance.

In response to the issues we have highlighted, we first recommend using well validated surveys of safety culture followed up by qualitative methods, such as interviews or focus groups, to enrich the exploration of complex issues related to safety culture, identify priority dimensions, and provide insight into areas for improvement (14, 15). We also recommend that staff wellbeing should be regularly assessed alongside measures of safety culture and patient safety outcomes to further advance our understanding of how safety is enacted in pressured healthcare environments. The issue of survey fatigue in many hospitals, also points to the broader need to reduce duplicative survey efforts and for a more streamlined and consistent survey approach (31). Moving to an agreed gold standard survey approach across healthcare settings would certainly make benchmarking more reliable. Research has also pointed to some strategies that are available to assist in increasing response rates, such as distributing the questionnaire in person during training sessions or staff meetings, or by allocating a local champion who can motivate non-responders to consider participating (50).

While measuring patient safety culture is a key component of many OECD countries' national patient safety strategies and the topic of a large body of research (11), the next steps for improving safety culture, health system performance and outcomes for staff and patients based on its measurement are less clear. Measuring safety culture should be considered as a starting point from which improvement actions and patient safety changes emerge (2). Systematized data feedback for all who contribute to measurement is recommended, combined with problem solving, action planning and monitoring (2). Team training and team communication skills, executive walk arounds, and intervention strategies combining adaptive interventions (such as continuous learning) with technical interventions (such as clinical care algorithms) have been shown to improve patient safety and quality

(54–58). Organizational strategies with bottom-up organizational and employee learning from behavioral outcomes, conducive enabling factors, and consistency over time and effective leadership are also key elements (3, 22). One promising bottom-up strategy shown to improve patient safety is safety huddles. Although huddles were originally designed to learn from errors and adverse events (known as "Safety-I"), huddles are also now being used to support learning for improvement based on situations where work goes well (Safety-II) (59), by including reflection time to allow staff to talk about and learn from things that went well. Based on the latest evidence, such safety-II-inspired huddles could also be considered to lead to improvements in safety culture (60).

Investigating issues and complexities to safety culture assessment in healthcare is a relatively young research field which needs to develop in line with the rapid changes in different healthcare systems. There are varying challenges from high to low-income countries and contexts ranging from primary care, nursing homes, homecare and specialized hospital services. We argue that a continuous critical reflection is needed in this field to keep assessment methods, instruments and approaches relevant and targeted. Keeping instruments and implementation guidance on open access and available is recommended to increase use and enable practice improvement worldwide. That is crucial of we are to encourage widespread application in poorly-resourced settings. This is also a way to support UN goal three: of sustainable development promoting good health and wellbeing for all at all ages.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

LE had the idea and developed the first draft of the article with EF, which was further developed in close collaboration with PH and SW. All authors contributed to the revision and have approved the final version of the article.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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A success story of clinical debriefings: lessons learned to promote impact and sustainability

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The COVID-19 crisis impacted emergency departments (ED) unexpectedly and exposed teams to major issues within a constantly changing environment. We implemented post-shift clinical debriefings (CDs) from the beginning of the crisis to cope with adaptability needs. As the crisis diminished, clinicians voiced a desire to maintain the post-shift CD program, but it had to be reshaped to succeed over the long term. A strategic committee, which included physician and nurse leadership and engaged front-line staff, designed and oversaw the implementation of CD. The CD structure was brief and followed a debriefing with a good judgment format. The aim of our program was to discover and integrate an organizational learning strategy to promote patient safety, clinicians' wellbeing, and engagement with the post-shift CD as the centerpiece. In this article, we describe how post-shift CD process was performed, lessons learned from its integration into our ED strategy to ensure value and sustainability and suggestions for adapting this process at other institutions. This novel application of debriefing was well received by staff and resulted in discovering multiple areas for improvement ranging from staff interpersonal interactions and team building to hospital wider quality improvement initiatives such as patient throughput.

KEYWORDS
debriefing, organizational learning, teamwork, quality improvement, clinician wellbeing

1. Introduction

"*Errare humanum est, perseverare diabolicum* ['To err is human, (but) to persist is diabolical']". Debriefings emerged from this philosophy of understanding and learning from one's mistakes (1). Developed in the military field during World War II, debriefings have been adopted by several disciplines over the decades (e.g., aviation, psychology, education, and medicine) (2). Debriefings are structured interprofessional meetings, guided by trained facilitators, who aim to promote team reflexivity, learning, and empowerment. These meetings may be characterized by specific semantic elements, such as "after-action review" or "huddle" (3–5). Since their emergence in healthcare, debriefings have mainly been used in simulation-based learning laboratories as initial or continuous training for nurses and physicians. The aim of team training and learning from real critical and complex cases led to a shift from simulation to clinical debriefings (CDs).

Due to the frequent exposure to complex and critical situations, CDs have primarily been introduced and practiced in emergency departments (EDs). Indeed, there is extensive evidence of the benefits of these debriefings in the ED: improvement of knowledge and clinical performance (6–9), communication, team dynamics, and efficiency (9–12), thus

impacting patient outcomes (2, 6, 7, 13, 14). These positive impacts, both on patients and the healthcare team, have led to the development of international recommendations advocating for the use of debriefings in the emergency context. As a result, CDs have garnered increased popularity, eliciting enthusiastic support from ED leaders for their implementation (14). However, research in the field indicates that CDs were mainly conducted after critical events and often sporadically or within limited research periods. Additionally, it has been found that these debriefings may have negative effects (3). Therefore, CD implementation remained highly variable for decades (15). The COVID-19 crisis has been a stepping stone to developing new perspectives and potential uses of CD within the ED. The uncertain and constantly changing environment induced by the crisis, considerably challenged, not only EDs but also healthcare institutions, clinical teams, and patient safety. In these difficult and challenging circumstances, CDs emerged as a solution to address many of the patient safety and team adaptation challenges (16, 17).

During this period, studies have investigated the most effective method for conducting CD in the ED and advocated for post-shift debriefings using debriefing with good judgment "plus/delta" method (3, 18–20). The importance of learning not only from failure but also from success, with leadership's wholehearted and visible commitment to act on things that are going well (pluses) and things that need improvement (deltas), appears essential (21). Beyond the question of the art of performing CD, their integration into a global strategy has also been questioned (5). Indeed, by expanding beyond the analysis of specific critical incidents and embracing a broader systemic evaluation of work conducted during the shift, debriefings appeared to hold promise to be a keystone for promoting a learning organization culture and triggering quality and safety improvement (5, 22, 23).

As the worst of the crisis passed, subsequent research seems to have reoriented toward investigating CDs after specific critical events or pedagogical aspects once more. However, questions remain on how to adapt the modalities of these CDs to guarantee their quality and relevance. In that view, moving to "debriefings as a management tool" and making them sustainable required in-depth reflective work. Hence, this article describes the creation of a post-shift-based CD, lessons learned from its implementation, and offers suggestions for adapting this process at other institutions.

2. Context: motivations for creating the CD process

The COVID-19 crisis suddenly exposed most EDs to major issues within a fluctuating environment. To cope with adaptability needs, we implemented post-shift clinical debriefings (CDs) at the onset of the crisis. Such CDs proved to be highly efficient and appreciated by the teams. As soon as the clinical situation returned to nearly normal, ED clinicians encouraged ED leadership to rethink ED management in light of lessons learned during the crisis and more particularly the potential use of regular post-shift CDs.

The objective was to develop and integrate an organizational learning strategy within our ED (24):

- to promote quality of care and patient safety

- to promote wellbeing at work by providing space for clinicians to process and reflect
- to empower clinicians and get them engaged.

CDs were implemented in two EDs of a single Belgian University teaching hospital with two geographically separated facilities, namely, Main and Satellite. The Main facility is a tertiary care hospital located in a suburban area, while the Satellite is an urban secondary hospital. The ED from the Main facility was raised under the cultural umbrella of a Public University Teaching Hospital while the second ED history started as part of a private clinic that was merged with the Main Hospital. The two sites combine an annual ED census of ∼100,000 patients, with the Main handling ∼57% and the Satellite handling 43%. The department employs ∼50 physicians and 120 nurses.

3. Key programmatic elements: how the CD process was designed and operationalized

During the pandemic, the ED developed a specific process following previously published recommendations for creating a CD program in the ED (13, 20). Upon entering "normal" ED operations, we quickly learned that pandemic-related CDs needed to be revised in a more convenient format and thoroughly integrated into ongoing ED management. Thus, the reshaped program has metamorphosed into an effective, well-received management system that is still in use today.

3.1. Creating a powerful leadership structure

The chief physician triggered the creation of a specific committee named the Strategic Committee (SC) to support new work strategies. The SC was specifically developed as part of the new initiative and to support new work strategies of the service. The SC was comprised of respected individuals and designated due to their genuine curiosity, influence, and leadership capabilities. In addition, the ED chief physician and the two head nurses were part of the SC. Other ED leaders committed to ensuring follow-up to CD and providing guidance for data management. When the COVID-19 crisis broke out, the chief physician and head nurses naturally joined forces to establish a common strategy and to speak with one voice. At that time, this seemed crucial to avoid conflicting information and decisions. A few physicians emerged as leaders and volunteered to help the SC by monitoring the situation in the field, guiding and implementing decisions, and coaching teams. As soon as the clinical situation returned to nearly normal, ED clinicians encouraged ED leadership to keep the CD program.

Specifically, the SC includes the following:

- The chief physician of the Main and Satellite ED
- The two head nurses from each hospital
- The two assistant head nurses from each hospital

- Five influential physicians, who emerged as powerful resources, were seen as role models by their peers and committed to developing the unit coordination and strategy
- The quality and safety manager.

3.2. Identifying a debriefing facilitator, coordinator, and management's role

The quality and safety manager (QSM) position was initiated at the beginning of the pandemic when a call for CD application was launched. The hired QSM, a nurse from another specialty, first spent time becoming familiar with ED processes and teamwork habits and took primary responsibility for the initiative. The QSM had previous experience as a safety manager, was rigorously trained to lead high-quality CDs, and had experience leading simulation debriefings. The QSM works for the ED, with a more transversal role, in connection with the hospital safety department.

3.3. Developing the debriefing strategy

Two studies that were carried out during the first wave of COVID-19 laid the groundwork for the process development. The first research described the development and the feasibility of implementing CD during the crisis (20). The second study proposed a framework to categorize the CD content and assess its worthiness (5). Based on these results, it took ~6 months of a quality improvement process to achieve a fully satisfactory integrated CD strategy as detailed below. The objective of these 6 months of continuous improvement was to transition from a crisis context and adapt the debriefing process to a more routine setting. Using Deming's Plan-Do-Check-Act (PDCA) design, different elements were progressively modified to better address the needs of the team and its leaders (e.g., the frequency of debriefings per week, the timing of debriefing sessions, the tools for sharing debriefing outcomes, and the methodology for providing feedback to teams). These modifications were primarily derived from input gathered from teams at the end of debriefing sessions through the QSM, anonymous suggestion boxes for soliciting ideas, and brainstorming sessions conducted within the SC. Moreover, the QSM received guidance and oversight from an internationally recognized expert in ED organization, organizational learning, team management, and change management. It is noteworthy that this principle of continuous improvement is still actively pursued 3 years after the implementation of the process.

3.3.1. Performing the debriefings

Debriefing sessions were performed face-to-face with clinicians (physicians and nurses) twice a week at the end of the shift. Originally, all debriefings were performed by the QSM. During the early months, other nurses and physicians were trained as clinical debriefers. On debriefing days, the debriefer joined the department about an hour in advance to conduct peer check-ins to assess the mood of the team and to promote the post-shift CDs. Those peer check-ins are based on the circle-up framework (16) and include

an invitation to talk, use of empathy, exploration, and listening to understand through short prompts (e.g., "How are you feeling right now?" and "How can I support you?") (16). The debriefer also observed the handover to the next shift to better understand the details of the workflow and clinical status of the unit. Debriefings were held in a private room adjoining the unit to promote access and privacy.

Debriefing began with a quick status check of the team, e.g., "How are you feeling today?" Then, a plus/delta investigation was conducted using short, simple prompts (e.g., "What did you enjoy?" "What challenged you?" "What worked well?" and "What can be improved for next time?"). Participant contributions needed to be as specific as possible. The various pluses/deltas were written down by the debriefer. Then a single delta or plus was chosen to be explored. The CD technique was based on debriefing with good judgment (25). Debriefers captured participants' thoughts on the event using a Frames –> Actions –> Results approach (26). The aim was to better understand the clinical and team thoughts and motivations behind the topic and to explore possible solutions by encouraging team reflexivity. The selected plus or delta was mostly focused on teamwork concepts, e.g., communication, leadership, workload management, and decision-making. Organizational issues or long-term concerns, e.g., institutional bed management, stretcher delays, and faulty equipment, were systematically cataloged (5) and transferred to management for follow-up and typically were not explored during the CD. The exploration of successes turned out to be surprisingly informative and energizing for the teams. The topics that participants appeared most enthusiastic were about personal interactions among team members, starting with concrete examples of interpersonal encounters and then revealing the participant's mental frames and motivations behind their behaviors. Empirically, we noticed that the CD mean duration was ~7 min.

3.3.2. Debriefings analysis and decision-making

Once the CD was over, a brief report was written and included: the date, location, number of participants, CD duration, plus/delta points, and specific suggestions for improvement. Participant anonymity was faithfully maintained in the report. The QSM collected the reports and entered them into the CD database. An updated database categorized all the pluses/deltas raised during CD according to the "Debriefing and Organizational Lessons Learned (DOLL)" (5). The DOLL is a debriefing classification framework that allows the CD to be tracked and systematically integrated with the unit strategy. Issues reported during the debriefings were systematically brought to the attention of the SC, which communicated and executed action plans in coordination with all ED clinicians.

We identified four ways to deal with debriefing content: "(1) project management using a lifecycle four phases methodology (27); (2) continuous improvement using the Plan-Do-Act-Check process (28); (3) immediate intervention; and (4) escalation to higher levels of management. Table 1 and Figure 1 detail these interventions and action plans (Figure 2; Table 1 give examples of CD content and subsequent actions).

TABLE 1 Examples of clinical debriefing content and subsequent actions.

Element reported during clinical debriefing	Type of subsequent actions	What was done
"There are disparities between nurses and physicians continuing education and nurses feel that is unfair"	Project management	- First was to define and establish of teams' continuing education strategy in the ED - Ongoing
"In general, people are more aggressive in the ED and outside (patients, families, colleagues etc). This is exhausting."	Continuous improvement	- Multidisciplinary team training focused on conflict management with the collaboration of the psychology department - Charter to promote zero tolerance policy to violence against ED staff - Structural safety initiated, e.g., access control system, camera surveillance, security guards.
"Difficulty in knowing patient's allocation among physicians. Also, some residents have argued the fact they usually get cases nobody wanted"	Continuous improvement	- Started system of random allocation of patients. - The system was assessed and refined through the debriefings following its implementation.
"One nurse was absent, and some physicians didn't know it. Physicians insist on sharing this information during the morning briefing."	Immediate intervention	- Awareness raised in the weekly newsletter by praising solidarity. - Asking nurses and physicians to systematically ask if some team members are absent.
"Trouble with device batteries. The unit has acquired more and more devices requiring sockets but there are few in the ED."	Immediate intervention	- Technical department was contacted to add sockets
"Issue related to continuity of care during lunch time. Almost all nurses went together to eat leaving one zone of the unit empty."	Immediate intervention	- Reminder of lunchtime rules in the weekly newsletter
"Teams are tired of long-term boarding in the ED. Teams explained that the hospital hasn't addressed this problem."	Escalation to higher levels of management	- The problem has been brought to the attention of the hospital's upper management. - Regular meetings are organized between other departments and ED leadership.

A weekly newsletter was sent by the SC comprised of debriefing points and the status of interventions implemented. While the weekly meetings of the SC were oriented to solving problems and assigning responsibility, emails and small meetings ensued until the issue was ameliorated or solved.

3.4. Linking debriefings to existing processes

To move CD from discussion and gripe sessions to a real safety and management tool, creating links with existing quality improvement processes was necessary. The usefulness of the DOLL framework served to illustrate the essence and value of CD. This has been a great support for leaders as it helped them to allocate resources and priorities more efficiently. The grouping of related problems through main categories helped the SC to think in terms of overall quality improvement processes and workflow rather than focusing on the previous method of singular problem solution. The ED found itself collectively developing ongoing quality improvement programs *vis-à-vis* the CD coupled with favorable action. When using the framework, more links were made between CD and their evolving content over time.

4. Practical implications and lessons learned for future applications

4.1. Numeric results

It should be noted that we have not attempted to directly link CD to quality and organizational metrics. To provide a numeric

overview, below are numbers to help the reader understand the size of the program.

From April 2020 to December 2021:

- 273 debriefings were performed
- 978 items were identified

  ○ 355 pluses
  ○ 623 deltas

- 66 strategic meetings of the SC were performed

  Delta management:

- 60% were solved by a simple action/change within the week of the debriefing.
- 15% required a long-term project with a specific action plan.
- 15% have been solved through ED team information and awareness.
- 10% are outside ED scope and have been assigned to various hospital processes for improvement.

  Patient safety indicator:

- Compared to previous years, incident reports were increased by 53%.
- Also, we observed an increase (3%) in the incident reports among the medical team. Before that, incident reports were mostly done by the nursing team.
- The perceived quality and safety culture has increased. We believe that this improvement was not only the result
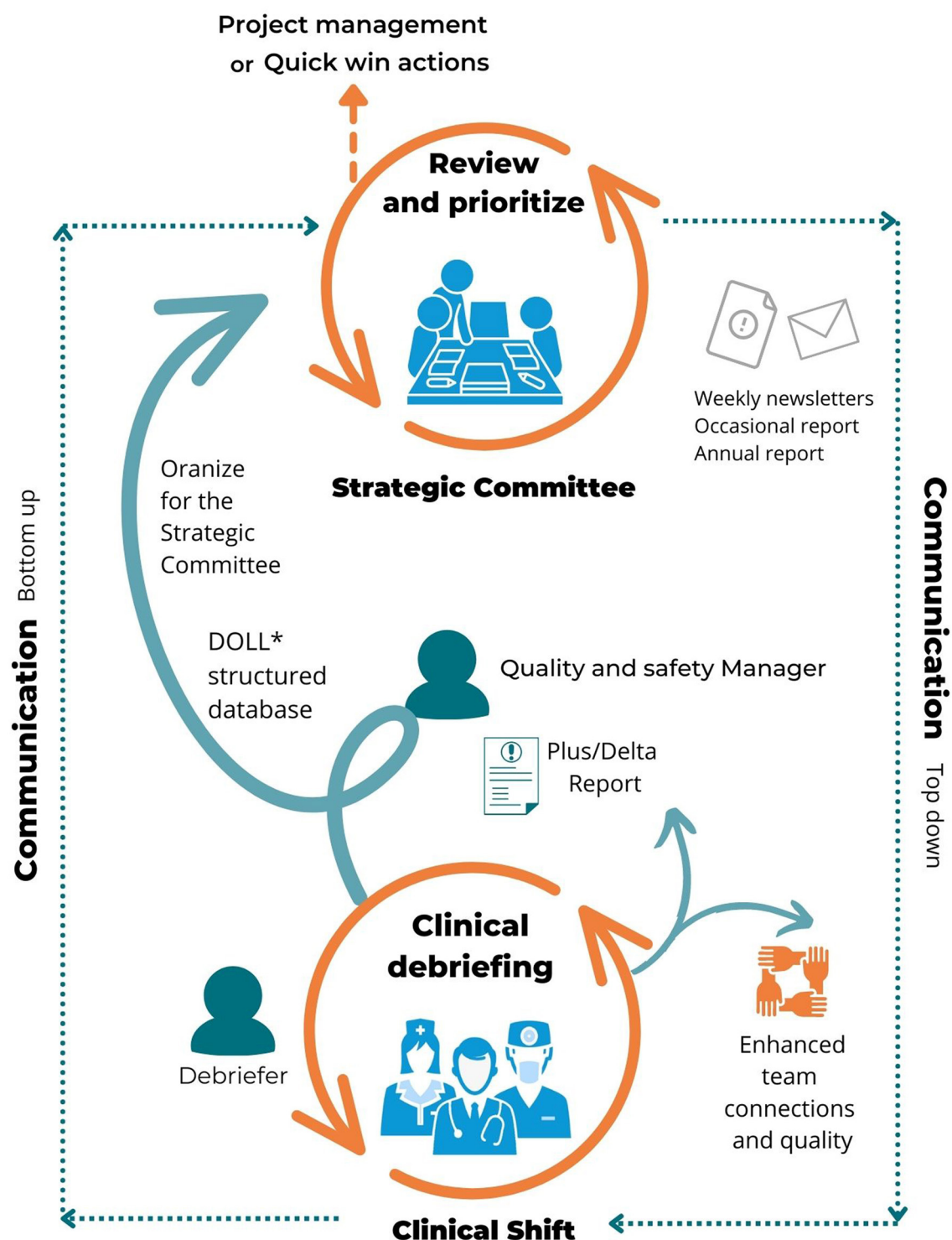
FIGURE 1
Clinical debriefing as a countercurrent management process. *Paquay et al. (5).

of the CD but was also part of a nascent positive culture change. Indeed, we sense and feel that the enhanced culture was built upon two key elements happening during CD, namely, genuine curiosity and shared reflective practice. These, in turn, authorized speaking up, reporting, and reflective thinking (24). We feel that this brought trust, confidence, and an *esprit de corps* to the ED.

