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Perceptions of Risk and Safety in the ICU: A Qualitative Study of Cognitive Processes Relating to Staffing*

Danielle M. D'Lima, PhD[1]; Eleanor J. Murray, PhD[2]; Stephen J. Brett, MD, FRCA FFICM[3]

Objectives: The aims of this study were to 1) examine individual professionals' perceptions of staffing risks and safe staffing in intensive care and 2) identify and examine the cognitive processes that underlie these perceptions.

Design: Qualitative case study methodology with nurses, doctors, and physiotherapists.

Setting: Three mixed medical and surgical adult ICUs, each on a separate hospital site within a 1,200-bed academic, tertiary London hospital group.

Subjects: Forty-four ICU team members of diverse professional backgrounds and seniority.

Interventions: None.

Main Results: Four themes (individual, team, unit, and organizational) were identified. Individual care provision was influenced by the pragmatist versus perfectionist stance of individuals and team dynamics by the concept of an "A" team and interdisciplinary tensions. Perceptions of safety hinged around the importance of achieving a "dynamic balance" influenced by the burden of prevailing circumstances and the clinical status of patients. Organizationally, professionals' risk perceptions affected their willingness to take personal responsibility for interactions beyond the unit.

Conclusions: This study drew on cognitive research, specifically theories of cognitive dissonance, psychological safety, and situational awareness to explain how professionals' cognitive processes impacted on ICU behaviors. Our results may have implications for relationships, management, and leadership in ICU. First, patient care delivery may be affected by professionals' perfectionist or pragmatic approach. Perfectionists' team role may be compromised and they may experience cognitive dissonance and subsequent isolation/stress. Second, psychological safety in a team may be improved within the confines of a perceived "A" team but diminished by interdisciplinary tensions. Third, counter intuitively, higher "situational" awareness for some individuals increased their stress and anxiety. Finally, our results suggest that professionals have varying concepts of where their personal responsibility to minimize risk begins and ends, which we have termed "risk horizons" and that these horizons may affect their behavior both within and beyond the unit. (*Crit Care Med* 2018; 46:60–70)

Key Words: critical care; cognition; personnel staffing; risk; safety

***See also p. 163.**

[1]Department of Applied Health Research, University College London, London, United Kingdom.

[2]Saïd Business School, University of Oxford, Oxford, United Kingdom.

[3]Centre for Perioperative Medicine and Critical Care Research, Imperial College Healthcare NHS Trust, Hammersmith Campus, London, United Kingdom.

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Drs. D'Lima and Murray share joint first authorship.

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For information regarding this article, E-mail: eleanor.murray@sbs.ox.ac.uk

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Concerns over patient safety and subsequent risk management attempts have prompted an increasingly regulatory focus on ICU staffing (1, 2). The implementation and monitoring of critical care staffing standards, such as staff-to-patient ratios and the availability of staff for coordinating

and "floating" roles, have become integral to day-to-day ICU management. Staffing standards are perceived to have regulatory implications, although arguably such standards may have a limited evidence-base, reduced adherence in practice, and potentially unintended consequences (3–6). For example, evidence exists that staff-to-patient ratios can be a blunt instrument, lacking responsiveness to rapidly changing patient numbers and needs (7) or the quality of work environment (8).

In many settings, ICUs are commonly required to manage a case-load which is somewhat beyond available capacity and work within an environment of financial constraints, high staff turnover, and staff shortages, which have the capacity to stress the "unit" and the individuals who work within it (9). In addition, the management of such situations can cause conflict and communication difficulties and solutions may evolve which involve compromise and erosions of normal "safe" practice; individuals respond to such challenges in a variety of different ways (10).

Few studies have assessed individual professionals' perceptions of ICU staffing in a "bottom-up" way. There have been recent calls for more qualitative studies to understand human factors in the ICU from a clinical team perspective, and to explore the cognitive and behavioral issues that enable a clinical team to deliver optimal care (11). Although the call for behavioral research has been answered to some degree, we respond to the call to understand the cognitive processes that influence behavior and may affect the delivery of care (12). We define cognitive processes, in this context, as "the impact of perceptions of staffing on the individual professional's internal cognitive processing in relation to risk." We explore how this cognitive processing influences the behaviors of the team and in turn the operation of the unit and organization.