FIGURE 2
Methodology used based on clinical debriefing subsequent actions.
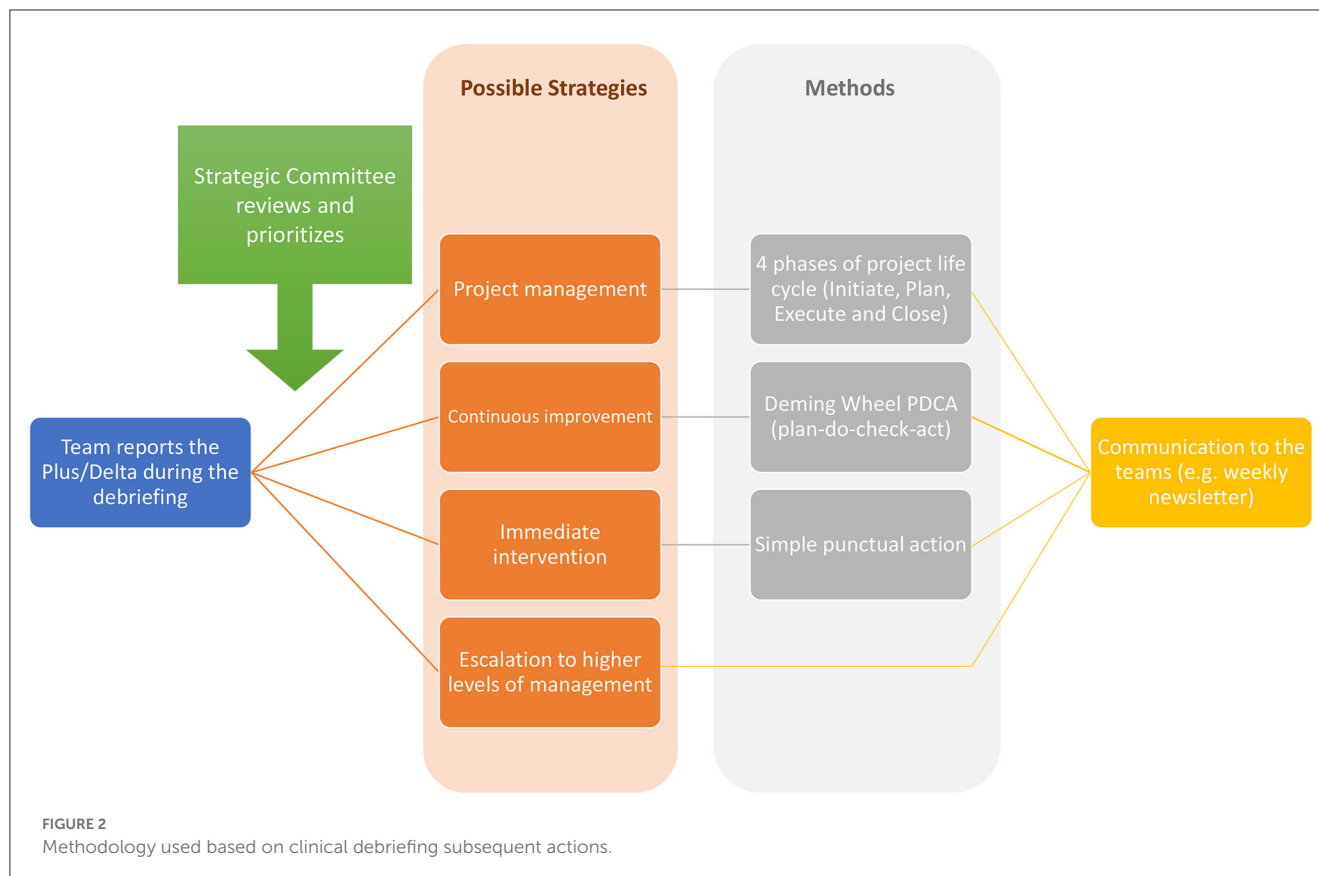
4.2. Lessons learned

- At the start of the project, we took the attitude that "best is the enemy of good." We wasted some time trying for the "best" and then decided to start small and apply quality improvements along the way. This approach was communicated to the department and asked for their patience and support as the program matured. Over time, synergies and improvements emerged naturally. QI implementation should be seen as an ongoing process operating on the basis of clinician feedback loops.

- When CDs were launched, some clinicians thought that the initiative was part of the hospital's accreditation process. Teams reported being less motivated to conduct debriefings in that context. Once the teams understood that the initiative was being implemented by and for them and had the full endorsement of the ED leadership, legitimacy and motivation were enhanced.

- At first, we thought that debriefers should already be simulation instructors. A few clinicians had a 1-year certification in medical simulation. Those were the first training with a 1-day clinical debriefing training and *in situ* coaching by the main debriefer (QSM). With time, we have observed that practice in medical simulation was not necessary. Values of simulation (e.g., good judgment, using the basic assumption, ensuring psychological safety, respectfully

handling difficult conversations, and effectively managing emotions were core competencies for clinical debriefings and could well be learned in the CD context.

- Team members were less motivated by scientific findings about CD but were motivated by their personal observations of changes and improvements in the workplace. However, ED leadership required scientific evidence and impact on patient safety.

- Teams' desire to change can fluctuate. During the COVID-19 crisis, the context was extremely favorable to rapid, ED-wide change implementation (more "immediate interventions" rather than "project management"). Issues were concrete, and the solutions were provided within days. Once the intensity of the crisis subsided, the change process slowed and there were several complex issues raised for which leadership did not have near-term solutions. This was demotivating. These larger problems require patience, strategic thinking, and often interdepartmental cooperation. With more experience, we noticed that exploring these points during the CD led to frustrating complaint sessions.

- The solution was to record every problem during the plus/delta portion of the debriefing. The debriefer then focused on topics the team could control, e.g., conversations and team coordination, mutual support, and communication issue. After the CD, all issues that required more thought, multi-department coordination, and planning to implement, e.g., failure to rapidly make empty in-hospital beds available,

were dutifully reported to the SC for their consideration and cross-department action.

- A major obstacle for nurses was to have the CD after their shift hours. A strategy was then organized so CDs were held before the end of the shift. Moreover, debriefers committed to respect the end-of-shift hour. If the discussion took a longer time, it was stated that the CD was going to exceed the end-of-shift hour and participants were offered a choice to continue or close. This approach improved participation.

- In the beginning, the debriefer appeared in the ED just before the scheduled CD. We learned that some valuable information was learned by a short observation before CD. To make better use of valuable clinician time, the lead debriefer went to the ED with plenty of time to "take the pulse" of the ED, i.e., the mood, significant events that may have occurred, how someone seemed out of sorts, etc. These early appearances also allowed the debriefer to have follow-up discussions with the clinicians about past concerns. This approach solved several problems, i.e., saved time, the debriefer was considerably better informed and often had an idea of the most worthwhile topics, and demonstrated the debriefer's personal involvement and commitment.

- Leaders were discouraged at the beginning because many issues required complex problem-solving and institutional coordination. To address this issue, we decided to prioritize actions. Issues related to institutional long-term situations were reported and tracked as appropriate but not given a high CD priority because they required quite a bit of time to address. On the other hand, teamwork, communication, and enhancing mutual respect were interesting and motivating topics for participants.

- At the outset, CD tended to focus on deltas, which were unpleasant and dispiriting by their very nature. Debriefers altered their approach and became skillful also at having interesting learning conversations using plus actions by clinicians.

- Healthcare quality initiatives have a reputation for starting and then slowly dying. Experienced staff resist initiatives partly for that reason, E.G., "If I wait long enough this program will go away like the rest of them do.": "this program won't make any difference in my clinical lift [SIC]." This lack of clinician enthusiasm was entrenched and discouraging. To overcome this common problem, (a) ED leadership visibly committed to the program being a long-term/permanent quality assurance technique. (b) Made clear to clinicians that we knew that the program was not perfect and that ED leadership was committed to refining and improving the innovation as experience increased. (c) Committed to public updates on project problems and project improvements and to providing public examples and project successes. In short, we publicly committed to "never give up."

4.3. Suggestions for starting a clinical debriefing program

The first steps to get started with CD are as follows:

- Have visible management support and engagement: In our case, the development of the SC, with the chief physician and the head nurses speaking with one voice regarding CD and using CD as part of their management strategy.

- Provide a sustainable resource to coordinate all aspects of the process: one specific person (e.g., in our case, the QSM) should be responsible for the quality and sustainability of the CD process. Clinical debriefing coordination should be included in a function definition.

- Regarding roles and competencies for selection, influential physicians should be individuals esteemed as paragons by their peers, exhibiting a heightened comprehension of unit functioning, while possessing adeptness in team management and task delegation. The CD coordinator should have profound and intricate comprehension of team management principles, change management strategies, and process management methodologies. Debriefers should cultivate the values of simulation (curiosity and sound judgment), emotional management, and handling difficult conversations. These debriefers must primarily undergo training and be coached by an experienced debriefer in these concepts.

- Develop an internal process for structuring and managing data, e.g., the DOLL or something like it.

- Establish department-wide regular communication regarding the program, e.g., a weekly newsletter, specific emails, department meetings, and annual reports.

- Celebrate success and give credit for good ideas.

- CD coordinators (e.g., QSM) and initiators (e.g., SC) should stay consistent, keep a positive vision of debriefings (e.g., publicly support the process, highlight when a change has been made thanks to CD, and provide regular feedback), and never give up on a commitment to making this work. Do not let the naysayers "win."

- The initiative should come from the unit leaders (e.g., head physician and head nurse) and be clearly explained to the teams.

- CDs should be integrated into the unit strategy and associated with other existing processes (incident reports, complaints, etc.). This is our next step.

- The CD process should be adapted to the needs, time, and experiences of the unit, i.e., the number of times CDs take place might fluctuate from every day to twice a week. This may fluctuate, but do not quit!

- Get started and make it better with time. Let the department know that is the approach. Adapt to the unique circumstances in a department.

- Listen to the outspoken critics. Be curious and respectful of criticisms.

- Unit leadership and the program leader should be aware of the scientific evidence on CD. Share it when clinicians show an interest.

- Debriefers should be familiar with unit daily operations and organization.

- Communication flows should be established. Consider who needs what information: clinicians, action committee, unit leadership, and hospital leadership.

- Teams must feel and see visible changes in their everyday work (dashboard, newsletter, follow-ups, etc.).

4.4. Suggestions for having interesting conversations

CD should:

- Start with quick *highly specific* examples using a plus/delta method.
- As a minimum, include nurses and physicians.
- Be brief with a maximum of 15 min for the CD.
- The CD should be proximal to the unit and preferably not in an active clinical space.
- Include a trained debriefer who is experienced in handling difficult conversations with respect and a willingness to share points of view.
- Focus on interpersonal, teamwork, and organizational issues rather than equipment, strategic, and hospital issues.
- When going deeper into plus or delta, think about asking follow-up questions because the first answer is likely to be superficial. Probe deeper.
- Debriefers can respectfully insert their own opinions for examination by others.
- CD reports should synthesize the plus/delta and be shared with leaders.

5. Methodological constraints

Only descriptive statistics were performed to summarize the frequencies and percentages of the pluses and deltas in each dimension of the DOLL as well as subsequent actions.

As part of the CD continuous improvement process, qualitative data were collected through diverse formal and informal means:

- Clinicians and SC members have been surveyed through individual interviews and focus groups.
- Debriefing content was also analyzed to evaluate the whole process.

As the DOLL classification framework and its implementation were based on these data, further research is needed to test the model in different localities and contexts. Interpretation bias is also common in qualitative studies during data collection and analysis. Currently, the successful integration of CD into quality and safety processes, unit coordination, and human resources is under consideration. Indeed, the extent of the impact resulting from this integration on patient safety variables and staff wellbeing remains to be fully performed and comprehensively assessed over a long-term period.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MP conceived and designed the study, realized data analysis, and wrote the first draft. GG and RS helped with study design, facilitated data transcription, and performed data analysis and interpretation. AA performed data analysis and made critical revisions. AG conceived and designed the study and performed critical editing supervision. All authors contributed to the manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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No size fits all − a qualitative study of factors that enable adaptive capacity in diverse hospital teams

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Introduction: Resilient healthcare research studies how healthcare systems and stakeholders adapt and cope with challenges and changes to enable high quality care. By examining how performance emerges in everyday work in different healthcare settings, the research seeks to receive knowledge of the enablers for adaptive capacity. Hospitals are defined as complex organizations with a large number of actors collaborating on increasingly complexity tasks. Consequently, most of today's work in hospitals is team based. The study aims to explore and describe what kind of team factors enable adaptive capacity in hospital teams.

Methods: The article reports from a multiple embedded case study in two Norwegian hospitals. A case was defined as one hospital containing four different types of teams in a hospital setting. Data collection used triangulation of observation (115h) and interviews (30), followed by a combined deductive and inductive analysis of the material.

Results: The study identified four main themes of team related factors for enabling adaptive capacity; (1) technology and tools, (2) roles, procedures, and organization of work, (3) competence, experience, knowledge, and learning, (4) team culture and relations.

Discussion: Investigating adaptive capacity in four different types of teams allowed for consideration of a range of team types within healthcare and how the team factors vary within and across these teams. All of the four identified team factors are of importance in enabling adaptive capacity, the various attributes of the respective team types prompt differences in the significance of the different factors and indicates that different types of teams could need diverse types of training, structural and relational emphasis in team composition, leadership, and non-technical skills in order to optimize everyday functionality and adaptive capacity.

KEYWORDS

resilience, resilient healthcare, adaptive capacity, teams, teamwork, quality

1. Introduction

Resilience in healthcare (RiH) can be defined as 'the capacity to adapt to challenges and changes at different system levels, to maintain high-quality care' p. 6 (Wiig et al., 2020). The research within this field seeks to understand how healthcare organizations cope with the dynamic, variable, and demanding environment in which they operate based on insights from

complexity and system theory and provides an alternative complementary perspective of learning from and understanding how, most of the time, work is safe (Ellis et al., 2019; Anderson et al., 2020a; Iflaifel et al., 2020; Ignatowicz et al., 2023). By examining how performance emerges in everyday work in different healthcare settings, RIH research seeks to develop knowledge of the enablers for adaptive capacity in everyday work, the focus is on how systemic and organizational processes can support adaptations, rather than on how individuals are resilient handling stressful events. Adaptations occur constantly in healthcare work in response to disruptions (positive and negative), shocks or crises, and are essential for maintaining control and the ability to function (Blanchet et al., 2017; Lyng et al., 2022). This ability for adaptive capacity in healthcare can be conceptualized as constituting "adaptations based on reframing, aligning, coping and innovating, in response to external and internal demands from different organizational levels, in order to ensure quality of care." p. 7 (Lyng et al., 2022), and may be anticipated or unanticipated, short, or long term, and, occasional or regular (Lyng et al., 2022).

Hospitals are defined as complex organizations with high task demands and a large number of actors collaborating across time and space to deliver safe healthcare. The tasks and number of interactions are high and variability in performance frequently occurs (Braithwaite et al., 2015). This inherent complexity requires healthcare professionals from multiple disciplines to co-ordinate their actions in teams. Consequently, most of the work currently being done in hospitals is team based. Teams are a means of organizing work so that individuals can accomplish more than they can on their own and to maintain operations 24 h a day (Bell et al., 2018). Hospitals as well as other healthcare organizations depend on teams to successfully undertake increasingly intricate tasks (Flin and Maran, 2004).

1.1. Teamwork in hospitals

A common conceptualization of teamwork is "two or more individuals with specified roles interacting adaptively, interdependently, and dynamically toward a common or valued goal" p. 559 (Salas et al., 2005). Teamwork includes skills in communication, team leadership, anticipation, feedback, and support, along with each team members ability to understanding their role and responsibility (Salas et al., 2005). The quality of teamwork is closely related to quality and patient safety in treatment and care (Salas et al., 2005; Rosen et al., 2018). Team training is important for improved efficiency in inter-professional teamwork within hospitals (Ballangrud et al., 2017). A vast number of overview articles and studies on teamwork and team training in healthcare have been published over the past decades (Hughes et al., 2016; Chen et al., 2019; Gross et al., 2019; Gregory et al., 2021). A significant amount of the literature has focused on Crew Resource Management (CRM) and TeamSTEPPS in limited clinical fields of practice where the results mainly have focused on participants reactions and the degree of learning achieved (Ballangrud and Husebø, 2021). Furthermore, the human factors discipline has focused on improving the quality and safety of care by focusing on teamwork with the development and refinement of the System Engineering Initiative for Patient Safety model (SEIPS 3.0) (Carayon et al., 2020). Further research on teams is needed to identify important factors for long term sustainability of team competencies (Ballangrud and Husebø, 2021). It is well recognized that teamwork in hospitals

comes with multiple challenges (Weller et al., 2014; Anderson and Reedy, 2021). Team members may come from different professional backgrounds with different training, knowledge, and attitudes. They often, work shifts and are located in different spaces across the hospital. Teams are diverse in structure and purpose (WHO, 2009; Anderson et al., 2020a) and a new approach to understanding teamwork is therefore needed to understand the commonalities, differences, challenges, and success factors of different types of teams. Recent literature on resilience in teams, identifies four types of teams that are common in the hospital setting (Anderson et al., 2020a); (1) Structural teams which are co-located, uni/multi professional, and feature prolonged teamworking; (2) Hybrid teams which have some permanent and some rotating staff, and feature planned teamwork; (3) Responsive teams, which respond to acute and unplanned episodes of teamwork, usually organized as mobile teams; and, (4) Coordinating teams in which planned episodes of teamwork integrate representatives from multiple teams, usually spanning different hospital units (see Table 1). Although it is clear that teamwork is fundamental to work in hospitals we need more knowledge on how team, organizational and system factors combine to influence team performance (Anderson et al., 2020a) and adaptive team capacity specifically. The rationale for this study is to increase our knowledge on how resilience is enabled in healthcare systems by studying adaptive capacity in different forms of hospital teams. As such we aim to identify what type of team factors that are of importance in enabling resilience.

1.2. Aim and research question

The aim of this study was to increase our understanding of adaptive capacity in four different types of hospital teams by exploring the temporal and dynamic features of teamwork and the contextual influences within which they operate. More specifically this study investigates how team factors (e.g., competence, team culture, procedures) relate to teams' adaptive capacity in four different team types in two hospitals. The following research question guided the study: what kind of team factors enable and hinder adaptive capacity in teams, and how do these factors affect adaptive capacity?

2. Methods

2.1. Design and setting

A qualitative case study methodology was used to explore team factors and how they enable adaptive capacity in hospital teams. Qualitative research describes, interpret, and generate theories about social interactions and individual experiences as they occur in natural, rather than experimental, situations (O'Brien et al., 2014; Busetto et al., 2020). The study was designed as a multiple embedded case study conducted in two Norwegian hospitals (Yin, 2014). A case was defined as one hospital containing four different types of teams.

2.2. Recruitment and study context

In line with the study protocol (Anderson et al., 2020a) the two hospitals were selected and recruited based on their size and teaching

position. Hospital 1 is a large teaching hospital with both national and regional responsibilities in addition to local functions and Hospital 2 is a middle-sized local hospital in the Norwegian healthcare context. Both the hospitals are situated in the same health region and collaborate to provide local functions. In the Norwegian health system responsibility for healthcare service provision is divided between local municipalities and four regional health authorities. The municipalities are responsible for primary care services for their citizens, including nursing homes, homecare, general practitioners, and rehabilitation services, while the four regional health authorities are responsible for the specialized healthcare services, including the governance of hospitals.

To gain initial access to the recruited hospitals we contacted their respective research departments, and researcher BF used her professional network to contact key personnel in the departments, enabling us to perform data collection during the Covid-19 pandemic. After receiving permission and access to carry out the study in both hospitals, we collaborated with the hospitals to identify and locate the four different team types in each of the hospitals; structural, hybrid, responsive and coordinating (see Table 1). The leaders of the identified teams were then approached directly. They were provided with detailed information about the study and given time to consider whether to participate. A total of four teams were recruited from each hospital (total of eight teams) to participate in observations of their work practice and in interviews. The compositions of the teams were similar in both hospitals, where members of the structural and hybrid teams were mostly nurses and nursing assistants alongside a smaller number of physicians, the numbers of which could vary from shift to shift. The responsive teams consisted of a permanent set of members from diverse healthcare professions. The coordinating teams consisted of ward managers from the different bed wards in each hospital. Due to the difference in size and number of wards in the two hospitals, Hospital 1 had a much larger coordinating team than what was the case in Hospital 2. During the observation we recruited participants for interviews. Researcher BF made appointments with the participants and the interviews were undertaken after the observation period was completed. Three to four team members in each team and one leader in each team were interviewed. A total of 30 interviews were conducted (see Table 2).

2.3. Data collection

We collected data through observation, interviews, and document analysis. The data were collected between December 2020 and June 2021. Researchers BF and HBL conducted the observations of all the teams using an observation guide which was subsequently used to structure the writing of the field notes. Both researchers wrote their own field notes for each of the teams. The guide was developed in line with central concepts from the resilience literature, and essential

TABLE 1 Team descriptions.

Team type	Organizational Context/structure	Demands/processes	Misalignments	Location
Structural	Ward based, nurses and assistants working together in small units 3–4 persons. Co-located	Receive patients 24/7 Unpredictable workday	Lack of staff, competence Peak situations	Orthopaedic/surgical bed ward Neurological bed ward
Hybrid	Permanent staff of nurses, rotating medical staff, co-located	Receive acute patients 24/7 Unpredictable workday Rapid workflow changes	Lack of staff, competence Peak situations	Emergency department Short stay acute unit
Responsive	Acute teams responding to incidents of cerebral infarction. Multi professional. Short episodes of teamwork	Respond to suspected cerebral infarction Routine work	Workflow changes due to patient situations	Members from differerent departments
Coordinating	Meeting of ward managers allocating patient to even out demand and capacity in the hospital. Their work span hospital units	Solve overall capacity in the hospital Complex organization	Inconsistant patient numbers	Members (Ward managers) from different departments

TABLE 2 Overview of data collection methods and data material according to team types and case sites.

Hospital 1			Hospital 2		
Team	Observation	Interview	Team	Observation	Interview
Structural	29 h	3	Structural	29 h	4
Hybrid	14 h	4	Hybrid	27 h	5
Responsive	(30 h)/ 3 h	4	Responsive	1 h	3
Coordinating	6 h	3	Coordinating	6 h	4
Sum	52 h	14	Sum	63 h	16

features of hospital teams. This prompted the researchers to capture key aspects of work as done (Anderson et al., 2016). The researchers looked for types of demands from the different levels in the organizations, capacities of the team to meet demands and types of adaptations that were performed. As teams were different in how they worked together, the length and timing of observations had to align with that. For the structural and hybrid teams the researchers shadowed one or more team members for an evening shift and the following dayshift. For the responsive teams the researchers shadowed the team members during their shift and followed them when they responded to acute alarms. The coordinating team met 10 to 15 min for a daily planned meeting. The two researchers observed the coordinating team meetings for a two-week period. As one of the coordinating teams held the meeting digitally due to the Covid 19 pandemic, the researchers attended this meeting digitally together with the rest of the team. The observations across all eight teams resulted in a total of 115 h of observation.

We used a semi structured interview guide based on content from the Concepts for Applying Resilience Engineering (CARE) model, i.e., demand, capacity, misalignments, and adaptations (Anderson et al., 2016). And furthermore, the four potentials of resilience; monitoring, anticipating, responding, and learning (Hollnagel, 2018). By conducting the interviews post observation, we were also able to ask about situations that we had observed and discuss them with participants to elaborate the adaptations they made in the course of their work. Researcher BF conducted all the interviews. Most of the interviews were held face to face at the respective participant's workplace, but some were held digitally due to the Covid-19 pandemic and consequent social distancing regulations. The length of the interviews varied from 40 to 90 min, with a median length of 60 min. All interviews were audio recorded and transcribed verbatim by researcher BF. The data material, including the transcribed interviews and observation notes totaled 430 pages (see Table 2).

2.4. Analysis

Observation notes and interviews for each team were transcribed grouped together to simplify the analysis work. The analysis was performed with a combined deductive and inductive approach (Elo and Kyngäs, 2008). We used the CARe model (Anderson et al., 2020b) as a framework to facilitate the deductive analysis. First, observation notes and interview transcripts were read through by the individual members of the research team to get a sense of the whole material and to select the units for analysis. To organize the data, we developed a categorization matrix based on the CARE model's key concepts of demand, capacity, misalignments, and adaptations. We further used NVIVO software to deductively select and code units for analysis according to three of the four main categories of the matrix: 'capacities', 'misalignments', and 'adaptations'. The capacities category was renamed 'team factors' and represent factors that have a positive influence on the ability to adapt. All data were additionally coded according to team type and hospital, which allowed for cross-team and cross case analysis. This resulted in a substantial number of different activities for each of the categories. The material in the three deductive categories was further analyzed following the principles of inductive content analysis (Elo and Kyngäs, 2008) (see Table 3). All the data within the categories were inductively reviewed and recoded

which were then further developed into themes across teams. There were differences between the teams, but in our cross-team- and cross case analysis we found overarching themes that matched all eight teams and their variances and nuances in how team factors influence adaptive capacity. The overarching themes enabled us to identify patterns, similarities and differences across both teams and hospitals, which deepened our understanding of team adaptive capacity. We transferred the themes into tables and developed a heatmap to visualize the differences in the various teams (see Table 4). Table 4 provides an illustration of differences between the different teams and hospitals based on instances of team factors that were noted in the qualitative data material. The number of team factor instances across teams and hospitals are represented with various colors ranging from green (few) to red (many).

3. Results

The results of how team factors influenced adaptive capacity in the eight teams at the two hospitals are presented team-wise and structured according to the following four main themes: (1) Technology and tools, (2) Roles, procedures, and organization of work, (3) Competence, experience, and learning, and (4) Team culture and relations. See Table 3 for an overview of the themes with quotes from the interviews or observation notes.

3.1. Structural teams

The structural teams were ward-based teams that consisted of nurses and nursing' assistants working together on a permanent basis. They worked together in small units of 3–4 persons on each shift. Typical misalignments for the teams were the unpredictable workday, lack of staff, competence (e.g., staff on sick leave with no proficient substitute available) and challenging peak situations (sudden high flow of incoming patients).

3.1.1. Technology and tools

An important enabling factor for the structural teams was the availability of technology and tools (e.g., computers, software's, mobile devices, electronic equipment for monitoring patients), and how the organization supported the teams by making these tools available, alongside the physical workspaces that corresponded with their needs. The structural team members in both hospitals carried a printed list containing names, diagnoses, and treatment plan for all patients in their pockets. The list was updated in the software and printed out at the start of each shift. The list not only helped the team members to easily assist each other in the treatment of patients, but also to monitor the overall status of the ward. In hospital 2 everyone also had their own mobile device. With this device they signed on to the care of their patients in a program that enabled other partners at the hospital to promptly contact them about their patients.

3.1.2. Roles, procedures, and organization of work

Organization of work, the structure of the different shifts, clear role descriptions and procedures for work tasks were factors that provided the teams confidence to undertake their daily work.

Although the teams had a plan, they were always prepared for it to change. Adaptive capacity was enabled by planning how to support each other, and by being mentally ready for changes to happen as part of a normal workday. Moreover, they prepared for the absence of team members who held additional roles outside the team (e.g., those who were part of a responsive team), for example by avoiding allocating responsibility for the most severely ill patients to them.

The results show how the organization of work took normal peak hours of the day into account by providing extra floating staff for these periods. The extra resources served the teams on the ward and completed requested tasks to reduce the misalignments of demand and capacities.

A key factor for supporting adaptive capacity related to how the team members continuously updated each other within the team during the shift. Updates enabled the organization of relevant assistance for patients and preparations for emergencies, for instance in the case of a deteriorating patient. It was also important for the team members to know who was available to help out, and scheduled team huddles helped bring the team members up to speed.

3.1.3. Competence, experience, knowledge, and learning

Competence was vital for the structural teams' ability to adapt. Several daily work tasks required high professional competence, such as monitoring acutely ill patients, or patients newly transferred from the intensive care unit (ICU). Replacing competent team members with less competent members led to a redistribution of tasks, and increased responsibility for others with more competence. The team members' experience was also important for adaptive capacity. When faced with challenges, experienced team members brought a sense of safety to the teams, and they supported new team members by providing advice. For example, knowing what to prioritize in peak situations was something new nurses found challenging to do as it has to be learned through working with more experienced colleagues. Competence development such as tutoring, training and simulation was offered to structural teams, but often competed with the daily chores.

3.1.4. Team culture and relations

The structural team members supported each other in carrying out their work. A culture of helping each other was fundamental for their adaptive capacity, for example by making sure that everyone got a break during the shift or helping with tasks if one of the members was struggling. Findings show that team members who work regularly together on weekend shifts became very familiar with each other and thus developed their own structures for the division of responsibility and support for each other. Team members talked about knowing each other personally and professionally. The division of responsibility on a shift was easier if they knew each other's preferences, strengths, and weaknesses. It was also easier to ask for help, or admit that they did not know, or were uncertain about something. They talked about how team members reluctant to help others, were counterproductive for the team's adaptive capacity.

3.2. Hybrid teams

The hybrid teams had a permanent staff of nurses and a rotating staff of physicians. The two teams observed in this study were situated on short stay units receiving patients with a wide range of diagnoses

who were admitted 24 h a day, 7 days a week. Typical misalignments for these teams were lack of staff, peak situations with high inflow of patients, erroneous triaging of incoming patients, and rapid workflow changes where the team members quickly needed to respond.

3.2.1. Technology and tools

The hybrid teams in both hospitals worked in well-equipped wards with premises well-suited for their work, with open spaces and short distances enhancing the prospect of monitoring and assisting colleagues when needed. In hospital 2 they used a software program that indicates incoming patients and their status to monitor, plan and prepare for admissions.

3.2.2. Roles, procedures, and organization of work

Receiving acute admission patients with a range of diagnoses, meant that the team needed clear procedures and role descriptions to structure their work. Patients were distributed within the team according to capacity, and the team members were prepared for unpredictable workdays. As in the structural teams, the hybrid teams were supported with extra floating staff to reduce workload and avoid high pressure situations during known peak hours of the day. In hospital 1 both nurses and physicians were physically located together, at the same work desk, and thus worked closely to improve information flow and communication.

In hospital 2, all patients were triaged into red, yellow, and green by ambulance personnel prior to admission. However, the coding of patients was often found to be misleading, leading to a need for the team members to reallocate resources and take on extra work to ensure quality in care in such situations.

Some hybrid team members held additional roles outside their team. Stroke alarm and cardiac arrest alarms were assigned to both nurses and physicians. In hospital 2 certain tasks and responsibilities came with the requirement of a certain level of competence, with three specified competence levels for the nursing group (1, 2, 3), and two for the physician group (1, 2).

The shift leader maintained an overview of the ward, and planned the allocation of incoming patients, and the transfer of patients to bed wards. By having an overview of the total situation, the shift leader could handle high pressure situations by reallocating resources to where they were needed. This supported the overall adaptive capacity of the team.

3.2.3. Competence, experience, knowledge, and learning

The distribution of roles and responsibilities among team members reflected the competence levels of both nurses and physicians. This was of high importance especially in hospital 2, due to the many roles and competence requirements the team had to cover on a shift (e.g., shift leader, stroke alarm respondent, and cardiac arrest alarm respondent). Both hybrid teams received patients with a large range of symptoms and the teams' task was to decide on a diagnosis and quickly start treatment. The range of possible treatments made it difficult for all team members to be familiar with all of them, so to a large degree they relied on written procedures. The less experienced the team members were, the more they relied on procedures. Several of the procedures and the different equipment in use in both hospitals required competence to operate, as well as recertification on a regular basis. This led the team to regularly undergo retraining. Both teams

TABLE 3 Deductive categories analyzed following the principles of inductive content analysis.

Category: team factors			
Quote	Category	Code	Themes
"While reading, they have a printed list from the electronic patient software that they use to make notes on. In addition, this list serves as a support to know the most important matters about the other patients for whom they are not responsible but may need to be able to help during their shift." Observation notes Structural team (1)	The use of lists with key features enables swift and correct assistance	Tools for information and preparing	Technology and tools
"In the nurses' workstation the team members always keep an eye on the screen of incoming patients in order to be prepared." Observation notes Hybrid team (2)	Available software improve preparedness	Sufficient equipment	
"We have a form with dosage of anticoagulant by weight hanging on the wall. We use that instead of calculating it ourselves." Physician Responsive team (2)	Predefined dosages hinder miscalculations	Written tools on display for easy access	
"Yes, we've been doing it for a few years now, had these meetings. We've had them longer, but there's no need to have them that long. We've made some changes to the "structure over time. For example, when we've got the patient overview software, we don't have to say all the numbers, because everybody can see them." Head nurse, Coordinating team (2)	Software enables more efficient meetings	Tools for information provides for more efficient meetings	
"We have divided them into groups, yard 2 and yard 1, after 3 months they switch, so that they get variety. Sometimes you have to work in yard 1 even if you belong to yard 2 due to illness or that there were only new employees staffed there, but mostly so, yes… So today they switch groups on one side, and that's how it works." Leader structural team (2)	Team belonging, but system for changes due to illness	Work routines to even out workload	Roles, procedures, and organization of work
"The ward also has a nurse working an intermediate shift from 11 am. to 7 pm. This role does not have defined tasks but helps where needed. Often the intermediate shift takes care of new patients who are admitted to the ward." Observation notes, Hybrid team (2)	Planning for peak hours	New roles to even out peak hours	
"The procedure document clearly describes the physician as the leader of the team. It is also clearly described what the team leaders' focus and tasks should be." Observation notes Responsive team (1)	Clear description of work tasks	Procedure for division of responsibility	
"The meetings follow a firm structure where everyone present gets their turn to speak. Before the meeting all the wards have filled in the day's patient numbers in the software programme they use. The meeting is led by a placement coordinator." Observation notes Coordinating team (1)	Clear roles and firm management of meetings	Roles for structure enables efficient meetings	
"We try to do tutoring and training regularly. We arrange lesson in medical topics that are relevant to us. We train in the use of medical equipment regularly. And we try to train new nurses…And also through staff appraisal and such we assess whether there is a need for any training." Leader Structural team (2)	Competence development in the team	Learning activities enhance competence	Competence, experience, knowledge, and learning
"Nurses in the emergency department are organized according to competence levels. All new employees, regardless of which department they have worked in before, start at competence level 1 (after an introduction period), after a minimum of one year they can move up to the next competence level, before ending up at competence level 3 after a variable period. Different situations and roles on the different shifts require different competence levels. Cardiac arrest and actilyse (thrombolysis) require competence level 1. Red alarms and shift leader require competence level 3." Observation notes, Hybrid team (2)	Competence levels secures correct and sufficient competence present on all shifts	Division of competence to assure quality	
"The staff talk about how experienced staff members contribute to the procedure being performed more rapidly. They praise the experience of the thrombolysis nurses who will contribute more if the neurologist is less experienced." Observation notes Responsive team (1)	Certain roles and teams require experience	Experience contributes to competence and safety	
"I guess it depend on who's at the meetings. Some are easier… In other words, for some it is easier to find a solution than for others. It depends a on the participants, how experienced they are amongst other things. Because this is a team that is not made up of the same members every day." Head nurse Coordinating team (1)	Experience enables the members with more options for solving problems	Experience contributes to a wider range of solutions	

(Continued)

TABLE 3 (Continued)

Category: team factors			
"Everyone is good at asking: "Can I do something for you?" If one of us is very busy, the others chip in to help, so that no one is sitting around doing nothing, while others are working their ass of." Nurse 3 Structural team (1)	Well acquainted team members develop a culture for helping each other	Helping culture enables overall capacity	
"We cooperate closely, we communicate a lot during the shift about things and situations we need to look out for and if we need to watch someone's patients for a period, when they are occupied with another situation. So, we collaborate really well, and are very understanding of each other's needs." Nurse 1 Hybrid team (1)	Close communication between team members and understanding each other's needs	Collaboration and understanding of each other's roles	Team culture and relations
Yes, basically it is the case that the team, seldom, or you could say never, meet in the same constellation since there are numerous departments and sections involved and each of them has a lot of employees. So, in the context of brain stroke, good team collaboration actually means that we save an incredible amount of time. For us, the whole stroke collaboration is built on us spending as little time as possible until the patient gets the right treatment so everyone has to know their procedures, they have to know exactly what to do, and they have to know all the things they shouldn't do to not delay the treatment." Leader, Responsive team (1)	Team culture of mutual understanding of their roles and tasks	Focus on roles for good collaboration	
"I felt like you got some insight into what the other wards were doing. Also, you felt, what I think is most important, is that you felt a little bit of that responsibility. You just have to deal with it and, if some wards were really busy or, you had to deal with each other, and I think that's very healthy, that you shouldn't just think of yourself and your ward in a way." Head nurse, Coordinating team (1)	Development of a culture for helping each other	Feeling responsible for others situation enables overall capacity	

TABLE 4 Heatmap of team factors (Themes).

	Coordinating H2	Coordinating H1	Hybrid H2	Hybrid H1	Responsive H2	Responsive H1	Structural H2	Structural H1
1: Technology and tools	6	4	3	9	7	18	4	1
2: Team culture, relations	27	31	30	37	3	20	40	27
3: Roles, prosedures, and organizations of work	38	32	41	18	21	51	23	21
4: Competence, experience, knowledge, and learning	3	0	16	12	8	27	16	10

also conducted simulation training on a frequent basis to learn and maintain skills in undertaking critical procedures, and to handle and adapt to situations under stress.

3.2.4. Team culture and relations

Both the hybrid teams were characterized by a supportive culture, where they tried having lunchbreaks together, or offered help to colleagues. In particular, the leaders in hospital 1 had put major effort into reducing the hierarchy between nurses and physicians in the team. The leaders insisted that the team members should be situated next to each other during their workday to enable information transfer and collaborative decision making. However, for the rotating physicians, familiarizing themselves with this structure was a challenge. Similar to the structural teams, the hybrid team members talked warmly of each other and found weekend shifts to be especially useful for building relationships with colleagues, as members worked closely together and developed their own routines and culture during these shifts. To enable adaptive capacity, the team members depended on helping each other to even out the workload by taking on extra work and changing the responsibility for tasks when needed.

3.3. Responsive teams

The responsive teams in our dataset were teams who responded to suspected incidents of cerebral infarction. The teams were multi professional, consisting of members from different professions and departments. The responsive teams only met and worked together during short, unplanned, and acute episodes. Typical misalignments for the teams were workflow deviations (e.g., several patients arriving simultaneously), personnel (e.g., insecure, less trained) and patient needs (e.g., disoriented, nauseated, non-native speaker). The teams regularly experienced that the patients were not in fact suffering a stroke, and that while they were focused on a rapid diagnosis of stroke other factors might be missed. This could lead to disagreements within the team, where some team members wanted to proceed with the

stroke procedure, whilst the physician as the team leader wanted further investigations to avoid missing other important conditions.

3.3.1. Technology and tools

The responsive teams relied heavily on technical aids that enabled them to perform promptly. All members carried a calling device, and they could monitor incoming patients using the hospital computer system. The physicians especially aimed to make use of this tool by having one eye on the screen whilst attending to other patients. This enabled preparation by reading the patient's journal notes before the patient arrived. In both hospitals the computed tomography scan (CT) machine was located next to the emergency room (ER) for quick access, though in hospital 2 they had to use a more precise CT machine on another floor when the patient's symptoms were uncertain, leading to a delay of diagnosis. However, the team adapted by performing some of the examinations during transportation to reduce the delay. Furthermore, the team had a medication bag including all necessary medication and equipment. To enable speedy work processes, the bag also included predefined medication dosages for quick administration of drugs and to eliminate the risk of miscalculations.

3.3.2. Roles, procedures, and organization of work

The responsive teams had a very clear division of roles and organization of work. Everyone had their specific role with assigned tasks and followed a set procedure in order for the diagnostic process to proceed quickly. The stroke procedure was designed for everything to happen rapidly in order to start treatment as soon as possible for a better patient outcome. The clear procedure also enabled them to adapt when the patient's condition changed or there was disruption of personnel.

3.3.3. Competence, experience, knowledge, and learning

The responsive teams had to make rapid and often life critical decisions to diagnose and activate stroke treatment as appropriate. These teams thus depended on the highly competent team members making the correct decisions and performing the stroke procedure quickly. To enable adaptive capacity, the team used simulation-based training for developing individual skills, ensuring a clear role understanding, and rehearsing the stroke procedure. However, since the team members did not know each other well, they emphasized the importance of training non-technical skills like communication and team management in the simulation sessions. These skills were seen as crucial for adaptive capacity in the responsive teams. During the simulation training the facilitator offered time for reflection. The lack of regular spaces to talk about their work, implied missing potential important learning points. To compensate some of the members talked about incidents with their leader or colleague when returning to their workplace.

3.3.4. Team culture and relations

Since the responsive teams did not work together on a regular basis, there were limited opportunities to develop strong relationships between the team members. In hospital 1, the team had a different composition every day, and only a few of the members knew each other. In hospital 2, the team members generally knew each other

from previous stroke episodes. However, the episodes of teamwork were short and characterized by an acute atmosphere, leaving little time to get well acquainted. Furthermore, they were reliant on a team culture of mutual understanding of their roles and tasks. Knowing each other enabled adaptations from set procedures. Experienced team members were more confident in doing adaptations.

3.4. Coordinating teams

The coordinating teams met to allocate patients to available beds to avoid bottlenecks in peak periods and even out the total demand and capacity of the two respective hospitals. The teams consisted of all bed ward managers in each hospital. They had daily 10-min meetings during the day shift to allocate patients and resources. Like in the responsive team, the coordinating team members did not work together on a regular basis, and only met for short episodes. The major misalignments of the teams were inconsistent patient numbers and a complex hospital organization where decisions about evening out demand and capacity were made across time and place. For example, the ward managers could agree on moving patients, but they needed approval from the chief physician who could disagree, leaving them to work out another solution. Also, a mismatch in conceptualizing bed capacity across wards caused challenges for team decision making. In particular, it was difficult for the members to accept/agree that some wards needed to have free buffer beds reserved for acute patient demand, for instance for Covid-19 patients, whilst other wards had to take on extra patients and overbook their capacity. This often led to discussions and disagreements within the coordinating teams. The different cultures the members represented also became visible with some team members often offering to help, while others were reluctant. The team leaders said that this was often the same members who were either positive or negative. There were few opportunities for reflecting on and learning from previous experience, and little sharing of learning.

3.4.1. Technology and tools

To get an overview of the total bed capacity status at the hospital the teams needed information decision aids and tools. As mentioned, in hospital 1 the coordinating team members took advantage of software to report bed status prior to the meeting. A lot of effort and work had been done to update the computer software system to deliver the correct information about current bed status. Hospital 2 used an online tool that showed the current bed status of every ward. However, due to the rapidly changing nature of the wards' bed status, both the coordinating teams needed additional information from the team members to make informed decisions on the reallocation of patients and beds across the hospitals.

3.4.2. Roles, procedures, and organization of work

Procedures and organization of work were important in both coordinating teams. The team in hospital 1 needed more structure because it was a larger team than in the smaller hospital 2. In hospital 1 the team members each reported the status of the current capacity on their ward via a webpage prior to the meeting. The coordination meeting was led by a coordinator from the emergency department (ED) and followed a specific agenda. In hospital 2 the

meeting had no firm agenda, although the objective of the meeting was similar to that in hospital 1. In hospital 2 the team had a procedure which they roughly followed, but they usually agreed on the required actions to close the bed capacity gap. The team in hospital 2 consisted of significantly fewer members than in hospital 1, and they all knew each other well, although replacements occurred. In hospital 2, in situations when the overall bed capacity was ok, and no actions were needed, the team members used this meeting to raise other challenges and supported each other in difficult decisions.

When the overall bed capacity situation was very uncertain, the teams in both hospitals could either agree to wait and see whether the situation would resolve itself without intervention or arrange for a second meeting later in the day to reassess the situation.

3.4.3. Competence, experience, knowledge, and learning

The coordinating teams used competence and experience in their decision making. The team members often used their prior experience when reallocating patients or negotiating for beds among themselves, knowing what to prepare for and expect in a situation. Based on their experience they could often foresee how a situation might develop, and as such, the appropriate alternatives for solving challenges. The more experienced leaders enacted a more independent voice in the team meetings and were listened to more by others.

3.4.4. Team culture and relations

Team culture and relations differed in the two observed coordinating teams. In both teams, the team culture affected their capacity to adapt to challenges and changes. Hospital 1 had a large coordinating team with a formal atmosphere and limited to no time for informal conversations. Most of the members were not well acquainted and the meeting had a very strict agenda leaving little time to get to know each other. The leader systematically worked to build a culture where the team members would feel responsibility across wards and create a supportive culture and relations between wards to better adapt and improve the overall situation of the hospital's bed capacity. In hospital 2, team members knew each other well, and used each other for problem solving, and to give or receive advice. When the overall capacity situation of the hospitals was good, the teams functioned well.

4. Discussion

In this study we have explored the role of team factors for adaptive capacity in four different types of hospital teams (structural, hybrid, responsive and coordinating) in two hospitals. We found that the main team related factors of importance for enabling adaptive capacity were (1) technology and tools available to the teams; (2) clarity and description of roles, procedures, and the teams' organization of work; (3) the teams' competence, experience, and knowledge which also enabled sound learning processes; and (4) the team culture and relations among the members. In the following we discuss our results in relation to previous research and suggest future research and implications for practice.

Our results are in line with previous research on teamwork and advances the literature on teams (Burke et al., 2006a; Rosen et al.,

2011; Gittell et al., 2013; Maynard et al., 2015; Christian et al., 2017; Anderson and Reedy, 2021; Sanford et al., 2022). Our study focused adaptive capacity in four different types of teams, enabling deeper understanding of how the team factors vary within and across these teams (Anderson et al., 2020a), and how contextual factors might affect teams and adaptive capacities within teams (Schmutz et al., 2019). Although all of the four team factors identified in this study are of importance in enabling adaptive capacity, some are more important than others, as shown in Figure 1.

As Figure 1 shows, competence (experience, knowledge, and learning) is vital for adaptive capacity in all teams and is illustrated in the figure as a ring across the teams. Team performance emerges from individual cognitive and behavioral actions carried out by team members where team members draw from their individual resources (Burke et al., 2006b). Our study highlights the importance of experience as a clear advantage for the ability of teams to anticipate, monitor, and respond, and experience was equally valuable for all the teams. For teams in need of making decisions under a high degree of uncertainty, experience was highly important. For instance, in the coordinating teams, members used their experience when deciding which actions to take. They used their experience to anticipate what was likely to happen, and they were able to make decisions based on their deep knowledge of everyday work in the hospital (e.g., need for available beds, need for overbooking of beds, challenges due to regular staff being on leave, or specific changing weather conditions putting pressure on healthcare services), and the range of situations most likely to occur.