We draw on and develop specific social science theories to explore and perhaps explain how and why variations in professional and team behaviors occur. A cognitive approach provides a deeper understanding of the unseen issues that influence day-to-day practice and facilitates the exploration of practical solutions to overcome them. The aims of this study were to 1) examine individual professionals' perceptions of staffing risks and safe staffing in intensive care and (2) identify and examine the cognitive processes that underlie these perceptions.

METHODS

Setting

The study was conducted across three adult ICUs within one hospital group consisting of three University Hospitals between November 2014 and November 2015.

Design

This study was a qualitative study based on individual interviews.

Ethics

Under U.K. research governance rules, studies involving staff members such as this do not require ethical committee review but do require institutional research governance approval. The study was reviewed and approved by Imperial College Healthcare Trust's and Imperial College's Joint Research Compliance Office, Reference number 13HH1823. All subjects provided written informed consent.

Participants

Semistructured interviews were conducted using a purposive sample with three core professional groups: nurses, doctors, and physiotherapists (**Supplementary Table 1**, Supplemental Digital Content 1, http://links.lww.com/CCM/C919).

Data Collection

Data collection was conducted largely by an Organizational Behaviorist (E.J.M.). The interview protocol contained two elements: first, a fictitious ICU staffing scenario that required participants to allocate below currently advised minimum staffing ratios to a fictitious unit of patients and secondly, general questions to initiate discussions on risk and safety in relation to staffing (**Appendix A**, Supplemental Digital Content 2, http://links.lww.com/CCM/C920). The staffing scenario was developed with the input of senior nursing and allied health professional staff and subsequently piloted. The goal was to explore individual perceptions and cognitive processes as participants "walked through" a hypothetical scenario that described an ICU under a certain amount of organizational challenge. The level of challenge was that which would be commonly encountered in a typical U.K. University Hospital; it was not designed to be overwhelming or a situation requiring "surge" management. The specific clinical scenario was designed to prompt reflection on where the boundary of safety and risk lay for that individual study participant. Previous experience during the piloting phase was that using a specific scenario at the beginning of such an interview prompted more in-depth reflection on the more general issues relating to risk and safety in relation to staffing (pilot phase data are not presented or discussed). Interviews were continued until saturation of thematic content was reached as conventionally determined (13). Interviews were recorded and subsequently transcribed verbatim.

Analysis

We analyzed the data using the constant comparative analysis method (14–16) with support from the qualitative analysis tool NVIVO (version 10; QSR International (U.K.), London, United Kingdom). Qualitative research experts (E.J.M., D.M.D.) developed an initial thematic framework based on the outcomes of preliminary inductive open coding exercises and discussion with five multiprofessional leads. This high-level framework was then applied deductively across the dataset by D.M.D. to further develop and define the emergent themes based on the strength of patterns in the data. The themes were then compared, interpreted, and discussed iteratively in relation to the broader literature on cognition to continuously develop and refine the overall framework. Ongoing discussion with clinical team member (S.J.B.) occurred throughout the analysis process.

RESULTS

Thirty-three hours of qualitative interview data was collected from 44 participants who are described in **Table 1**. The nurses were all registered. The physiotherapists provided primary support to their ICU site and some support to other clinical areas.

An overview of two themes (individual and team) and subthemes with additional supporting quotations are displayed in **Table 2**. The remaining two themes (unit and organizational) and subthemes are displayed in **Table 3**.