4.1. Relations, culture, and co-location

Figure 1 furthermore visualizes the varying importance of the factors that enable adaptive capacity within the four different types of teams studied. For instance, by being co-located, the structural and hybrid teams had the opportunity to develop what has been termed high quality relations (Havens et al., 2010), with frequent, timely, accurate, problem solving-communication. This not only enables the team to coordinate their work more effectively (Bolton et al., 2021), but also to develop shared goals, shared knowledge, and mutual respect within the team. These attributes increased the team's ability to adapt to changes that occur (Gittell, 2008; Kozlowski et al., 2009), and the possibility to coordinate their work in response to adaptive triggers such as peak hours, acute alarms, and patient demands (Goldenhar et al., 2013; Grote et al., 2018). Team members prepared together and also looked out for each other and noticed when colleagues needed assistance without explicitly asking for help, all of which relates to the importance of relations and psychological safety in teamwork as described in the literature (Edmondson, 1999; Ceri-Booms et al., 2017; Bolton et al., 2021). Relational team factors stood out in our study as a significant enabler for adaptive capacity particularly for the structural and hybrid teams in both hospitals.

For the responsive and coordinating teams, however, it was challenging to develop these relations due to not working closely together on a regular basis. Instead, they compensated for this by having structural factors in place, like clear role descriptions and procedures that allowed them to function well as a team. Competent and experienced team members added to the likelihood of their success. In addition, the responsive teams regularly undertook simulation-based training focusing

FIGURE 1
Team and factors relevance.
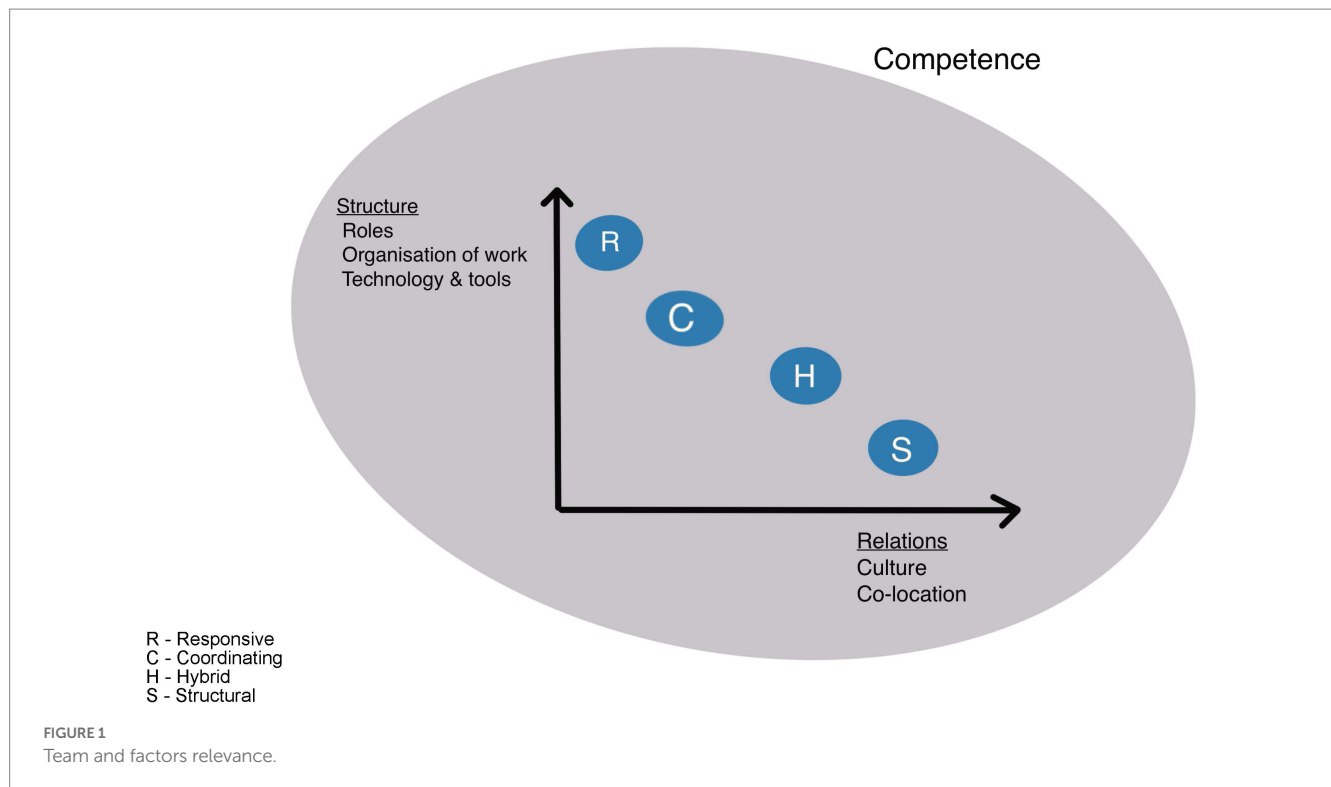
on communication to compensate for the lack of close relationships between the team members, as these teams only come together to perform specialized tasks for short periods of time.

In addition, the coordinating team in hospital 1 was heavily reliant on their software program to understand the total bed capacity situation, mainly due to the size of the team. The larger team in hospital 1 faced greater coordination challenges and had more difficulties developing and maintaining relations than smaller team in hospital 2 (Schmutz et al., 2019). The coordinating team in hospital 1 also relied more on having formal structures in place (e.g., meeting facilitator) compared to hospital 2, where the team was smaller, and the members more well acquainted with each other. This suggests, however, that the size of the team and perhaps the continuity of the team members are factors relevant to adaptive capacity. To a varying degree, both the responsive and the coordinating teams in the smaller hospital 2 had developed close relationships through frequent meetings. Although these teams relied strongly on set procedures in their day-to-day functioning, it was easier for them to decide on actions after initial disagreement due to the psychological safety their established relationships brought to the team (Edmondson, 2002; Schmutz et al., 2019). Our study indicates that no size fits all in terms of how to support these teams in promoting adaptive capacity and implies that team type and organizational settings need to be considered when developing teamwork improvements.

4.2. Structure (roles, organization of work, technology, and tools)

Figure 1 further shows that structuring factors such as roles, procedures, organization of work and provision of tools and technology are important factors for teams' adaptive capacity. As everyday work in

hospitals is characterized by constant fluctuations of work demands and changes to align with the situation, there must be room for maneuvering and flexibility. However, the flexibility has to be complemented by setting boundaries for a team's degree of leeway (Burke et al., 2006a) to avoid the risk of maladaptation's (Wears and Hettinger, 2014; Lyng et al., 2021). In our study we found that these boundaries are in many ways defined in the role descriptions and procedures of clinical work, which was fundamental for all teams, but especially in the coordinating and responsive teams only working together for short periods. Moreover, the set competence requirements, within the teams, safeguard the organizations from maladaptation's due to unqualified personnel. Standardized procedures and formal task assignments can be conceptualized as stabilizing mechanisms. And, similar to the findings of Sanford (Sanford et al., 2022) and colleagues, we found that functional procedures and role descriptions, provide the team members with security in knowing how much, when, and how they can adapt. Therefore, the structural elements around the team are key for enabling adaptive capacity.

Previous research argues that aligning flexibility with stability is key for enabling adaptive capacity in teams (Grote et al., 2018; Salehi and Veitch, 2020). Relating this to our results, we found that for the structural and hybrid teams the respective hospital organizations had provided them with slack resources such as floating staff or staff with a coordinating role that provided the teams with the flexibility to adapt to different emerging situations (Saurin and Werle, 2017; Lyng et al., 2022), or adapt with the aim of maintaining the status quo on the ward, for instance changing the responsibility for work tasks to free up resources to handle deteriorating patients. Our results clearly showed that teams who were co-located and had developed sound relationships with each other (Gittell et al., 2010), could flex more effectively regarding roles and structure, especially to do with the allocation of tasks between team members. This improved the overall

capacity of these types of teams, which would otherwise struggle when demands overloaded their capacity.

Overall, this study demonstrates that the adaptive capacity of all team types depended on the four main factors identified. However, the varying influence of the factors within the different teams, as depicted in Figure 1, indicates that different types of teams could need diverse types of structural parameters, training programs, leadership and relational emphasis when composing team in order to optimize everyday functionality and adaptive capacity. Further research should investigate both larger samples of teams, and how diverse organizational settings or national culture influences adaptive capacity in such types of healthcare teams.

4.3. Strengths and limitations

The study has some strengths and limitations. It is a major strength to combine observations and interviews in a total of eight teams in two different hospitals. This provided us with a rich material to understand adaptive capacity in teams and how team factor enables this. Although we have performed *in situ* observations of the teams, teamwork is dynamic and team members react to each other's words and behaviors' and to the demands of the environment (Anderson and Reedy, 2021). Adaptations most likely reflect these different factors. We did not observe all possible adaptations and their triggers, nonetheless, the results have been derived directly from empirical research using a theory driven combined deductive and inductive approach by a diverse team of researchers with clinical and academic expertise. By describing and aggregating the different factors into higher level themes, we have captured and defined the factors of importance for different types of hospital teams.

4.4. Implication/conclusion

This study has shown that factors for adaptive capacity in hospital teams must be seen in relation to the distinct attributes and circumstances of the teams in question. The key team factors that enable adaptive capacity are related to the technology and tools available for the teams; the specification of roles, procedures, and organization of work within the teams; the team members' competence, and experience, and the internal culture in the team and the relationships between team members. We found that the influence of these factors on team adaptive capacity varied according to the team types. Adaptive capacity in structural and hybrid teams was mainly dependent on relational and cultural factors and by the team being co-located, as these teams had stable membership and roles. The responsive and coordinating teams, however, needed clear structures, roles, and tools and technology available to support their adaptive capacity, as the relational dimension was not as influential on task execution and adaptations within these teams as compared to structural and hybrid teams.

Our results imply that the systems supporting hospital teams must consider the teams' strengths and weaknesses when organizing in and around the teams. Resilient responses to changes and challenges requires resources that are both relational and organizational (Gittell, 2008). The adaptive capacity of a team can be improved by joint

reflections, team training and system improvement (Maynard et al., 2015; Schmutz et al., 2019). These results also indicate that hospitals could improve care quality by investing in competence, training, and activities to improve relations and collaboration in teams. The quality of teamwork is associated with the quality and safety of the care provided (Rosen et al., 2018), and sound team collaboration enhances the patient's experience and outcome (Ashcroft et al., 2023). System improvement should focus on the internal structuring of teams such as ensuring continuity, procedure clarity, and available tools, etc., alongside the organization around teams and the division and coordination of the different complex tasks performed within and across teams in the organization. This could help prevent the types of adverse events and patient safety risks that often occurs during transitions of care (i.e., between care providers or during shift changes) (Rosen et al., 2018). The findings and implications from this study could likely be transferred to other parts of the healthcare system where the work is also carried out by teams. This includes, for example, the noted potential for improving teamwork by offering teams possibilities for reflection and training. However, team context and cultural traits need to be considered, as these are crucial for team operation and may differ significantly. Based on our study, we suggest further research should continue to explore factors for adaptive capacity in different team types, how a team's attributes and circumstances affect its adaptability, and how the adaptive capacity of teams can be best supported.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Regional committee for Medical and Health Research Ethics. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

SW was member of Frontiers editorial board special topic; Occupational Health and Organizational Culture within a Healthcare Setting: Challenges, Complexities, and Dynamics.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The impact of vulnerability and exposure to pervasive interprofessional incivility among medical staff on wellbeing

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Introduction: Traditional methods for modelling human interactions within organisational contexts are often hindered by the complexity inherent within these systems. Building on new approaches to information modelling in the social sciences and drawing on the work of scholars in transdisciplinary fields, we proposed that a reliable model of human interaction as well as its emergent properties can be demonstrated using theories related to emergent information.

Methods: We demonstrated these dynamics through a test case related to data from a prevalence survey of incivility among medical staff. For each survey respondent we defined their vulnerability profile based upon a combination of their biographical characteristics, such as age, gender, and length of employment within a hospital and the hospital type (private or public). We modelled the interactions between the composite vulnerability profile of staff against their reports of their exposure to incivility and the consequent negative impact on their wellbeing.

Results: We found that vulnerability profile appeared to be proportionally related to the extent to which they were exposed to rudeness in the workplace and to a negative impact on subjective wellbeing.

Discussion: This model can potentially be used to tailor resources to improve the wellbeing of hospital medical staff at increased risk of facing incivility, bullying and harassment at their workplaces.

KEYWORDS

healthcare workforce, incivility, organizational culture, medical staff, self-organizing social system, human interaction impact modeling, interprofessional behavior, staff wellbeing

1. Introduction

Over the last decade, researchers have extended the principles of information theory and quantum mechanical formalism to the social sciences (1–3). These innovative lines of enquiry into the nature of human systems have allowed social scientists to explore theoretical frameworks that can help explain the supposed inscrutability inherent within complex human assemblages (4, 5). The study of disruptive or uncivil human behavior within organizations is an area where such theoretical developments may shed light and aid the development of sustainable solutions. Characterizing an organization as an infological system allows for the study of the material, symbolic and system of structures that comprise it (3, 6). For instance, interprofessional behaviors that are enacted, perceived, and received as professional or unprofessional can be viewed as a

combination of moralized, values-laden, and socio-culturally constituted interactions. Consequently, unprofessional behaviors in healthcare organizations are not only emergent properties within human systems but are also profoundly influenced by context. For example, when a senior medical specialist is rude to their intern and publicly corrects them for not responding decisively in a clinical situation, the senior medical specialist may view their own behavior as warranted. However, the intern's experience of the same event may result in psychological harm because of feeling humiliated and belittled, particularly if such interactions occur repeatedly. Therefore, identifying the complex factors that contribute to negative interprofessional staff behaviors, and mitigating their negative impacts on individuals and within organizations can prove challenging.

Traditional frameworks used to study the emergent properties of human interactions such as unprofessional behaviors demand a reductionism of the phenomenon to derive statistically valid evidence (7). Innovative approaches that aim to provide a unified theory of information appear to offer an alternative approach that circumvents this reductionism and progresses the scholarship in this field beyond the dichotomy of determinism. Large organizations are fundamentally designed and structured on the premise of functionalist accounts, therefore framing emergent phenomenon such as unprofessional staff behavior as aberrant or bad (7, 8). Consequently, addressing aberrant events then demands inordinate amounts of resources and modularity in solutions that may not adequately address the related factors that enable these aberrations to remain. The prevalence of unprofessional behaviors within complex and dynamic organizations such as hospitals has been characterized as an endemic and an entrenched phenomenon typical of large healthcare systems (9). The phenomenon of staff unprofessional behavior in hospitals has been portrayed as difficult to model or predict within literature related to patient safety and healthcare organizational management studies. Traditionally, only statistical, qualitative or a combination of these two methods have been used to understand and describe the prevalence of unprofessional behaviors within organizations, and how these cultural elements emerge, unfold, and further inform the behavior of people within professional systems.

Foundational arguments within mathematical anthropology assert that patterns of behaviors not only express shared ideas, beliefs, values, but also demonstrate the structural organization of these human systems (10). In this sense, professionalization, group identity and organizational cultures within occupational groups may reflect features of kin structures and systems of behavior, class organization (11). Indeed, Lévi-Strauss had argued that within the future of kinship studies, not only would structures be composed of commutative classes and networks, but would also be composed of "unpredictable events, whose statistical distribution…will show regularities and provide meaningful clues" (12). In some studies of professional systems in healthcare, demographic similarities, and socio-cultural characteristics among individuals within networks have been described as endowing the self-organizing properties of kinship systems to these professional and practice networks (13). In this context, the emergence of behavioral patterns such as unprofessional behaviors within medical practitioner communities does appear to fit Strauss' conceptualization of unpredictable events that occur with regularity in social systems, and provides us clues about how these groups are organized and structured. However, within contemporary scholarly literature related to unprofessional behaviors within organizations, there is an absence of mathematical representations

about the structural implications of how culture and behavior inform professional human systems. In an effort to understand whether this gap can be filled, it may be worthwhile to combine descriptive statistical methods of study, and data collected using these methods with mathematical representational efforts to ascertain whether the behavioral artifacts of professional practitioner systems and cultures can be modeled to describe how these systems are organized and maintained.

Within organizational improvement studies, staff negative behaviors have typically been viewed through the lens of a subject-object dialectic where perpetrators, victims and the organization are seen as inter-related but, ultimately, distinct. An alternative and possibly better-suited approach to viewing relational and behavioral dynamics in organizations could be derived by applying the paradigm of self-organizing systems. This approach has been discussed by Hofkirchner in "Emergent Information: A Unified Theory of Information Framework" (7). Within this approach, emergent dynamics within self-organizing systems have been described as an evolutionary system where,

> "s_e = (defined as) a collection of
>   (1) elements E that interact such that,
>   (2) relations R emerge that – because of providing synergistic effects – dominate their interaction in (3) a dynamics D"

Therefore, if subcultures within groups of staff and sub-professional units within hospitals are viewed as artifacts of self-organizing systems, the prevalence of unprofessional behaviors such as incivility and rudeness within a hospital can be defined as a by-product of pre-existing dynamics between the members of a professional socio-cultural system. If conditions that give rise to these emergences could all be observable in theory, the prevalence of these unprofessional behaviors could be predicted and therefore, attenuated or even prevented.

Through this article, we aim to demonstrate the emergence of system dynamics as an artifact of self-organization among medical staff. We argue that the emergence of uncivil behaviors such as rudeness, that arise in interactions between hospital medical professionals, can be modeled through a composite of each staff member's individual profile that may make them vulnerable to, or protect them from, system dynamics. We posit that every member within the system can be characterized as a combination of demographic traits that impact their experience within the workplace (14). While not every biographical characteristic can be realistically or reliably measured due to limitations presented by traditional research methods, practice and resources, characteristics that can be captured and have been used for this study are, age (a), gender (g), professional sub-role and associated status (s), length of employment (l) within an organization and type of funding (f) that is used to operate the organization, i.e., private or public (which may indicate the sufficiency of other resources). Each staff member's profile (p) can then be represented as a collection of their a, g, l, and f,

$$p = [a,g,s,l,f]$$

Assuming that self-reported scores for the negative impact on wellbeing from an interpersonal or interprofessional event can be used

to test our argument, we could reason that the impact (i) as well as exposure to unprofessional behaviors (e) should be proportional to the composite of the profile of each staff member. This dynamic can therefore be represented as,

$$p \propto [e,i]$$

2. Methods

As part of an evaluation of a culture change intervention across seven hospitals in three Australian states, a large- scale baseline survey of incivility was conducted in 2017/18 (15). A total of 5,178 staff responded to the survey seeking to establish the prevalence of 26 unprofessional behaviors. Among all respondents, 546 were identified as medical professionals from sub-roles such as surgical staff specialist, medical staff specialist, visiting medical officer, registrar, career or hospital medical officer, medical fellow, resident, or intern. Secondary analysis was undertaken on the data collected from the survey and has been used to report findings presented in this article. The analysis reported in this article pertains only to these 546 medical professionals. Staff indicated the gender they identified with as male, female, other. They were also provided the option of "prefer not to say." Respondents were surveyed on temporal factors such as their length of employment at their current hospital, and their age and gender. Responses indicated as "prefer not to say" or missing responses for gender, length of employment and age were excluded from the analysis. If respondents indicated their sub-roles, these were factored into the analysis. Where this information was not available, a mean score from available data was allotted to respondents. Responses related to the extent of exposure to one item enquiring about rudeness, namely, "In the past 12 months, how often have you experienced the following staff behaviors in this hospital – being spoken to rudely" (scored on a seven-point Likert scale that graded responses as, "never, 1–2 times/year, every few months, around monthly, weekly, daily, and multiple times daily") were extracted and used in this study. Responses to questions related to the other 25 unprofessional behaviors were not included in this analysis as this is intended to be a test case using the event of being spoken to rudely within professional contexts. Responses to the question, "Thinking about your experience of unprofessional staff behaviors in this hospital, to what extent do you believe they have had a negative impact on – you and your wellbeing" were reported on a five-point Likert scale with responses that indicated "no impact, minor impact, moderate impact, major impact and not sure." Missing responses and responses including "prefer not to say" and "not sure" were excluded from the analysis.

Based on Westbrook et al.'s primary analysis, the characteristics that were protective of staff members from being exposed to or negatively impacted by unprofessional behaviors were, being male and being over 55 years of age. Further analysis undertaken on the data related to the factors that influence speaking up among hospital staff indicated that staff who have worked at the hospital site for over 6 years and who work at private rather than public hospitals may also face lower rates of exposure to unprofessional behaviors (16). The scoring strategy presented in Table 1 is based on well-established bivariate relationships which have been shown in other studies to be associated with higher prevalence of bullying etc. (17–21). Composite scores were used to determine vulnerability profile scores for each respondent, where lower scores indicated a higher degree of protection from exposure to unprofessional behaviors and higher scores indicated higher vulnerability.

Scores calculated for each employee were aggregated and visualized using Microsoft Excel to generate a representation of the distribution of scores and relationships between groups of employees according to vulnerability profile (p), negative impact on wellbeing (i) and extent of exposure to rudeness (e).

3. Results

3.1. Staff vulnerability to being exposed to incivility

Based on the scoring strategy presented above, a total of 512 respondents reported all information required in Table 1 and were included in the analysis. Respondents were scored and grouped by their vulnerability profiles, with 0 indicating a low degree of vulnerability of being exposed to rudeness and 6 indicating the highest degree of vulnerability to exposure. Exposure to rudeness and the impact of unprofessional behaviors experienced were examined for each vulnerability category (Table 2). Increasing vulnerability profile scores appear to be associated with increased exposure to rudeness as well as increased negative impact on wellbeing (Table 2; Figure 1).

3.2. Exposure to incivility and negative impact on staff wellbeing

The distribution of scores for 512 respondents were aggregated by exposure to rudeness into seven groups. As described in Table 1, the seven degrees of exposure to rudeness increased incrementally from "never" to multiple times daily." These groups were labeled Group 0 through to Group 6 indicating increasing frequency of exposure. Scores were aggregated and the means and medians calculated for degree of negative impact on wellbeing and extent of exposure to rudeness and plotted against groups of respondents based on vulnerability profile scores. The pattern of distribution of scores is presented in Table 3 and visualized in Figure 2. Based on the distribution of scores, the relationships between the three categories – staff vulnerability to being exposed to rudeness and frequency of exposure to rudeness appears to increase in proportion to vulnerability score. A negative impact on wellbeing appears to be present for all groups who experienced any instances of rudeness. The only group who appears to report no negative impact on their wellbeing are those who have a combination of protective factors such as age, gender (being male), working at a private hospital and working in a function that affords higher professional status.

Based on the distribution of scores for vulnerability profile, exposure, and negative impact for respondents' (Table 3; Figure 2), it appears that the vulnerability profile of respondents is indeed proportional to the extent of exposure to rudeness as well as the negative impact on wellbeing reported by respondents. This relationship can be represented as:

$$p \propto [e,i]$$

Thus, it appears that vulnerability characteristics such as higher age, identifying as male, and working for over 6 years at a private

TABLE 1 Scoring strategy to determine respondents' characteristics for (a) vulnerability profile for respondents based on their biographical characteristics, (b) degree of exposure to rudeness, and (c) the negative impact on respondents' wellbeing because of exposure to rudeness from other hospital staff.