Individual Staff Factors

The Pragmatist Versus the Perfectionist. Interviewees expressed discrepancies in how they wanted to conduct their work ideally and the reality of how they had to manage their work given the

TABLE 1. Participant Characteristics by ICU Site, Gender, and Seniority

Participant Characteristics	Total	Nurse	Physician	Physiotherapist
n (%)	44 (100)	27 (61)	13 (30)	4 (9)
ICU site, *n* (%)				
Site 1	14 (32)	8 (30)	5 (38)	1 (25)
Site 2	14 (32)	9 (33)	4 (31)	1 (25)
Site 3	16 (36)	10 (37)	4 (31)	2 (50)
Gender, *n* (%)				
Female	30 (68)	22 (81)	6 (46)	2 (50)
Male	14 (32)	5 (19)	7 (54)	2 (50)
Seniority, *n* (%)				
Senior grade	16 (36)	8 (30)	5 (38)	3 (75)
Middle grade	10 (23)	9 (33)	1 (8)	0 (0)
Junior grade	17 (39)	9 (33)	7 (54)	1 (25)
Not known	1 (2)	1 (4)		

TABLE 2. Overview of Individual and Team Themes and Subthemes With Associated Practical Examples and Supporting Evidence

Main Theme	Subthemes Based on Cognitive Processes	Definition of Subtheme	Practical Examples	Additional Supporting Quotations
Individual staff factors	"The pragmatist vs the perfectionist"	This subtheme explores the role of individual cognition in relating underlying beliefs to problem solving with the resultant impact on the ability to cope. Pragmatists have a stronger ability to recognize that compromises are required to find solutions and contribute to collective whole. Perfectionists continue to strive for ideal standards for individual allocated patients regardless of competing demands on their attention and resources.	Doctors with pragmatist tendencies delaying weaning if unit resources constrained whereas perfectionists weaned if patient need necessitated, regardless of unit resources. Deprioritizing patient trips to external departments such as CT scan, if resources would be too stretched. Accepting an emergency admission, even though this may result in level 3 patients being "doubled."	"I won't feel happy about myself because I haven't done what I should have done" (Middle grade nurse) "I think there is a philosophy that you just…obviously we are a major trauma centre, you just take what comes in and get on with it." (Senior grade nurse) "Some people search for perfection at all times and want the patient to look nice. Others will ensure the patient is comfy, but the patient may look a mess with sheets askew." (Senior grade nurse) "If you've got someone who just says "I can't do this, I can't do this. This is unsafe, this is unsafe." And you think "yes but I can't do anything about it. We just have to get on with it." And it's very difficult." (Senior grade nurse) "Yeah I've got too many patients in the ICU. Then it's all about figuring out how to fix the problem and there's always a solution…it may not be the best solution but there's always a solution." (Senior grade doctor)

(*Continued*)

TABLE 2. (*Continued*). Overview of Individual and Team Themes and Subthemes With Associated Practical Examples and Supporting Evidence

Main Theme	Subthemes Based on Cognitive Processes	Definition of Subtheme	Practical Examples	Additional Supporting Quotations
Team factors	"Team dynamics"	This subtheme examines the interactions between professional team members and their perceptions of team function. It explores the ideal mix of people to work effectively on a shift, referred to by one participant as "the A team."	A senior physiotherapist identified that on intensive care, things can go wrong much quicker compared with other areas of the hospital if physiotherapists do not have the knowledge and skills to act safely.	"So if I had an A team on, even though we were short staffed, I'd know that they would get on with it." (Senior grade nurse) "So I think one of the differences with our role, especially on ICU compared to other physio teams, is that safety although it's always a priority, on intensive care things can go wrong a lot quicker if you don't have the knowledge and skills to act safely." (Senior grade physiotherapist) "The question here regarding the agency nurse is whether or not they've worked on the unit before." (Middle grade nurse) "So here the barrier here that we can see is the staffing. So not only numerically but also experience." (Middle grade nurse) "When I cannot teach my new staff members I will never achieve quality and safety." (Junior grade nurse) "I suppose the more junior the doctor is the less confident they are, especially on the ICU and also it comes down to their experience of their consultants, as well, depending on how hands on their consultant may or may not be." (Senior grade doctor) "I think it's high risk not to have enough people trained to use the correct – the equipment in a safe way, so you need to have people who are qualified in using a filter or managing someone on a ventilator. If you do not have someone who's qualified in doing that who's managing it, errors are going to be made." (Junior grade doctor)
	"Interdisciplinary tensions"	This subtheme identifies areas of difference between the professional priorities and perspectives of multidisciplinary team members that create tensions. Differences are identified in relation to prioritization and managing stress and emotion.	Conflict between physicians and nurses over unplanned admissions. Different perceptions of risk balance between stretching to admit a patient, who will otherwise be cared for in the operating room by nonnursing staff. Physiotherapists tried to adapt their work plans around the existing circumstances on the unit at the time, but this was not always in the best interests of the patient and could result in dissatisfaction for multiple parties.	"So there have been times where at handover I guess from a doctor's point of view you might feel that there's not enough nurses here. Whereas the nurses are "it's okay, we can do this, we can"." (Junior grade doctor) "Sometimes you know, the consultant pushing you – you know, "we need to admit this one". They don't – they don't see it how I see it." (Senior grade nurse) "You cannot depend on them, you cannot depend on the therapist if you want to plan your work environment, you have to depend on your colleagues." (Junior grade nurse) "I mean I wouldn't be able to get anyone because the doctors they have their own problems and job to do." (Middle grade nurse) "What challenges me is just if we were very short of staff and the doctors putting us…making sure that "oh, we have an admission, you have to discharge this", and you have to escalate the bed situation higher up with the management, but then you still haven't got any bed and then the consultant's trying to push you." (Middle grade nurse) "So where I thought I was going to be covered, the consultant interfered in a nursing issue and we weren't." (Senior grade nurse)

TABLE 3. Overview of Unit and Organizational Themes and Subthemes With Associated Practical Examples and Supporting Evidence

Main Theme	Subthemes Based on Cognitive Processes	Definition of Subtheme	Practical Examples	Additional Supporting Quotations
Unit factors	"Achieving a dynamic balance"	This subtheme highlights the complex relationships between patient, individual, and team factors that control the success of the unit at any given time. It explores factors that can offset the balance including changing clinical status of patients and the burden of local processes.	Interviewees described the support and staffing requirements for level 2 patients often being higher than level 3 patients owing to their combined need for nursing, psychologic and organ support, and possibly restraint	"But in terms of allocating it's very difficult and what you allocate in the morning might half an hour later be inappropriate allocation based on deterioration or improving." (Junior grade nurse) "Because that's the other thing, is that things can change. Some of these patients are ready for discharge but you might not get a bed." (Senior grade nurse) "High risk is when it might not take much for something to go wrong or if something goes wrong, there are not enough people to deal with it in a timely fashion." (Senior grade nurse) "Well I think everyone has a busy time, but I think it's when you know that actually you reach maximum and if something unexpected happens you know that you're not actually going to be able to cope with it." (Senior grade nurse) "But essentially the registrars were taken out of action due to scans and referrals from outside the ward, and the unit was full, there was pressure on beds to be emptied for new admissions." (Middle grade doctor) "Like for example, the level two patient who's agitated, you might say "I know they're only level two on paper but this patient has got to have a nurse to themselves." (Senior grade nurse) "You can't do that with every level three but you will have level threes which are even more stable and easier to handle than level two." (Junior grade nurse) "And I suspect that although technically he is a level two person he will actually need somebody fairly closely with him because of his confusion and agitation. And it's these kinds of level twos that aren't really ready for one to one or one to two nursing that can potentially be a big risk." (Senior grade doctor)

(*Continued*)

TABLE 3. (*Continued*). Overview of Unit and Organizational Themes and Subthemes With Associated Practical Examples and Supporting Evidence