Vulnerability profile score (p)—Total score for biographical characteristics that increase vulnerability to exposure to unprofessional behaviors, such as age, gender, length of employment at hospital site, age, and funding model for hospital site at which respondents work		
Category	Number of respondents	Score allocated
Gender (g)		
Male	299	0
Female	237	1
Prefer not to answer	9	Not included in analysis
Other	1	1
Age (a)		
≥55+	105	0
18–54	428	1
Missing	2	Not included in analysis
Prefer not to answer	11	Not included in analysis
Professional sub-role, if available (s)		
Career/Hospital Medical Officer/Medical Fellow/Registrar	119	1
Intern/ Resident	98	2
Medical Staff Specialist/Surgical Staff Specialist/Visiting Medical Officer	206	0
Missing	89	Average score from responses provided by 423 respondents calculated as 0.7, and assigned to 89 respondents whose sub-roles are missing

Hospital funding type (f) – data from employees who worked across seven hospitals, comprising two public hospitals and five private hospitals		
Public hospital employees	381	1
Private	145	0
Length of employment at site (l)		
<1 years to <6 years	283	1
≥ 6 years	258	0
Missing	5	Not included in analysis

Vulnerability profile score range: maximum possible score of 6 and minimum possible score of 0		
Degree of exposure to rudeness (e) – Respondents who answered the question, "In the past 12months, how often have you experienced the following staff behaviors in this hospital – this has happened to me – being spoken to rudely"		
Never	136	0 (Group 0)
1–2 times / year (assumed average of one instance a year)	140	1 (Group 1)
Every few months (assumed average of one instance a quarter)	96	4 (Group 2)
Around monthly (assumed average of one instance a month)	77	12 (Group 3)
Weekly (assumed average of one instance per week)	65	52 (Group 4)
Daily (assumed average of one instance per weekday at the rate of five working days every week for the whole year)	22	260 (Group 5)
Multiple times daily (assumed average of at least two instances per weekday at the rate of five working days every week for the whole year)	9	520 (Group 6)
Missing	1	Not included in analysis

(Continued)

TABLE 1 (Continued)

Negative impact (i) − Respondents who answered the question, "Thinking about your experience of unprofessional staff behaviors in this hospital, to what extent do you believe they have had a negative impact on: You and your wellbeing"		
No impact	186	0
Minor impact	199	1
Moderate impact	99	2
Major impact	51	3
Not sure	11	Not included in analysis

TABLE 2 Number of respondents categorized by vulnerability profile scores and corresponding exposure to rudeness and negative impact because of being exposed to unprofessional behaviors.

Vulnerability profile score groups	Percentage of respondents who reported any instances of exposure to rudeness	Percentage of respondents who reported any negative impact on their wellbeing because of experiencing unprofessional behaviors	Total respondents within each vulnerability profile group
0	14 (33.33%)	11 (26.19%)	42 (8.2%)
1	43 (53.75%)	31 (38.75%)	80 (15.63%)
2	55 (74.32%)	46 (62.16%)	74 (14.45%)
3	74 (75.51%)	68 (69.39%)	98 (19.14%)
4	69 (93.24%)	60 (81.08%)	74 (14.45%)
5	82 (92.13%)	70 (78.65%)	89 (17.38%)
6	53 (96.36%)	45 (81.82%)	55 (10.74%)
Total respondents	390 (76.17%)	331 (64.65%)	512 (100%)

FIGURE 1
Visualization of proportional increase in percentage of respondents exposed to rudeness against increasing vulnerability profile scores, and percentage of staff who reported any negative impact on their wellbeing because of being exposed to unprofessional behaviors.
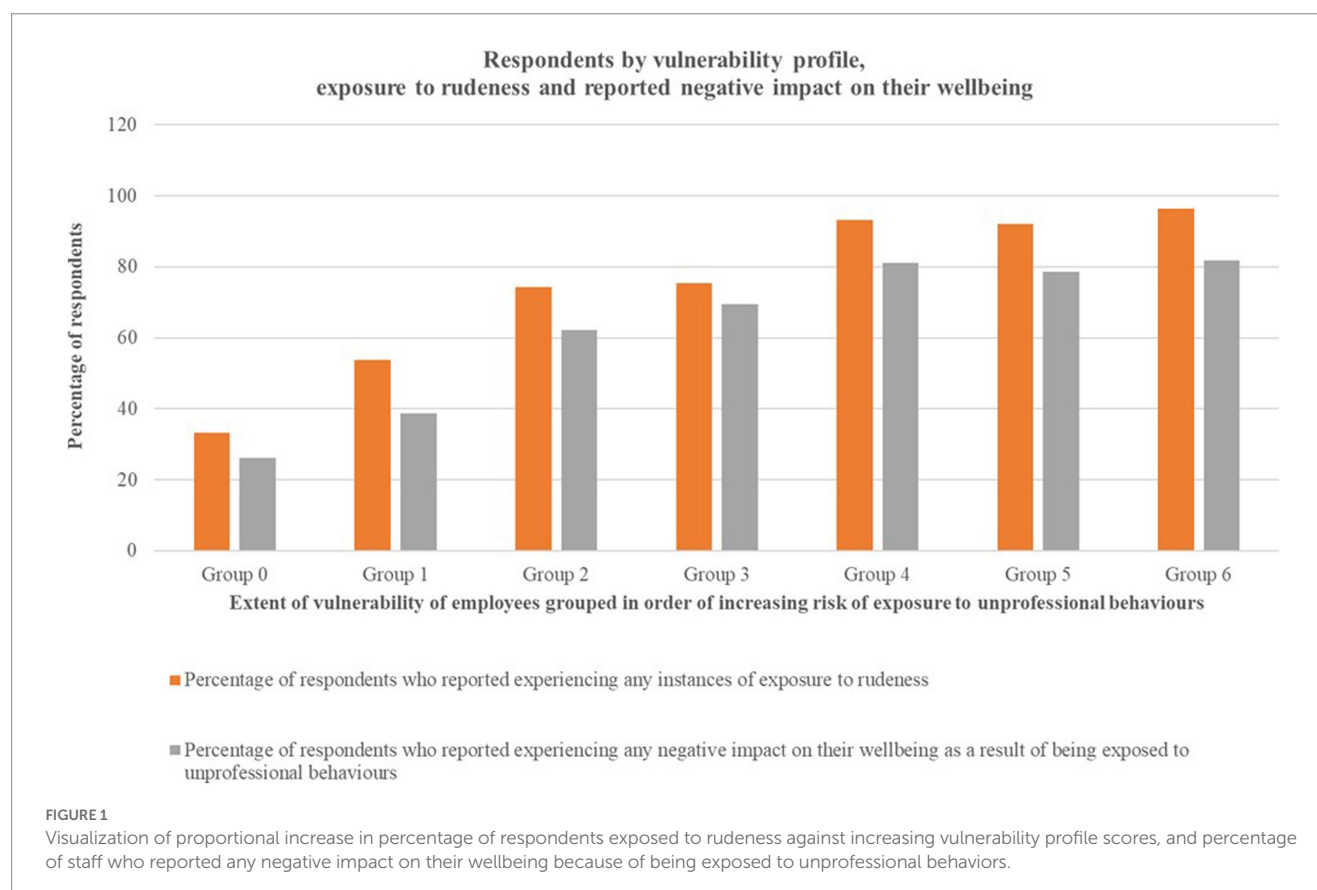
TABLE 3 Distribution of scores for degree of negative impact on wellbeing and extent of exposure to rudeness by respondents' vulnerability profile.

Distribution of scores based on:	Extent of exposure to rudeness in order of increasing exposure (range: 0−6)		Degree of negative impact on wellbeing because of experiencing unprofessional behaviors (range: 0−3)	
Vulnerability profile score that indicates increased risk of exposure to unprofessional behaviors (range: 0−6)	Mean	Median	Mean	Median
Group 0 ($n=42$)	0.55	0.00	0.38	0.00
Group 1 ($n=80$)	0.95	1.00	0.60	0.00
Group 2 ($n=74$)	1.47	1.00	0.96	1.00
Group 3 ($n=98$)	1.69	1.50	1.13	1.00
Group 4 ($n=74$)	2.49	2.50	1.23	1.00
Group 5 ($n=89$)	2.63	3.00	1.18	1.00
Group 6 ($n=55$)	2.85	3.00	1.38	1.00

FIGURE 2
The mean and median scores for extent of exposure of rudeness and degree of negative impact on wellbeing against groups of employees ranked in increasing order of vulnerability profile.
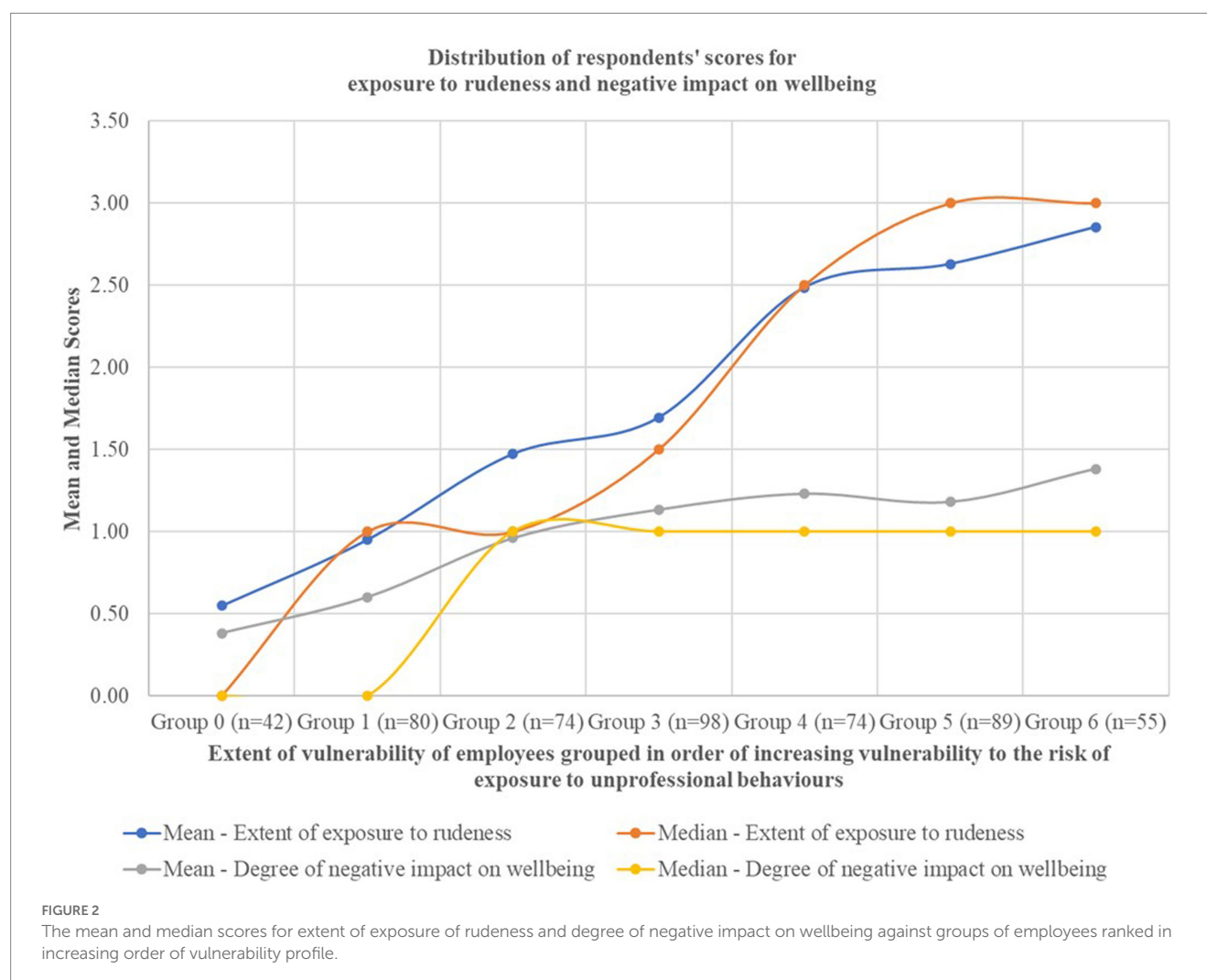
hospital in a role that affords higher influence or professional status, may be protective factors against exposure to uncivil interprofessional behaviors such as rudeness as well as the negative impact on wellbeing resulting from experiencing these behaviors.

4. Discussion

Healthcare organizations usually adopt a risk management and mitigation approach to capture data about incidents where negative

impacts may have been experienced by staff or patients in hospitals (22). However, the quality and type of data related to contributing factors captured by these organizational reporting systems and interventions can often be poor (23). The potential for reporting systems to better reflect systemic factors and how they interact, influence or may be embedded in individual and situational factors is an emerging area of interest in healthcare organization and safety studies (24–26). Despite growing evidence indicating that incivility may have impacts on a range of organizational, staff and patient outcomes, interprofessional staff incivility may not always be explicitly identified nor addressed as a factor within risk management reporting systems and tools (27, 28). Recent scholarship has highlighted the limitations of top-down culture change interventions within healthcare organizations, owing to the systemic challenges within highly stratified healthcare organizations where multiple subcultures coexist (29, 30). Some structural factors that impact staff behavior may include type of hospital funding, consequent staff and service mix, human resourcing models, and resulting patient care capacity differences between private and public hospitals (31). These elements create different working conditions, dynamics and contextual factors that may influence interprofessional and interpersonal staff behavior (32). Therefore, researchers have argued for the need to synthesize a wider range of theories to improve current healthcare organizational risk management approaches (33). A strength of our study is that it demonstrates how such syntheses may be achieved, by using theory-driven information processing approaches to better understand incident and risk reports that hospitals record about staff unprofessional behaviors. We postulated that medical staff in hospitals are differentially exposed to and impacted by unprofessional behaviors, and that their biographical profiles that are a combination of demographic characteristics as well as contextual factors such as hospital funding type and length of employment, may predispose them to being exposed to negative behaviors. While we have not captured the entire loop of factors that impact interactions between staff when negative incidents unfold, nor all the contextual influencers that contribute to the dynamics observed among hospital staff, our preliminary results demonstrate that artifacts of complexity that present as negative behaviors and their flow-on effects can indeed be captured within an information model. We demonstrated that the experience of being targets of unprofessional behaviors may also point to a pattern of behavioral self-organization for medical professionals. This self-organization appears to coalesce despite recommended organizational and professional codes of conduct and regulatory policies that enshrine positive values-based behaviors within these occupations (34). Our findings also provide empirical evidence to support prior studies that argued that the overarching benefits or disadvantages that stem from pre-existing socio-cultural stratification may overflow into professional interactions on micro, meso, and macro scales (35–38). Therefore, a differential approach to achieving equitable wellbeing outcomes for medical staff and other members within healthcare organizations may be required to counteract the negative and uneven prevalence of unprofessional behaviors in hospitals, as well as the consequent negative impacts because of exposure to these behaviors. Finally, this work can be used as foundational evidence to design differentiated training and development approaches as well as automated monitoring and accountability initiatives to disincentivize unprofessional behaviors that have been normalized within sub-groups of medical professionals. Limitations of this study are that it is exploratory in nature, and a range of potentially relevant factors such as race, class, ethnicity, nationality, residential location, immigration status, self-identified

cultural identity and type of employment that may indicate economic precarity (casual, contract work arrangements) have not been captured, and were not built into the study design. Further rigorously designed and more sustained research is warranted to test and validate whether this modeling approach can be used to capture and depict the dynamics of negative behaviors that are part of the cultural features of wider groups of healthcare professionals, organizations, and across diverse geographical and socio-political contexts.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Human Research Ethics approval was granted by St Vincent's Hospital Melbourne Human Research Ethics Committee for a multi-site study (HREC/17/SVHM/237). All participants were over the age of 18, employed at one or more of the study sites, and provided informed consent by agreeing to participate in the LION survey. All methods were carried out in accordance with relevant guidelines and regulations. The patients/participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Work engagement and associated factors among healthcare professionals in the post-pandemic era: a cross-sectional study

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Background: With the shift of strategy in fighting COVID-19, the post-pandemic era is approaching. However, the "hard times" for healthcare systems worldwide are not yet ending. Healthcare professionals suffer negative impacts caused by the epidemic, which may seriously threaten their work motivation, concentration, and patient safety.

Objective: Investigating the status and factors associated with Chinese healthcare professionals' work engagement in the post-pandemic era.

Methods: A cross-sectional study was conducted to investigate healthcare professionals from 10 hospitals in Hunan Province. Data were collected using demographic characteristics, Generalized Anxiety Disorder-2, Patient Heath Qstionaire-2, Utrecht Work Engagement Scale, Work-Related Basic Need Satisfaction Scale, National Aeronautics and Space Administration-Task Load Index, and self-compassion scale. Descriptive and multiple linear regression analyses explored the factors associated with work engagement.

Results: A total of 1,037 eligible healthcare professionals participated in this study, including 46.4% of physicians, 47.8% of nurses, and 5.8% of others. The total mean score of work engagement was 3.36 ± 1.14. The main predictor variables of work engagement were gender ($p = 0.007$), years of work experience ($p < 0.001$), whether currently suffering challenges in the care of patients with COVID-19 ($p = 0.003$), depression ($p < 0.001$), work-related basic need satisfaction ($p < 0.001$), and mindfulness ($p < 0.001$).

Conclusion: Healthcare professionals have a medium level of work engagement. Managers need to pay attention to the physical and psychological health of healthcare professionals, provide adequate support, help them overcome challenges, and acknowledge their contribution and value to improve their work engagement, enhance the quality of care and ensure patient safety.

1. Introduction

Since December 2019, the immediate global pandemic of COVID-19 has brought enormous challenges and shocks to the world's healthcare systems. In order to respond effectively to this public healthcare event, worldwide healthcare professionals, including doctors, nurses, and other disciplines, have been fully engaged in the care of patients with COVID-19 and the prevention and control of the epidemic. However, the enormous number of patients with COVID-19 and the high risk of infection further strain the available medical resources and the medical environment. Frontline healthcare professionals caring for COVID-19 patients are under heavy workloads and psychological stress (1). Healthcare professionals' physical and psychological conditions have become critical research fields during the pandemic outbreak. Studies showed that healthcare professionals suffered from a range of trouble, such as anxiety, depression, burnout, and insomnia during the outbreak (2–4). These issues are detrimental to healthcare professionals' physical and psychological health, seriously affect the quality of care, and threaten patient safety.

With the shift of policy and strategy in fighting COVID-19, global epidemic control has gradually been liberalized. The deregulation of the policy and the downgrading of prevention and control levels have brought tremendous pressure and challenges to healthcare professionals, including the surge of infections, especially among healthcare professionals, marked increased workload, and the shortage of medical resources. Significant deterioration in the quality of care, working conditions, occupational health, and patient safety compared to the situation before the COVID-19 outbreak (5). Effective medicines are still lacking, and the battle against COVID-19 is ongoing. As a professional group, healthcare professionals have an essential role in the care of infected patients and in preventing and controlling the pandemic. However, these disadvantages can seriously threaten the work motivation, dedication, efficiency, and quality of healthcare professionals. Retaining skilled healthcare professionals and continuing their engagement is a huge challenge for healthcare systems. Therefore, investigating the work engagement of healthcare professionals in this particular context is vital.

As an essential component of the PERMA (Positive emotion, Engagement, Relationship, Meaning, Accomplishment) model in positive psychology (6), work engagement has become a popular research topic in positive organizational behavior and human resource management. Work engagement is a work-related positive, enriching emotional and cognitive status comprised of vigor (i.e., high levels of psychological energy during work), dedication (i.e., a sense of significance, enthusiasm and challenge with regard to work), and absorption (i.e., total immersion in one's work) (7). Studies demonstrated that high work engagement was associated with low burnout, reduced turnover intention, increased job satisfaction, enhanced work performance and care quality, promoted patient health outcomes, and positively impacted healthcare systems (8–12). Cai et al. (13) investigated the work engagement of Chinese nurses before the COVID-19 outbreak (2019) and showed that nurses' work engagement was at a medium level. Yin et al. (14) examined the status and typology of frontline nurses' work engagement in China at the beginning of the pandemic (2020) and found that more than 40% of nurses' work engagement was low. However, another study from Spain indicated a high level of work engagement among healthcare

professionals at the beginning of the pandemic (15). Wijngaards et al. (16) discovered that frontline healthcare professionals' work engagement was slightly above average during a period when the Netherlands was gradually relaxing the COVID-19 protective measures (2020). From this, variability in the level of work engagement of healthcare professionals between different studies and contexts exists. Up to now, the COVID-19 epidemic has been lasting for more than 3 years. Confronted with a liberalized epidemic policy, the number of infected patients has soared. Both the healthcare workforce and resources have been challenged and shocked to some extent. In the ongoing battle against COVID-19, healthcare professionals are mentally tensed, exhausted, and also have to deal with their own and family members' infections, which will make them overloaded. Therefore, in this particular context, these negative effects may still be detrimental to the work engagement of healthcare professionals. Notably, no relevant research is available on the status and influencing factors of healthcare professionals' work engagement in the post-epidemic era, namely after the epidemic liberalization.

The conservation of resource theory (COR) was developed by Hobfoll in 1989, which explained stress and burnout in terms of the loss and gain of resources and stated that individuals always strove to protect, maintain and acquire valuable resources (17, 18). This theory suggests that the resources of individuals are limited, including energy, time, and emotions. The individual's resources may be depleted when they are exposed to stressors such as stressful work, role conflict, etc., and a variety of negative outcomes may occur. Accordingly, this study regarded work engagement as a coping behavior of healthcare professionals to protect resources in stressful situations and investigated the potential factors associated with work engagement of healthcare professionals from internal and external resources (see Figure 1) to provide suggestions for improving the work engagement of healthcare professionals.

2. Materials and methods

2.1. Design and setting

A cross-sectional study was conducted to investigate the work engagement of healthcare professionals. Data were collected in 10 hospitals from Hunan Province in January 2023 (after adjusting epidemic prevention and control policies in China). This study followed the STROBE reporting guidelines.

2.2. Participants

Purposive sampling was used to recruit healthcare professionals (doctors, nurses, and others) in 10 hospitals from the Hunan Health Management Association (HNHMA). Inclusion criteria: (i) having professional qualifications; (ii) currently working on the clinical frontline, with no limitation on the departments; and (iii) willing to participate in this study. Exclusion criteria: (i) training; (ii) internship; and (iii) rotation of departments. The sample size for linear regression is at least 10 times the number of independent variables (19). Assuming that all independent variables enter into the regression equation, the number of independent variables for this study is 41 (including dummy variables) and the required sample size is at least 451, considering the 10% invalid questionnaire.
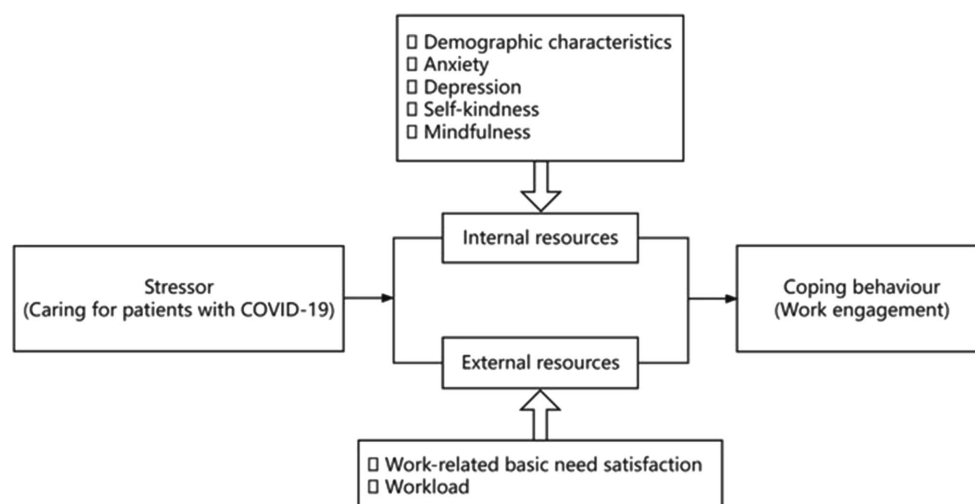
FIGURE 1
The framework in this study (self-designed based on COR and research hypothesis).

Finally, a total of 1,037 healthcare professionals were enrolled and met this requirement.

2.3. Instruments

2.3.1. Demographic characteristics

The basic information of participants, including gender, age, education level, marital status, occupation, professional title, hospital grade, department, years of work experience, the status of COVID-19 infection, the severity of caring for patients with COVID-19, whether having experience in the care of patients with COVID-19, and whether currently suffering challenges in the care of patients with COVID-19 and the type of challenges encountered.

2.3.2. Generalized anxiety disorder-2

The Generalized Anxiety Disorder-2 (GAD-2) was used to assess participants' anxiety symptoms in the past 2 weeks [20]. The scale consists of two items. Each item is scored on a 4-point scale. The total score ranges from 0 to 6, with higher scores indicating higher anxiety levels. The cut-off score is 3. The scale has been used to screen anxiety in healthcare professionals [21]. The Cronbach's α coefficient in this study is 0.845.

2.3.3. Patient health questionnaire-2

The Patient Health Questionnaire-2 (PHQ-2) was used to measure participants' depression symptoms in the past 2 weeks [22]. The scale consists of two items. Each item is scored on a 4-point scale. The total score ranges from 0 to 6, with higher scores indicating higher depression levels. The cut-off score is 3. The scale has been used to screen depression in healthcare professionals [21]. The Cronbach's α coefficient in this study is 0.882.

2.3.4. Utrecht work engagement scale

The Utrecht Work Engagement Scale (UWES-9) was developed by Schaufeli et al. [23] to measure healthcare professionals' work engagement. The UWES-9 comprises nine items clustered in three dimensions (vigor, dedication, and absorption), using a 7-point scale (from 0 = never to 6 = always). The total mean score ranges from 0 to 6 scores. A higher score suggests greater work engagement. The Cronbach's α coefficient in this study is 0.944.

2.3.5. Work-related basic need satisfaction scale

The Work-Related Basic Need Satisfaction Scale (W-BNS) was developed by Van den Broeck et al. [24] to measure healthcare professionals' work-related basic need satisfaction. The W-BNS scale includes 18 items and divides into three dimensions (relatedness, competence, and autonomy), rating on a five-point scale (from 1 = completely disagree to 5 = completely agree). The Cronbach's α coefficient in this study is 0.870.

2.3.6. National Aeronautics and Space Administration-task load index

The National Aeronautics and Space Administration-Task Load Index (NASA-TLX) was developed by Hart et al. [25] to measure healthcare professionals' workloads. The NASA-TLX consists of 6 items that evaluate six dimensions regarding workload, including mental demand, physical demand, temporal demand, performance, effort, and frustration. The score of each item ranges from 0 (low load) to 20 (high load). The lower the performance score, the more perfect the self-performance and the lower the workload. The total score is the sum of each item' score, ranging from 0 to 120, with higher scores indicating a higher load [26]. The Cronbach's α coefficient in this study is 0.813.

2.3.7. Self-compassion scale

The self-compassion scale was developed by Neff et al. [27], with six subscales (self-kindness, common humanity, mindfulness, self-judgment, isolation, and overidentified). The elements of self-compassion are distinct and can be measured separately [28]. This study used the subscales of self-kindness and mindfulness separately to measure health professionals' self-kindness and mindfulness, respectively. The Cronbach's α coefficient for the subscale of

self-kindness in this study is 0.868, and the subscale of self-kindness is 0.893.

2.4. Data collection

This study used electronic questionnaires to collect data via Wenjuanxing.[1] The front page of the electronic questionnaire was the information statement, including the study overview and data confidentiality pledge. Questions can only be entered if the participant clicks to agree to participate in this study, otherwise, they will be automatically logged out. Each ID was set to be filled in only once, and each question was compulsory. In order to ensure the integrity of the data, the questionnaire will be submitted only after all the questions have been completed. Before the survey, the research team obtained informed consent from the hospitals. Then, the researchers explained the purpose of the study, the subjects, and the precautions for department chiefs and nurse managers and sent the QR code of the questionnaire to them via WeChat. Finally, the department chiefs and nurse managers used the uniform information template created by the researcher (including the purpose, significance, subjects, and instructions) to introduce this study to healthcare professionals and motivated healthcare professionals who met the criteria to fill it out carefully in the workgroup. After the electronic questionnaires were completed, two trained researchers checked each questionnaire to ensure their quality.

2.5. Data analysis

Data were analyzed by IBM SPSS 26.0. The scores of work engagement, work-related basic need satisfaction, workloads, self-kindness, and mindfulness showed approximately normal distributions (checked by histograms and normal curves). Mean, standard deviations, frequency, and percentage were used to describe variables. One-way analysis of variance (ANOVA) and t-tests were used to examine the influence of different independent variables on work engagement. Pearson correlation was used to identify the relationships between work-related basic need satisfaction, workloads, self-kindness, and mindfulness with work engagement. Significant variables were included in multiple linear regression for further analysis. Dummy variables of unordered multi-categorical variables used the "Enter" method, while others used the "Stepwise" method to select. The values of "alpha to enter" and "alpha to remove" were, respectively, 0.05 and 0.10. A two-tailed p-value under 0.05 was considered statistically significant.

2.6. Ethical approval

This research was approved by the Ethics Committee of the Second Xiangya Hospital, Central South University (XGFYYJHL-2020). The data collected was encrypted and available only to the researchers.

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1 https://www.wjx.cn/

3. Results

3.1. Characteristics of participants

A total of 1,037 eligible healthcare professionals participated in this study, including 46.4% of physicians, 47.8% of nurses, and 5.8% of others. Most of the participants were 25 years and older. The majority had 11–15 years of experience (23.8%). Over 90% were infected with COVID-19. A large proportion had experience caring for patients with COVID-19 (65.0%). Less than 1/3 had anxiety (31.9%) and depression (24.8%). Detailed information was shown in Table 1. In addition, over two-thirds suffered challenges in the care of patients with COVID-19. The most common challenges were insufficient workforce and larger workloads than before. Details were presented in Table 2.

3.2. The scores of work engagement, work-related basic need satisfaction, workload, self-kindness, and mindfulness

As shown in Table 3, The total mean score of work engagement was 3.36 ± 1.14, indicating healthcare professionals had moderate work engagement. The total scores for work-related basic need satisfaction, workload, self-kindness, and mindfulness were 64.90 ± 9.26, 87.58 ± 19.50, 16.47 ± 3.89, and 14.00 ± 3.05, respectively.

The results of correlation analysis indicated work engagement had a significant positive correlation with work-related basic need satisfaction ($r = 0.620$, $p < 0.01$), self-kindness ($r = 0.364$, $p < 0.01$), and mindfulness ($r = 0.474$, $p < 0.01$), and had a weak negative correlation with workload ($r = -0.125$, $p < 0.01$). Details were presented in Table 4.

3.3. The relationships between independent variables and work engagement

As indicated in Table 1, variables such as gender, age, marital status, occupation, professional title, years of work experience, whether caring for severe and critical types of patients with COVID-19, whether having experience in the care of patients with COVID-19, whether currently suffering challenges in the care of patients with COVID-19, anxiety, and depression were statistically significant with work engagement ($p < 0.05$). On the contrary, others, such as education level, hospital grade, department, and the status of COVID-19 infection were not statistically significant with work engagement ($p > 0.05$).

3.4. The linear regression results among work engagement, work-related basic need satisfaction, workload, self-kindness, mindfulness, and demographic variables

The values of variables entered in the linear regression analyses are detailed in Supplementary Table S1. Results indicated that gender,

years of work experience, whether currently suffering challenges in the care of patients with COVID-19, depression, work-related basic need satisfaction, and mindfulness were the significant predictors of work engagement ($R^2 = 0.500$, adjusted $R^2 = 0.495$, $F = 102.436$, $p < 0.001$), which explained 50.0% of the variance (see Table 5).

4. Discussion

To our knowledge, this study is the first research to investigate healthcare professionals' work engagement in this post-epidemic era. In our study, the total mean score of healthcare professionals' work engagement in the post-epidemic era was 3.36 (SD = 1.14), which was moderate overall. This finding was lower than the studies by Gómez-Salgado et al. (15) in the early phases of the epidemic (total mean score = 5.04, SD = 1.14) and Wijngaards et al. (16) in a period of gradually relaxing COVID-19 protective strategies (total mean score = 4.95, SD = 1.02), which suggests that taking measures to improve healthcare professionals' work engagement after the epidemic liberalization is important. The trajectory of healthcare professionals' work engagement from pre-epidemic, the early stage of the epidemic, to policy liberalization could be further explored.

Exploring influences is critical to developing measures to improve work engagement. This study found gender, years of work experience, whether currently suffering challenges in the care of patients with COVID-19, depression, work-related basic need satisfaction, and mindfulness are significant predictors of work engagement.

Our study showed that gender significantly affected work engagement. Compared to males, females had relatively lower work engagement. However, Rivera et al. (29) indicated that gender was not statistically significant in work engagement. Possibly due to the following. On the one hand, females were significantly more likely to report negative psychological experiences during the epidemic compared to males (30). On the other hand, in the Chinese traditional cultural context, females are primary caregivers of the family, especially when the families are not well, such as infected with COVID-19, which may take up much energy and lead to less work engagement. The result warrants further validation, given that cross-sectional studies cannot deduce a causal relationship.

Years of work experience had a significant influence on work engagement. The work engagement of healthcare professionals with insufficient work experience was relatively low compared to seniors (more than 5 years of work experience), which was consistent with the findings of Bamford et al. (31). Due to the relative inexperience of younger healthcare professionals, the challenges at work have a higher impact on work engagement than those with more experience. Given this, managers need to value younger healthcare professionals and provide support, especially for novice professionals.

This study found that healthcare professionals faced with challenges caring for patients with COVID-19 were less engaged in the work. In addition, we also discovered that the most common challenges were insufficient workforce and larger workloads than before. The implication is that managers need to provide knowledge and psychological support to help employees cope with the challenges, improve the quality of care and improve their physical and mental health.

Healthcare professionals with high levels of mindfulness had higher work engagement, consistent with Kuang et al. (32).

TABLE 1 Characteristics of participants and results of one-way ANOVA and t-test ($N = 1,037$).

Variables	N	%	Work engagement (Mean±SD)	t/F	P
Gender				5.027	<0.001
Male	301	29.0	3.64 ± 1.18		
Female	736	71.0	3.25 ± 1.10		
Age (year)				13.264	<0.001
<25	76	7.3	3.29 ± 1.07		
25 ~ 35	505	48.7	3.17 ± 1.12		
36 ~ 45	317	30.6	3.45 ± 1.11		
46 ~ 55	125	12.1	3.90 ± 1.11		
>55	14	1.4	4.10 ± 0.72		
Education level				0.298	0.827
College degree or lower	166	16.0	3.35 ± 1.22		
Undergraduate degree	771	74.3	3.36 ± 1.13		
Master's degree	90	8.7	3.39 ± 1.08		
Doctor's degree	10	1.0	3.69 ± 0.63		
Marital status				11.178	<0.001
Unmarried	210	20.3	3.04 ± 1.11		
Married	804	77.5	3.44 ± 1.13		
Others	23	2.2	3.69 ± 0.97		
Occupation				15.167	<0.001
Physician	481	46.4	3.52 ± 1.16		
Nurse	496	47.8	3.17 ± 1.09		
Others	60	5.8	3.69 ± 1.01		
Professional title				9.651	<0.001
Primary title	410	39.5	3.24 ± 1.18		
Intermediate title	419	40.4	3.34 ± 1.11		
Senior title	208	20.1	3.66 ± 1.04		
Hospital grade				1.928	0.146
Primary	57	5.5	3.35 ± 1.33		
Secondary	308	29.7	3.26 ± 1.15		
Tertiary	672	64.8	3.41 ± 1.11		
Department				1.731	0.069
Emergency	75	7.2	3.13 ± 1.11		
Outpatient	160	15.4	3.60 ± 1.09		
General internal medicine	222	21.4	3.24 ± 1.25		
General surgery	222	21.4	3.42 ± 1.11		
Infectious diseases	12	1.2	2.98 ± 0.85		
GICU	164	15.8	3.34 ± 1.09		
Specialized ICU	53	5.1	3.40 ± 1.00		
Hemodialysis	24	2.3	3.44 ± 1.25		
Respiratory diseases	40	3.9	3.15 ± 1.24		
Obstetrics and gynecology	35	3.4	3.49 ± 0.98		
Pediatrics	30	2.9	3.49 ± 1.00		
Years of work experience				13.866	<0.001
≤5	223	21.5	3.20 ± 1.15		

(Continued)

TABLE 1 (Continued)

Variables	N	%	Work engagement (Mean±SD)	t/F	P
6–10	245	23.6	3.15 ± 1.13		
11–15	247	23.8	3.27 ± 1.06		
16–20	111	10.7	3.48 ± 1.07		
≥21	211	20.3	3.83 ± 1.12		
The status of COVID-19 infection				0.517	0.596
Infected but recovery	957	92.3	3.37 ± 1.12		
Positive	17	1.6	3.09 ± 1.20		
Negative	63	6.1	3.38 ± 1.33		
The severity of caring for patients with COVID-19					
Mild				−1.080	0.281
Yes	776	74.8	3.38 ± 1.17		
No	261	25.2	3.30 ± 1.03		
Mild with high-risk factors				0.514	0.608
Yes	599	57.8	3.35 ± 1.16		
No	438	42.2	3.38 ± 1.11		
Sub-severe				0.630	0.529
Yes	411	39.6	3.34 ± 1.16		
No	626	60.4	3.38 ± 1.12		
Serious				2.125	0.034
Yes	412	39.7	3.27 ± 1.12		
No	625	60.3	3.42 ± 1.14		
Critical				2.211	0.027
Yes	345	33.3	3.25 ± 1.09		
No	692	66.7	3.42 ± 1.15		
Whether having experience in the care of patients with COVID-19				2.818	0.005
Yes	674	65.0	3.44 ± 1.15		
No	363	35.0	3.23 ± 1.09		
Whether currently suffering challenges in the care of patients with COVID-19				5.468	<0.001
Yes	938	90.5	3.29 ± 1.10		
No	99	9.5	4.01 ± 1.26		
Anxiety				10.148	<0.001
Negative	706	68.1	3.60 ± 1.04		
Positive	331	31.9	2.86 ± 1.17		
Depression				12.724	<0.001
Negative	780	75.2	3.60 ± 1.02		
Positive	257	24.8	2.64 ± 1.15		

ICU, intensive care unit; GICU, general intensive care unit.

TABLE 2 Types of challenges in the care of patients with COVID-19 (N = 1,037).

Category	N	%
Lack of experience		
Yes	406	39.2
No	631	60.8
Lack of knowledge		
Yes	248	23.9
No	789	76.1
Lack of skills		
Yes	255	24.6
No	782	75.4
Lack of ability of thinking		
Yes	261	25.2
No	776	74.8
Lack of effective drugs		
Yes	457	44.1
No	580	55.9
larger workloads than before		
Yes	595	57.4
No	442	42.6
Length of work longer than before		
Yes	500	48.2
No	537	51.8
Insufficient workforce		
Yes	597	57.6
No	440	42.4
Insufficient equipment		
Yes	408	39.3
No	629	60.7
Shortage of beds		
Yes	340	32.8
No	697	67.2
Patient and family adherence		
Yes	382	36.8
No	655	63.2
Work completion		
Yes	200	19.3
No	837	80.7
Powerlessness		
Yes	397	38.3
No	640	61.7
Others		
Yes	13	1.3
No	1,024	98.7
No challenges		
Yes	99	9.5
No	938	90.5

Mindfulness manifests internal resource abundance and has statistical significance on work engagement. Calcagni et al. (33) explored the effects of mindfulness-based interventions on work engagement and demonstrated that the participants' level of work engagement and performance successfully increased after interventions. Healthcare professionals who screened positive for depression were less engaged in their work. Contrary to mindfulness, depression may be a depleting process of internal resources. Decreased work engagement may act as a proactive coping behavior during resource depletion and increased demands at work (34). Therefore, managers are supposed to boost employees' mindfulness through training, and promote the positive emotions of healthcare professionals, to enhance work engagement.

TABLE 3 The scores of work engagement, work-related basic need satisfaction, workload, self-kindness, and mindfulness.

Variables	Mean	SD
Work engagement (UWES-9)		
Vigor	3.25	1.15
Dedication	3.53	1.20
Absorption	3.30	1.25
The total mean score	3.36	1.14
Work-related basic need satisfaction (W-BNS)		
Relatedness	22.97	3.69
Competence	23.01	3.70
Autonomy	18.92	3.93
The total score	64.90	9.26
Workload (NASA-TLX)		
Mental demands	14.25	4.36
Physical demands	15.51	4.28
Temporal demands	15.08	4.25
Performance	15.53	3.88
Effort	16.44	3.71
Frustration	10.77	6.21
The total score	87.58	19.50
Self-kindness	16.47	3.89
Mindfulness	14.00	3.05

UWES-9, Utrecht Work Engagement Scale; W-BNS, Work-Related Basic Need Satisfaction Scale; NASA-TLX, National Aeronautics and Space Administration-Task Load Index.

This study identified that the higher the satisfaction with work-related basic needs, the higher their work engagement. As a reflection of the abundance of external resources, basic needs satisfaction was significantly associated with work engagement. Cheung et al. (35) found frontline nurses lacked support, especially in psychological aspects, and had low job satisfaction. Luo et al. (36) suggested holistically enhancing the support system and increasing attention and support at the individual, family, and organizational levels. Clinical managers should pay more attention to the needs of employees, provide adequate knowledge, skills and psychological support, acknowledge their contribution and value, and thus increase their work engagement.

Notably, this study found no statistical significance between infection status and healthcare professionals' work engagement. Possibly a small number of uninfected healthcare professionals and a large number of the infected in this study resulted in a non-significant difference. This result needs further verification. In addition, although a weak negative correlation existed between workload and work engagement, the regression analysis showed that this variable was not a significant contributor to work engagement. The result differed from Wang et al. (37), which showed that workload decreased work engagement among nurses. However, this result was similar to van Mol et al. (38), which suggested that although the relatively high workload in ICUs and a high emotional burden may be an integral part of ICU work, this workload did not affect work engagement. These surveys differed in population, culture, context, and instruments. Given the variation, the results need to be taken seriously. Regardless, our findings further illustrated that despite the unprecedented challenges and burdens faced by the healthcare professionals, their dedication and sense of duty motivated them to fight against the pandemic and build a life-saving defense.

5. Implications

In the post-epidemic era, managers and researchers need to focus on healthcare professionals' physical and psychological health, especially female and young healthcare professionals, provide adequate support (such as training, psychological interventions, adequate medical supplies, etc.) to meet their needs and help them overcome the challenges in caring for patients with COVID-19, acknowledge their contribution and value to increase their work engagement and improve the quality of care. In addition, the findings of this study further validate the COR theory and enrich the

TABLE 4 The correlations of work engagement, work-related basic need satisfaction, workload, self-kindness, and mindfulness.

Variables	Work engagement	Work-related basic need satisfaction	Workload	Self-kindness	Mindfulness
Work engagement	1				
Work-related basic need satisfaction	0.620**	1			
Workload	−0.125**	−0.190**	1		
Self-kindness	0.364**	0.352**	−0.115**	1	
Mindfulness	0.474**	0.381**	−0.042**	0.708**	1

**p-values < 0.01.

TABLE 5 The result of linear regression analyses.

Variables	B (95% CI)	SE	β	P
Constant	−0.79 (−1.46 to −0.12)	0.34		0.020
Gender	−0.18 (−0.32 to −0.05)	0.07	−0.07	0.007
Years of work experience	0.09 (0.05–0.13)	0.02	0.11	<0.001
Whether currently suffering challenges in the care of patients with COVID-19	−0.26 (−0.44 to −0.09)	0.09	−0.07	0.003
Depression	−0.37 (−0.50 to −0.25)	0.06	−0.14	<0.001
Work-related basic need satisfaction	0.05 (0.05–0.06)	0.00	0.44	<0.001
Mindfulness	0.10 (0.08–0.11)	0.01	0.26	<0.001

$R^2 = 0.500$, adjusted $R^2 = 0.495$, $F = 102.436$, $P < 0.001$.

application context. The theory may provide significant guidance for future relevant research on work engagement.

6. Limitations

Our study also had several limitations. Firstly, the results should be taken cautiously because the sample's representativeness was limited, and a cross-sectional study cannot deduce causal relationships. Secondly, this study was a preliminary exploration of the influencing factors, possibly overlooking other potential factors. Thirdly, this study only investigated healthcare professionals' work engagement after the epidemic liberalization and could not describe its changes from the early stage of the epidemic to the liberalization.

7. Conclusion

Healthcare professionals had a medium level of work engagement. We also found that gender, years of work experience, whether currently suffering challenges in the care of patients with COVID-19, depression, work-related basic need satisfaction, and mindfulness were significant predictors to work engagement. Managers need to pay attention to healthcare professionals' physical and psychological health, provide adequate support, help them overcome challenges, and acknowledge their contribution and value to improve their work engagement and enhance the quality of care.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of the Second Xiangya Hospital, Central South University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

YW: conceptualization, writing – original draft, investigation, methodology, formal analysis, and data curation. LT: conceptualization, investigation, methodology, writing – original draft, and data curation. LL: conceptualization, supervision, review and editing, and data curation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1173117/full#supplementary-material

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The development and validation of the hospital organizational environment scale for medical staff in China

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Objectives: There is currently no measure of the hospital organizational environment targeting both clinicians and nurses in China. This study was conducted with the aim of developing and testing an instrument to assess the properties of the hospital organizational environment that is applicable to Chinese medical staff.

Methods: Items were developed based on a literature review, semi-structured interviews and an expert review and finalized based on corrected item-total correlation, content validity, construct validity, convergent validity, discriminant validity and reliability. The two samples for testing the first and final version of the Hospital Organizational Environment Scale (HOES) included 447 and 424 participants, respectively.

Results: The primary test, which comprised 18 items, contained four factors: hospital culture, work situation, organizational support and scientific research situation. The Cronbach's alphas were 0.935, 0.824, 0.943, and 0.920, respectively. The results of the validation test showed that the questionnaire had good validity and reliability.

Conclusion: The HOES is a comprehensive instrument with demonstrated validity and reliability that can be adopted among medical staff to assess the organizational environment in hospitals.

KEYWORDS

medical staff, questionnaire, development, validation, organizational environment

Background

The "organizational environment," also called the "work environment," is studied in environmental psychology and can be divided into two types: the physical environment and social environment (1). Early studies of environmental psychology mostly focused on the impact of the physical environment on people's mental health and behavior, including factors such as noise, air pollution, climate, and related architectural design (1–3). With the change in social problems, environmental psychology focuses more on exploring the relationship between social environment factors and human behavior (4, 5). Hence, in the study, the organizational environment comprised the psychological and social environment perceived by employees.

There is still a lack of consensus about how the hospital organizational environment is best conceptualized, which directly affects the different scales and dimensions used in the assessment of the organizational environment. The "organizational environment" affects organizational goal setting and operation behaviors, and it can further influence organizational task performance according to Dill (6). Claire Capon's view (7) that the organizational environment mainly includes organizational culture, organizational resources and functions, and member behavior. Aiken (8) believed that the work environment of a hospital can be understood as the internal environment of the organization, which is affected by the work situation, doctor–patient relationships, the organizational culture, etc. The American Association of Critical-Care Nurses (AACN) (9) suggested that the hospital work environment needs to provide organizational support to meet the autonomy needs, the positioning of values and management methods at the organizational system level. In literature reviews (4, 5, 7, 10, 11), numerous theories and different definitions of the work environment have been identified due to differences in research objectives and fields. Based on the above studies, the key elements of the organizational environment include the following four: the hospital organizational culture (12), referring to the cultural mentality, ideology and behavior norms formed by medical personnel in medical practice. And organizational support (13), considering as the overall perception that the organization values their own contribution and pays attention to their well-being. Doctor–patient relationships (14), referring to medical staff's perception of the relationships with patient's in the process of clinical practice. Work situation (15), referring to perception of workload or work-related factors. It can be concluded that the hospital organizational environment is a multidimensional concept referring to the sum of various psychosocial elements of the management system and organizational atmosphere that directly or indirectly affect the mental health and behaviors of medical staff; the hospital organization environment can further influence organizational goal setting and task performance.

The existence and development of any organization is inseparable from its environment, which enables information exchange and resource sharing. If the organizational environment is inconsistent with people's needs, it will have negative effects, such as stress and dissatisfaction (11). For example, due to the special organizational environment of hospitals, health care professionals come into contact with serious diseases and death every day and experience greater physical and psychological pressure than individuals in other professions (16, 17). Aiken et al. (18) found a negative correlation between the work environment and burnout. In addition, Chan and Huak (19) found that a high proportion of doctors and nurses suffered from mental disorders, anxiety, depression and posttraumatic stress disorder. A harmonious hospital work environment can not only reduce the levels of burnout and promote the mental health of medical staff (20) but also improve the quality of medical services for patients (21). Thus, the hospital organizational environment is very important to promote the physical and mental health of medical staff.

Evaluating the hospital organizational environment can help determine medical staff members' feelings about the hospital and strengthen hospital management. The scope and structure of the assessment of the hospital organizational environment should be clearly defined according to the change in the actual situation and cultural context. However, limitations regarding the current hospital organizational environment have been identified in studies, and most of the measurements of the organizational environment were designed based on psychological scales combined with nursing characteristics (20–23). To date, the most widely used organizational environment scale is the Nursing Work Evaluation Index (Nursing Work Index-Revised) (24–26). It was primarily constructed from the perspective of nursing work practice and not from the perspective of the entire organizational system.

Some applicable conditions need to be considered. First, the hierarchical medical system in China is not perfect (27), and tertiary public hospitals undertake most of the medical treatment work. Chinese doctors are not allowed to engage in private practice, so patient disease management needs to be considered in the clinical practice of both nurses and doctors together. Thus, nurses and doctors are confronted with a similar organizational environment and the same clinical workload. In addition, public hospitals employ performance management measures that combine the personal goals of the medical staff with organizational strategic goals. The ability to conduct scientific research is incorporated into the performance appraisal system (28). For Chinese medical staff, promotion to a professional title requires not only excellent clinical practice skills but also certain scientific research abilities. Moreover, scientific research abilities and achievements are also indispensable factors for medical staff in hospital performance evaluations. Chinese medical staff experience serious pressure to perform scientific research in the current organizational environment. There is currently no measurement of the hospital organizational environment that targets both clinicians and nurses who face similar work circumstances. Additionally, current measurement methods fail to take into account both the scientific research stress and clinical workload that nurses and doctors are commonly confronted with. Hence, a universally applicable instrument needs to be developed. Therefore, this study was conducted with the aim of developing and testing an instrument to assess the properties of the hospital organizational environment that is applicable to Chinese medical staff.

Therefore, in this research, the widely recognized concept was summarized in four dimensions (hospital organizational culture, organizational support, doctor–patient relationships, working situation) to determine the basic structure of the hospital organizational environment. Then, in the development phase, we conducted qualitative interviews to collect and discover more information to expand the boundaries of the hospital organizational environment dimension. Finally, we developed a universally applicable instrument assessing the organizational environments of Chinese hospitals.

Methods

Study design overview

The study was performed in three stages: In Phase I, The Hospital Organizational Environment Scale (HOES) items were generated through a comprehensive literature review, semi-structured interviews and discussion with an expert panel specializing in health service management. The experts' opinions regarding the wording, language, ease of use and generalizability to practice were incorporated into the instrument. The content validity was analyzed based on the experts'

opinions. Assessments of construct validity included an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA). In Phase II, the primary test was developed through EFA to ensure that the items were readable, with no lack of clarity or reliability. Then, in Phase III, a validation test was performed through CFA and convergent and discriminant validity analysis to ensure that the scale was valid, explicit and accurate in reflecting the organizational environment among medical staff. The scale construction process is shown in Figure 1.

Patient and public involvement statement

Neither patients nor the public were involved in this study, as this research focused solely on scale development.

Phase I: design of the item pool

Literature research method

The literature research method (29) mainly included two parts: the first part involved determining the theoretical structure of the public hospital organizational environment scale for medical staff in China; the second part involved determining the specific content of the scale for medical staff in China.

The data sources included the following electronic databases: Google Scholar, PubMed, Web of Science, MEDLINE, CNKI, WanFang and CBM. To review the literature, we used the following search terms: (Tertiary public hospitals [Title] + (hospital[Title])*(organizational environment [Title] + (work environment [Title])*(organizational support [Title]) + (organizational culture [Title]) + (doctor–patient relationships [Title]) + (work situation)[Title] + (work stress)

FIGURE 1
Scale construction process.
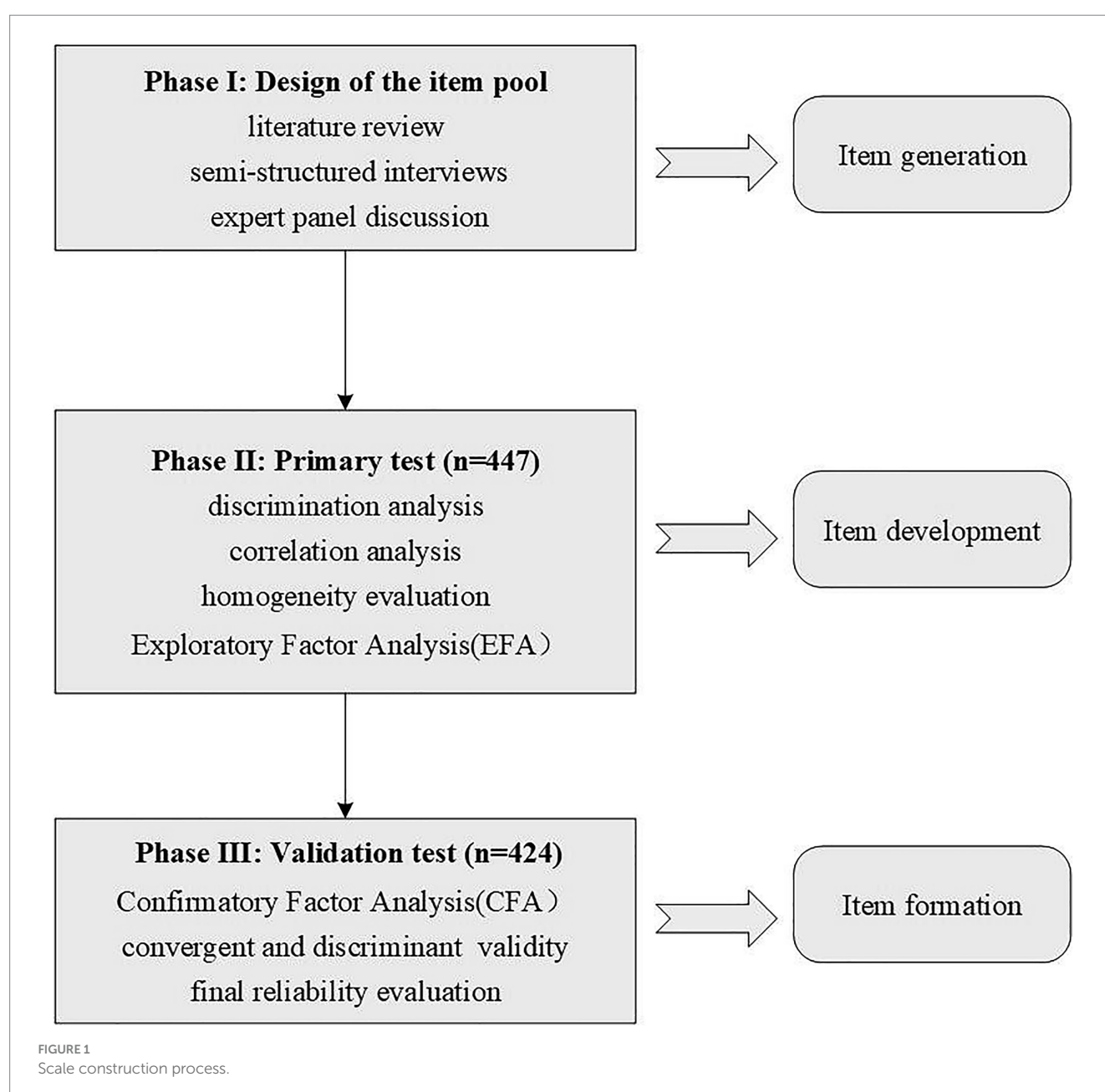
[Title])*((evaluation[Title]) + (assessment[Title]) and ((organizational environment [Title] + (work environment [Title])*((organizational support [Title]) + (organizational culture [Title]) + (doctor–patient relationships [Title]) + (work situation)[Title] + (work stress) [Title])*(evaluation [Title]) + (assessment[Title] + (scale [Title/ Abstract]). The inclusion criteria consisted of all indicators of the hospital organizational environment, including the hospital culture, working situation, organizational support and doctor–patient relationships. The exclusion criteria were indicators that could not be applied to evaluate the organizational environment or indicators with repeated formulations or descriptions. After duplicates and conference reports were removed, 24 papers remained, and based on the team members' intensive reading, 8 papers were considered for inclusion. The retrieved articles (5, 12–15, 24–26) were assessed independently by two authors, information was extracted from the eligible studies, and the English items were preliminarily translated.

Semi-structured interviews

In order to clarify and develop the framework of the theoretical dimensions of the organizational environment, we conducted semi-structured interviews to gain a deeper understanding of the connotation of the hospital organizational environment (30). Twenty medical staff were randomly selected for face-to-face semi-structured interviews that served as a supplement to the current Chinese hospital organizational environment dimensions. All interviewees agreed to the whole process being recorded. The interviews were conducted by three graduate students from the Department of Public Health, Capital Medical University. The interview question was "What do you think the elements of the current organizational environment in public hospitals are?" At the same time, the interviewees' answers were recorded, and when the answers did not involve the content of the mainstream scale, the interviewer asked whether the factors in this aspect were related to the organizational environment until enough interview data were collected to achieve information saturation. Then, members of the research group analyzed the interview results and two experienced bilingual medical experts checked and revised the translated items.

Content validity

Content validity refers to the extent to which the content of a scale reflects or represents the construct that a researcher intends to measure (31). In current practice, qualitative methods are used to evaluate the content validity of a scale. Content validity was assessed based on the following criteria: appropriateness, comprehensibility and clarity of phrasing for all items. The expression of each topic should be as concise and clear as possible, be easy to understand, and have wording. In this study, we invited experts in the field of health service management to make independent judgments based on their own knowledge and work experience, assess the content and expression of each topic, and delete or revise inappropriate or inaccurate topics in all the originally prepared topics. In this study, each item was scored on a five-point Likert scale ranging from "1 = very strongly disagree" to "5 = very strongly agree" (1–5), and seven items were reverse scored.

Phase II: primary test

This stage involved item reduction and the development of the primary test. Sufficient quantity and standard-compliant participants were selected for the EFA to extract key components.

Sample and setting

It is generally accepted by most researchers in the field of social and behavioral sciences that results are more reliable than pretest samples based on the number of items (32). According to the literature report, when evaluating the properties of a scale, the testing sample size should be 5–10 times the number of analysis items (33). In our study, the number of participants in each stage met this condition. Cluster sampling was adopted in this study, and all medical staff were recruited from Hospital Y. There were 416 practicing physicians and 600 registered nurses in Hospital Y. There were 750 hospital beds in Hospital Y (a tertiary hospital should have at least 500 beds). The participants had to meet the following criteria: (1) were registered clinicians or nurses with at least 1 year of clinical or nursing practice experience and (2) agreed to voluntarily participate in this project and signed the informed consent form. Those who were unwilling to cooperate during the investigation were excluded. The questionnaire was developed in the Chinese language. The questionnaire collected demographic information (e.g., age, sex, marital status, professional title, and the number of years of medical work experience) and contained 22 initial HOES items scored on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

Descriptive analysis

Floor and ceiling effects are considered to be present if more than 15% of respondents achieve the lowest or highest possible score, respectively (34). Skewness and kurtosis are rough indicators of a normal distribution of values: skewness is an index of the symmetry of a distribution, while kurtosis is a measure used to describe the tailedness (35). Symmetric distributions have a skewness value of 0 and a kurtosis value of 3 (36). If the skewness value is less than 3 and the kurtosis value is less than 10 (37), it is regarded as basically acceptable that the sample obeys a normal distribution.

Discriminant analysis

The discrimination value refers to the difference between the percentage of correct answers in the high group (the first 27% of the subjects) and that in the low group (the last 27% of the subjects) (38). The main purpose of analyzing the discrimination index value was to determine whether the test could distinguish subjects' abilities. The average score of each item was compared between the high and low groups. We adopted the independent sample t test to assess the differences between participants in the high and low groups. The t value obtained was called the critical ratio (CR), and $p < 0.05$ indicated the significance of the items.

Correlation analysis

This method filters items from the perspective of representativeness and independence (39). We adopted the Pearson correlation coefficient to measure the correlations. The least relevant item was excluded due to its high theoretical association with the same underlying dimension. In this study, the score correlation coefficient between each item and the total items was statistically calculated. A coefficient greater than 0.4 (40) indicated that each item had good representativeness in its dimension.

Homogeneity evaluation

If the standardized Cronbach's α coefficient of a scale increases after a variable is deleted compared with that before deletion, it

indicates that the variable has a hidden danger of reducing the internal consistency of the scale and that the corresponding items should be considered for deletion (38).

Exploratory factor analysis

EFA extracts a certain number of common factors from all items according to the structure envisaged by the measuring tool and considers the composition of each principal component according to the results of common factor extraction and the load of each index on the common factor. In this study, first, the suitability condition of the EFA was assessed by Bartlett's test (41) and the Kaiser–Meyer–Olkin (KMO) measure. According to Kaiser (42), whether items are suitable for factor analysis can be judged from the KMO index value. A KMO sampling adequacy value greater than 0.90 indicates that the relationship between item variables is excellent (43). Then, factors with eigenvalues >1 were retained (44). Factor analysis with the maximum variance method was used to extract the principal factors of the organizational environment. Then, the factor loading matrix was obtained by the Kaiser standardized orthogonal rotation method. The loading of the item on the principal factor was required to be greater than 0.50. If the loading value for the item on each principal factor was less than 0.5, deletion was considered when the loading values on two or more principal factors were greater than 0.5 (45).

Phase III: validation test

In this stage, a validation test was performed for item formation, and eligible participants were selected to perform the CFA using M-Plus 8.0.

Sample and setting

Using the same inclusion and exclusion criteria as above, study participants were enrolled from Hospital S. There were 403 practicing physicians and 402 registered nurses in Hospital S, which had 450 hospital beds. Confirmatory analysis was performed for Hospital S. The questionnaire collected demographic information (e.g., age, sex, marital status, professional title, and the number of years of medical work experience) and contained 18 initial HOES items.

Convergent and discriminant validity

The convergent and discriminant validity of the instrument were evaluated through Fornell and Larcker's (46) approach using the average variance extracted (AVE) and composite reliability (CR). Convergent validity is confirmed if the items of the intended scale show strong correlations. In addition, discriminant validity is supported when the extracted factors are distinct from each other. To confirm convergent validity, the AVE should be greater than 0.5, and the CR value should be greater than the AVE. However, discriminant validity is maintained if the AVE is greater than the maximum shared squared variance (MSV) and the average of squared variance (ASV).

CFA

We performed a CFA (47) to test the fitness of the factor structure extracted from the original 4-factor subscales of the 18-item scale. The extracted factor model was evaluated via maximum likelihood estimation using the following model fit indices (48, 49): the comparative fit index (CFI), Tucker–Lewis index (TLI), root mean

score error of approximation (RMSEA), freedom (CMIN/DF), standardized root mean square residual (SRMR), chi-square test of model fit and degrees of freedom (χ^2/df). The fit of the model was judged based on the chi-square test of model fit and degrees of freedom (χ^2/df < 5), RMSEA (RMSEA < 0.1), CFI (CFI > 0.9), Tucker–Lewis index (TLI > 0.9), and SRMR (SRMR < 0.05).

Reliability evaluation

Cronbach's α coefficient was used to assess the internal consistency of the total scale and subscales (50). This method involves calculating the Cronbach's α coefficients of the scale. An acceptable internal consistency is ensured with a coefficient greater than 0.7 (51).

Data collection

The two databases were collected through online platforms, and questionnaire completion was voluntary and anonymous. The first version of the HOES (22 items) was administered to a sample of 447 clinicians and nurses in Beijing Hospital Y, a tertiary hospital, from May 13 to May 20, 2021. Similarly, the final version of the HOES (18 items) was administered to a sample of 424 participants from Beijing Hospital S, a tertiary hospital, from June 10 to July 19, 2021. The valid response rate of the questionnaire was 76.8%.

Results

Preliminary item pool

According to the initially constructed conceptual framework, after referring to existing scales and published literature, a 32-item questionnaire was drafted, including the hospital culture (14 items), work situation (9 items), organizational support (5 items), and doctor–patient relationships (4 items) dimensions.

To make the organizational environment concept more in accordance with the actual work environment and occupational characteristics of Chinese medical staff, this study conducted semi-structured interviews to supplement the item pool. The interview results showed that the elements of the hospital organizational environment were basically consistent with the preliminary framework of the scale, except that scientific research situation was found to be important in public hospitals. Hence, the item pool comprised 36 items and the following 5 dimensions: hospital culture (14 items), work situation (9 items), organizational support (5 items), doctor–patient relationships (4 items) and scientific research situation (4 items).

Content validity

The experts discussed the initial scale items repeatedly by using the focus group discussion method, deleting items with similar and irrelevant expressions, and adjusting the order and wording of sentences to form the initial scale. Any similar or ambiguous items were grouped together or excluded after two rounds of expert meetings. The development of the scale strictly followed the scientific scale preparation process and integrated the theories related to organizational environments to ensure the systematic and comprehensive nature of this scale. Interviews verified the adaptability

of the scale dimensions and items in the current era, and the questionnaire items were basically compiled based on the mainstream scale items. Hence, the content validity of all items was proven to be appropriate, comprehensive, clear and understandable. The number of initial items was reduced to 22.

Demographic data of participants

In this study, a total of 424 medical staff members were recruited from Hospital S, and 447 medical staff members were recruited from Hospital Y. Table 1 shows that the sex gap of the hospital's medical staff was wide, with more women than men.

The medical staff were mainly concentrated in group aged 31–40 years old, which was the main working age. A large number of medical staff in the two hospitals were married and had a primary title; for the most part, the medical staff were officially enrolled and did not have a large number of working years.

Descriptive analysis of items

As shown in Table 2, the average item value was 2.62–4.47, the standard deviation was 0.59–1.35, the floor effect (score = 1) was 0.23–23.11%, and the ceiling effect (score = 5) was 0.94–57.34%. In this study, there was almost no floor effect in the hospital organizational environment questionnaire for medical staff, but there was a ceiling

effect, especially in the hospital culture dimension. Although there was ceiling effect, the proportion of participants with the lowest score and the highest score at the dimension level was less than 15%. It can be considered that there was no floor or ceiling effect at the dimension level. In addition, the skewness coefficient of each item was between −1.616 and 0.285, and the kurtosis coefficient was between −0.983 and 2.551. The data can be regarded as having an approximately normal distribution.

Primary evaluation

Discriminant analysis

The discriminant analysis results showed that all items were significant in the high and low groups ($p < 0.001$) (Table 3). In this stage, the 22-item version appeared to have discrimination and to warrant further development.

Correlation analysis

According to the results of the overall correlation analysis (Table 3), the correlation coefficients between each variable and the total score of the 22 items were statistically significant ($p < 0.01$), and the absolute value and the new dimension score of each variable were the highest, indicating that each variable had good representativeness in its dimension. In this stage, the 22-item version of the questionnaire appeared to have sufficient correlation and to warrant further development.

TABLE 1 Demographic characteristics of the participants.

Variable		Hospital S $N = 424$ (%)	Hospital Y $N = 447$ (%)
Age (years)	≤30	107 (25.2)	75 (16.7)
	31–40	236 (55.7)	211 (47.2)
	41–50	58 (13.7)	112 (25.1)
	≥51	23 (5.4)	49 (10.7)
Sex	Male	64 (15.1)	57(12.8)
	Female	360 (84.9)	390(87.2)
Marital status	Unmarried	77 (18.2)	71(15.9)
	Married	340 (80.2)	365(81.7)
	Separated/divorced	7 (1.6)	11(2.5)
Professional title	Primary title and below	252 (59.4)	163 (36.5)
	Middle title	122 (28.8)	197 (44.1)
	Vice-senior title	38 (9.0)	51 (11.4)
	Senior title	12 (2.8)	36 (8.1)
Human resources	Officially enrolled	226 (53.3)	297 (66.4)
	Officially unenrolled	194 (45.8)	147 (32.9)
	Other situations	4 (9)	3 (7)
Medical work experience (years)	<5	105 (24.8)	46 (10.3)
	6–10	133 (31.4)	104 (23.3)
	11–20	114 (26.9)	171 (38.3)
	21–30	58 (13.7)	85 (19.0)
	30	14 (3.3)	41 (9.2)

TABLE 2 Descriptive analysis of initial questionnaire item scores.

Items	Mean ± SD	Skewness	Kurtosis	Floor effect (%)	Ceiling effect (%)
Item 1	4.47 ± 0.788	−1.616	2.551	0.45	53.30
Item 2	4.62 ± 0.586	−1.357	1.170	0.46	57.34
Item 3	4.33 ± 0.854	−1.278	1.338	0.67	53.02
Item 4	4.48 ± 0.742	−1.546	2.432	0.23	0.94
Item 5	4.38 ± 0.823	−1.496	2.515	1.13	1.12
Item 6	4.45 ± 0.764	−1.388	1.662	0.56	58.83
Item 7	4.40 ± 0.783	−1.253	1.230	0.54	50.70
Item 8	3.89 ± 1.115	−0.904	0.126	4.53	33.25
Item 9	4.18 ± 0.961	−1.188	1.037	1.85	46.31
Item 10	2.77 ± 1.349	0.194	−1.156	22.82	13.42
Item 11	3.05 ± 1.329	−0.098	−1.129	13.44	16.55
Item 12	4.14 ± 0.853	−0.778	0.154	1.65	39.82
Item 13	2.79 ± 1.305	0.221	−1.054	14.15	12.98
Item 14	3.81 ± 1.032	−0.634	−0.285	2.01	28.86
Item 15	2.75 ± 1.284	0.285	−0.983	15.33	12.53
Item 16	4.23 ± 0.857	−1.063	0.993	0.94	38.68
Item 17	4.19 ± 0.871	−0.906	0.495	2.34	37.03
Item 18	4.30 ± 0.799	−1.080	1.028	10.37	43.86
Item 19	4.13 ± 0.909	−0.781	0.035	11.86	35.38
Item 20	2.62 ± 1.268	0.219	−0.879	23.11	10.07
Item 21	2.85 ± 1.299	0.126	−1.009	19.46	13.87
Item 22	3.19 ± 1.290	−0.215	−0.983	13.65	16.98

TABLE 3 HOES item analysis.

Item	CR	Corrected item-total correlation	Cronbach α if the item is deleted
1. The hospital has a harmonious working atmosphere and a good culture	−18.037***	0.690**	0.902
2. Colleagues get along well and help each other	−16.311***	0.637**	0.904
3. The smooth coordination between hospital departments can effectively solve problems for patients	−19.556***	0.725**	0.901
4. Leaders have strong leadership and decision-making abilities	−17.743***	0.715**	0.902
5. Hospital functional departments have strong executive abilities	−17.417***	0.706**	0.901
6. The hospital provides a good opportunity for my promotion to a professional title	−20.709***	0.694**	0.902
7. The hospital does its best to provide me with training and exchange opportunities	−17.980***	0.736**	0.901
8. I'm satisfied with my salary and performance awards	−19.249***	0.645**	0.902
9. The working environment of the hospital is clean and comfortable	−19.539***	0.696**	0.901
10. I always have work to do	−9.003***	0.505**	0.908
11. I often work overtime in my job	−8.245***	0.533**	0.907
12. I can handle the current clinical work stress	−9.125***	0.536**	0.905
13. There are occupational exposures around me that could endanger my health	−7.080***	0.459**	0.909
14. Patients are courteous and respectful during the provision of medical care	−7.603***	0.472**	0.907
15. I have occasionally received verbal or violent threats or injuries from patients in my work	−5.808***	0.373**	0.911
16. The hospital respects my goals and values	−20.048***	0.747**	0.900
17. When I need special help, the hospital will help as much as possible	−18.556***	0.719**	0.901
18. The hospital cares about the health of the staff	−15.852***	0.701**	0.902
19. My opinions and suggestions on hospital development are listened to	−22.208***	0.742**	0.900
20. I feel much pressure from my research work	−11.656***	0.497**	0.907
21. I'm worried about how to complete research tasks	−12.726***	0.540**	0.906
22. I'm depressed and unhappy about my scientific work	−15.908***	0.557**	0.906

**$p < 0.01$, ***$p < 0.001$; CR (critical ratio).

TABLE 4 Factors extracted from the HOES.

Items	Factor 1	Factor 2	Factor 3	Factor 4	Eigenvalue	% of variance
Hospital Culture (HC)						
1. The hospital has a harmonious working atmosphere and a good culture	**0.806**	0.291	0.094	−0.005	6.089	33.829
2. Colleagues get along well and help each other	**0.794**	0.192	0.114	−0.010		
3. The smooth coordination between hospital departments can effectively solve problems for patients	**0.820**	0.264	0.084	0.100		
4. Leaders have strong leadership and decision-making abilities	**0.855**	0.295	0.049	0.034		
5. Hospital functional departments have strong executive abilities	**0.829**	0.313	−0.002	0.101		
6. The hospital provides a good opportunity for my promotion to a professional title	**0.747**	0.379	0.015	0.093		
7. The hospital does its best to provide me with training and exchange opportunities	**0.757**	0.458	0.038	0.049		
8. I'm satisfied with my salary and performance awards	**0.545**	0.497	−0.033	0.117		
9. The working environment of the hospital is clean and comfortable	**0.672**	0.417	0.040	0.100		
Work Situation (WS)					1.659	9.217
10. I always have work to do	0.062	0.047	0.280	**0.877**		
11. I often work overtime in my job	0.117	0.035	0.343	**0.837**		
Organizational Support (OS)					3.709	20.604
16. The hospital respects my goals and values	0.476	**0.775**	0.079	0.053		
17. When I need special help, the hospital will help as much as possible	0.408	**0.832**	0.072	0.031		
18. The hospital cares about the health of the staff	0.439	**0.791**	0.095	−0.039		
19. My opinions and suggestions on hospital development are listened to	0.475	**0.789**	0.055	0.060		
Scientific Research Situation (SRS)						
20. I feel much pressure from my research work	0.025	0.031	**0.872**	0.250	2.692	14.956
21. I'm worried about how to complete research tasks	0.072	0.032	**0.929**	0.193		
22. I'm depressed and unhappy about my scientific work	0.080	0.104	**0.902**	0.157		

The bold values indicate the factor loading coefficients for the item under that dimension.

Homogeneity analysis

The homogeneity analysis results are shown in Table 3. Items 13 and 15 were removed due to the risk of reducing the overall reliability of the scale. Twenty items were retained in the scale after the item analysis.

Construct validity

EFA

An EFA was performed on the data obtained from 447 medical staff in Hospital Y, which initially generated five factors (KMO = 0.927, Bartlett's test of sphericity $\chi^2 = 7767.003$, df = 190, $p < 0.001$) with a total explained variance of 71.210%. However, the fit was poor, and one factor was removed, as the eigenvalue of 0.471 was lower than 1. Two items (Items 12 and 14) were omitted due to nonsignificant factor loadings (< 0.5). After the final round of EFA (KMO = 0.921, Bartlett's test of sphericity $\chi^2 = 7394.295$, df = 153, $p < 0.001$) on the remaining 18 items, 4 factors were produced,

explaining 78.606% of the variance, and each eigenvalue was over 1 (Table 4). The explained variance of these four factors was 33.829%, 20.604%, 14.956%, and 9.217%, respectively. Based on the EFA results, the first factor contained nine items and was identified as hospital culture. The second factor was defined as work situation and contained two items. Four items were loaded on the third factor, which was defined as organizational support. Finally, three items described the scientific research situation. Overall, in the primary evaluation, most items fell into the corresponding dimensions, so it could be preliminarily stated that the HOES had good structural validity.

CFA

The extracted factor structure was evaluated using CFA, and data were obtained from the 424 participants in Hospital S. The goodness-of-fit of the four-factor structure model (Figure 2) of the HOES was determined. The calculated goodness-of-fit indices were as follows: χ^2/df = 3.273, CFI = 0.957, RMSEA = 0.074, TLI = 0.949, and SRMR = 0.035. These indices confirmed the model's goodness-of-fit.
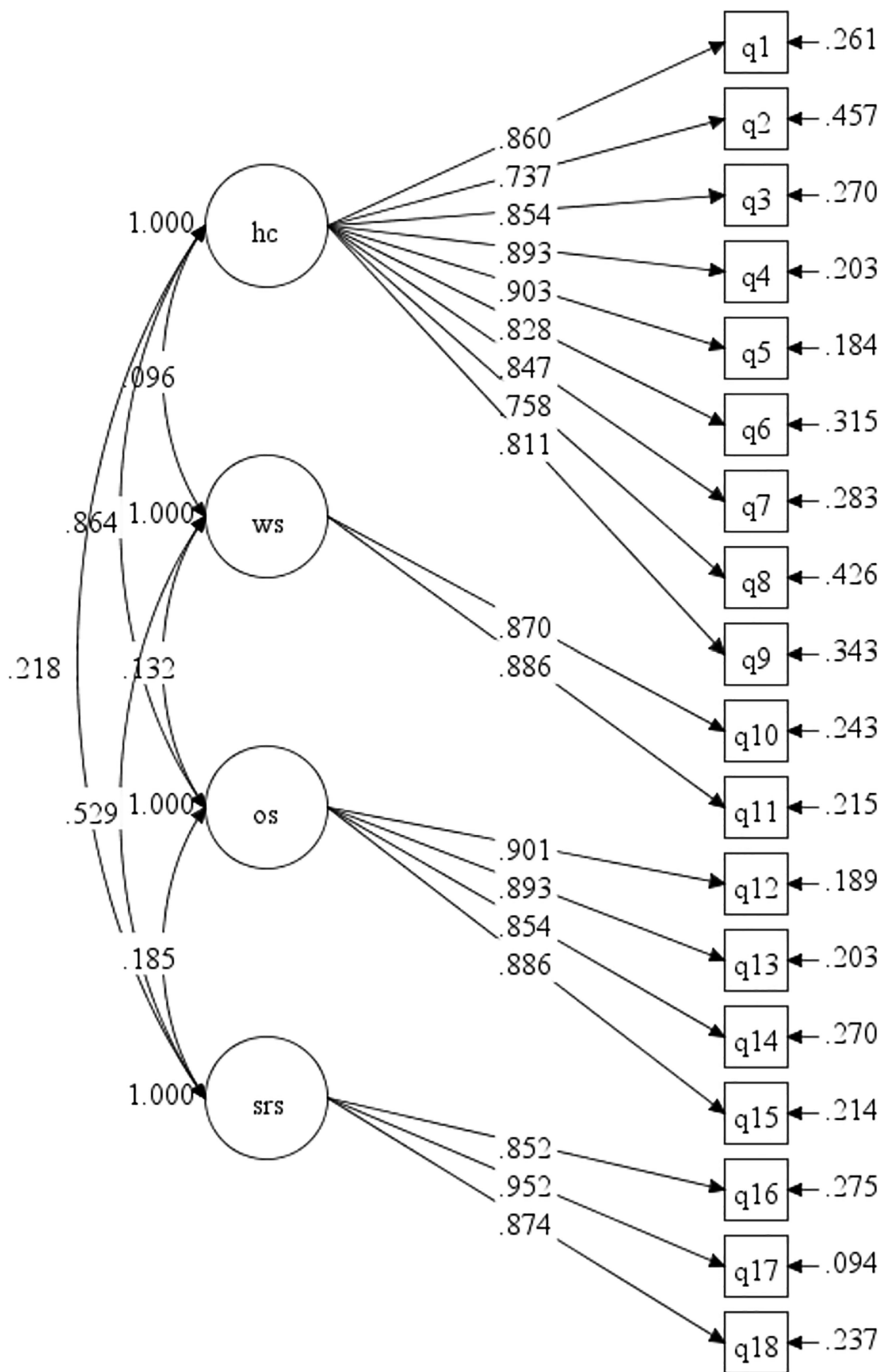
FIGURE 2
The CFA model of the HOES. HC, hospital culture; WS, work situation; OS, organizational support; SRS, scientific research situation.

TABLE 5 Convergent validity, discriminant validity, and reliability indices of the HOES.

Index Factor	AVE	MSV	ASV	CR	Cronbach's alpha
Hospital Culture (HC)	0.697	0.744	0.375	0.954	0.935
Work Situation (WS)	0.776	0.303	0.240	0.874	0.824
Organizational Support (OS)	0.785	0.744	0.370	0.936	0.943
Scientific Research Situation (SRS)	0.804	0.303	0.298	0.925	0.920

AVE, Average Variance Extracted; MSV, Maximum Shared Squared Variance; ASV, Average of squared variance; CR, Composite reliability.

TABLE 6 The final version of the HOES and the scores of medical staff in the two hospitals.

Scale/items	Hospital S $N = 424$	Hospital Y $N = 447$	T test P	Doctors $N = 392$	Nurses $N = 479$	T test P
	$\bar{x} \pm SD$	$\bar{x} \pm SD$		$\bar{x} \pm SD$	$\bar{x} \pm SD$	
Total scale	14.19 ± 2.75	14.36 ± 2.77	>0.05	14.18 ± 2.63	14.36 ± 2.86	>0.05
Hospital Culture (HC)	4.26 ± 0.72	4.36 ± 0.69	>0.05	4.36 ± 0.68	4.27 ± 0.73	>0.05
1. The hospital has a harmonious working atmosphere and a good culture						
2. Colleagues get along well and help each other						
3. The smooth coordination between hospital departments can effectively solve problems for patients						
4. Leaders have strong leadership and decision-making abilities						
5. Hospital functional departments have strong executive abilities						
6. The hospital provides a good opportunity for my promotion to a professional title						
7. The hospital does its best to provide me with training and exchange opportunities						
8. I'm satisfied with my salary and performance awards						
9. The working environment of the hospital is clean and comfortable						
Work Situation (WS)	3.01 ± 1.23	2.91 ± 1.23	>0.05	2.87 ± 1.23	3.02 ± 1.23	>0.05
10. I always have work to do						
11. I often work overtime in my job						
Organizational Support (OS)	4.11 ± 0.81	4.21 ± 0.79	>0.05	4.21 ± 0.80	4.12 ± 0.79	>0.05
12. The hospital respects my goals and values						
13. When I need special help, the hospital will help as much as possible						
14. The hospital cares about the health of the staff						
15. My opinions and suggestions on hospital development are listened to						
Scientific Research Situation (SRS)	2.81 ± 1.20	2.86 ± 1.19	< 0.05	2.74 ± 1.16	2.93 ± 1.22	<0.05
16. I feel much pressure from my research work						
17. I'm worried about how to complete research tasks						
18. I'm depressed and unhappy about my scientific work						

Convergent and discriminant validity

As shown in Table 5, the AVE was greater than 0.5 for all factors, and the CR value was greater than the AVE, which indicated great convergent validity. In addition, the AVE of Factors 2, 3, and 4 was greater than the MSV, and the ASV of four factors was less than the AVE. The discriminant validity of the HOES was confirmed.

Reliability

As shown in Table 5, the Cronbach's alpha coefficient (α) for the total scale was 0.910, which is considerably higher than the recommended value of 0.70. The internal consistency and composite reliability indices of the four dimensions were greater than 0.7, confirming the acceptable internal consistency and reliability of the factors. The scale reflecting the hospital organizational environment ultimately included four dimensions and 18 items.

Scoring

The final version of the HOES and the scores of medical staff in the two hospitals are shown in Table 6. We calculated the mean scores of the four dimensions by dividing the sum of the scores by the number of items. Then, we added the average scores of each dimension to obtain the score of the full scale. The total HOES score of the medical staff in Hospital S was 14.19 ± 2.75, while that of the medical staff in Hospital Y was 14.36 ± 2.77. There was no difference in the total scores or scores on the 4 dimensions between the two hospitals ($p > 0.05$). In addition, the total mean HOES score of the doctors was 14.18 ± 2.63, while that of the nurses was 14.36 ± 2.86. The univariate analysis results of this study showed that there were no significant differences in the total scores and scores on 3 dimensions between the doctors and nurses ($p > 0.05$). There was a significant difference in the scientific research situation score between the doctors and nurses ($p < 0.05$).

Discussion

In this study, the Chinese Hospital Organizational Environment Scale was developed through a standard and rigorous questionnaire development process. In the questionnaire development process, based on the actual work situation and psychological state of medical staff in Chinese public hospitals, a five-point Likert scale was used to enable medical staff to describe their current organizational environment more objectively. Based on our findings, the HOES had good internal consistency and validity. The acceptable explained variance of the scale confirmed its ability to measure the work environment among medical staff in China and could stably, reliably and accurately reflect the current level of the organizational environment perceived by Chinese medical staff.

This is the first study considering both clinicians and nurses to develop a detailed validation of a scale to assess hospital organizational environments. It applies to a wider subject group than previous scales targeting nurses. Compared to the Practice Environment Scale of the Nursing Work Index (NWI-PES) (22), the HOES developed in this study is a more specific tool that integrates factors related to practical conditions; the NWI-PES is composed of 31 items and 5 subscales: nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse–physician relationships (52). Based on the actual situation in China, the constituent factors of the hospital organizational environment were summarized in this study. The HOES contains 18 items, five of which are reverse scored, and 4 subscales. Higher scores indicate a better work environment perceived by medical staff in China.

The first HOES subscale is hospital culture, which contains 9 items that refer to the overall hospital atmosphere. Hospitals with a "people-oriented" management culture realize the common value orientation of employees as the core, with the goal of developing team spirit (12). At present, China's medical and health system reform has begun to improve the welfare of medical workers, focusing on their long-term career development. Only when the hospital culture is humanized can the organizational environment of the hospital be optimized and its development be sustainable.

The second HOES subscale is work situation, with 2 items reflecting the work intensity and work hours of the medical staff, which focus on the characteristics of the work itself and the occupational risks (24). Tertiary public hospitals are the main providers of medical services in China. Although a hierarchical medical system has been implemented, most patients still choose tertiary public hospitals for treatment when they first become ill due to the limited resources of primary medical and health institutions and inadequate medical service levels (53). This leads to a heavy workload and long work hours for medical staff in tertiary public hospitals, which is a problem that should be urgently addressed.

The third HOES subscale is organizational support, with 4 items evaluating the degree of support from the organization for the staff's well-being (13). One study (54) showed that organizational support can affect doctors' job satisfaction. The support and recognition perceived by hospital medical staff could generate positive work attitudes and enthusiasm. In contrast, if medical staff do not feel that their efforts and contributions are valued, their cognition can weaken their enthusiasm and sense of responsibility in the hospital and even lead them to consider leaving their jobs (55). Thus, hospital organizational support is a key part of the organizational environment that determines the working attitudes of medical staff.

The fourth HOES subscale is the scientific research situation, with 3 items representing the most defining characteristics of the Chinese hospital environment combined with the characteristics of the hospital performance appraisal, professional title promotion and other systems (56). In addition to their clinical practice, most medical staff have no choice but to refer to a large number of studies to prepare for scientific research because achievements in scientific research are related to their promotion and salary. Chinese medical staff are thus forced to carry out scientific research projects.

The correlation coefficients among the HOES dimensions were statistically significant. The contents of the scale had high representativeness, high internal consistency, and good reliability. The EFA and CFA results showed that the fit index of the scale was good, which indicated that the questionnaire had good validity. The physician–patient relationship dimension was deleted due to low reliability; the reason may be that this questionnaire survey was conducted after the COVID-19 outbreak. During the COVID-19 period, medical staff were rushed, which made patients more tolerant and more understanding of doctors and nurses. In addition, Chinese hospitals implemented stricter patient management, and only critical patients can choose to be treated in tertiary hospitals. As a result, the number of patients in tertiary public hospitals decreased during the pandemic, causing physician–patient relationships to improve. Ultimately, the internal consistency of the final version of the scale was 0.910 and ranged from 0.824 to 0.943 in each subdimension. There was no significant difference in the total score or the scores of the four dimensions between the two hospitals. This result indicated that the organizational environments of the two hospitals were similar. The reason may be that the two hospitals are tertiary hospitals with little difference in the service scale and overall volume of consultations and medical treatment; hence, the overall environments perceived by the medical staff were similar. The univariate analysis results of this study showed that nurses' perceived organizational environment scores on the scientific research situation dimension were higher than those of doctors. Under the current professional title promotion system, if medical staff want to be rated at or above the intermediate title, they not only need to have enough years of work, but also need to complete daily rounds, host meetings on certain topics, publish enough papers, complete credit courses required for continuing medical education, and even complete tasks and work such as teaching and providing care in the countryside (57, 58). In the future, cooperation between doctors and nurses in scientific research can be strengthened to help hospitals provide a harmonious organizational environment. There is an urgent need for more evidence on scientific research situation in medical staff.

Strengths and limitations

The strengths of the study are as follows: we developed and validated a scale by using a Chinese sample of medical staff for potential application in hospital management. This study provides a new tool from new perspectives that can be adopted among medical staff to assess the organizational environment in hospitals in China and other overseas regions with similar situations. The analysis of the perceived organizational environment provides protection for the physical and mental

health of medical staff. This study serves as a foundation for developing the hospital organizational environment of clinicians and nurses to enhance hospital staff management.

There were several limitations in the current study. First, the samples in this study were selected from two tertiary hospitals (the mainstay of medical care in China) in Beijing and cannot represent secondary or primary hospitals in other regions. More HOES validation studies should be conducted to verify its suitability for different regions and different levels of hospitals in a wide area. In addition, we did not perform a comparison with the Nursing Work Evaluation Index due to the limitations of the current research site, so future studies should continue to explore the validity of the HOES and compare it with the Nursing Work Evaluation Index in a context in which the nurse population is large. Future studies should be conducted to explore the sustainability and stability of the results across such periods.

Conclusion

The HOES is a comprehensive instrument with demonstrated validity and reliability that can be adopted among medical staff to assess the organizational environment in hospitals. The tool designed in this study was used to assess the organizational environments of clinicians and nurses. Since the scale was developed based on the Chinese context, more studies are needed to support the adaptation of the HOES in other contexts.

Data availability statement

The datasets presented in this article are not readily available because data may be made available by contacting the corresponding author. Requests to access the datasets should be directed to KM. E-mail: mengkai@ccmu.edu.cn.

Ethics statement

The studies involving humans were approved by the Ethical Review Committee of Capital Medical University (No. Z2021SY011). 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

YW and JZ contributed to the data curation, software analysis, formal analysis, and writing of the original draft and are responsible for the overall content as the guarantors. XF and YL participated in the study investigation and validation, and made recommendations for the manuscript draft. KM and ZG contributed to the conceptualization, methodology development, writing, and review and editing of the manuscript, project supervision and administration, and funding acquisition. All authors contributed to the article and approved the submitted version and complied with the Human Resources for Health standards for authorship.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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