Main Theme	Subthemes Based on Cognitive Processes	Definition of Subtheme	Practical Examples	Additional Supporting Quotations
Organizational factors	"Risk perceptions"	This subtheme describes the extent to which the unit, and those within it, perceive, understand and cope with the ways in which local risk impacts on the broader organization. It includes both geographic focus and perceived accountability.	Junior doctors less able to cope with broader risks demonstrated mental separation, by switching off from concerns about patients outside the unit.	"Because if you let a band five float as well they don't have that experience to look around and be global." (Middle grade nurse) "Yeah, sometimes the head nurse will come and say, you know, "We've got so many patients waiting to come in, who can we discharge?" and you have to kind of make sure that everything's done safely and not just getting worried about the fact that there are loads of people who need to come in because they will go somewhere eventually. But thankfully that's not the decisions I have to make." (Junior grade doctor) "And the thing is, it has to be handed over to the next shift, and the next shift handed over to the next shift and…you know" (Middle grade nurse) "So it would be patient safety actually. I would be very worried about the one who is ventilated on the ward; I would kind of be worrying where that's going. Some people think he's not with us but actually you've got a ventilated patient on the ward who they can't look after, if they take him…staff, theatre is probably closed, there's a lot of different knock on effects." (Senior grade nurse) "To help decision-making because that's the key thing really here. Has consequences outside of the unit as well as inside." (Middle grade doctor) "Often, you know, I find that consultants or the nurse will say, "Are you happy for that? Do you think the staff on wherever will feel confident having that? Could they manage that patient?" and because you know there's even less staff there, you think, no, no, there'll just be someone coming back and it will look bad." (Senior grade physiotherapist)

context and circumstances. Some interviewees described either "perfectionist" or "pragmatist" tendencies in themselves and/or others.

Pragmatists had a stronger ability to recognize that compromises might have to be made in order to find solutions and contribute to the collective whole as described by a senior grade nurse, "Of course you have to prioritise, instead of rolling the patient four times it could be done twice or three [times] at the moment, just for example" and a senior grade doctor, "Yeah I've got too many patients in the ICU. Then it's all about figuring out how to fix the problem and there's always a solution… it may not be the best solution but there's always a solution."

Perfectionists, on the other hand, tended to continue to strive for ideal standards for individual allocated patients regardless of competing demands on their attention and resources as described by a senior grade physiotherapist, "I think on a day-to-day working level it's quite frustrating that we're not able to provide the input that we want to…..I think it sounds very idealistic but you do go into healthcare to try and help people in some way, and although I do feel I help people I feel I could be doing a lot better."

Team Factors

Team Dynamics. A predominant finding was interviewees' personal feelings of security and confidence in team members and the team leader. The concept of "the A team" was adopted to refer to the ideal mix of people in the team on a particular shift. This concept does not just refer to numbers of staff but their length and level of experience, whether they are temporary staff and have worked on the ward before, their existing team relationships, and their level of qualification as described by a junior grade doctor, "I think high risk staffing situations are where you have staff who are inexperienced or who are unskilled, or who don't have the right skill for the level of patients on the unit or you don't have enough staff." When working as part of "the A team," interviewees described feeling more able to cope with fewer staff members and adapt easily to unexpected situations—as described by a junior grade nurse, "It's not in terms of skills but I know that there are some people that are more teamwork-orientated than others. So I know that if I come on and look around the room I can feel pretty confident that even if I know we are going to be short staffed that day, with that group of people working around me it'll be okay because I know that when I ask them for help with something they'll do it, and I would do the same."

Linking to the previous individual staff theme, people who are pragmatic and carry on despite difficulties were generally favored as optimal team members by the interviewees. They were sometimes dismissive of team members with perfectionist tendencies who wanted to consistently perform at a high standard and adopt a value driven approach, where this compromised the team effort: "So if I had an A team on, even though we were short staffed, I'd know that they would get on with it." (Quotation from a senior grade nurse)

Interdisciplinary Tensions. Multiple tensions between different professional groups were played out in the interviews, reflecting the existence of conflicting priorities around patient care and a lack of shared professional goals.

One notable finding was that of prioritization. Doctors described being able to prioritize effectively across numerous patients and situations without becoming emotionally attached to individual cases or circumstances. They were aware of having a high level of responsibility and being unable to "walk away" from competing organizational demands. Nurses, on the other hand, appeared to prioritize differently, associating more closely with individual patients, often making reference to specific cases and situations that they had experienced. Physiotherapists had a different prioritization mechanism, usually prioritizing respiratory patients and discharges over rehabilitation patients. They indicated that they sometimes experienced guilt for dipping in and out of the unit and disrupting the flow of the day for other professional groups. Some interviewees gave examples of trying to adapt their work plans around the existing situation and circumstances of the unit at the time but this was not always in the best interests of the patient and could result in dissatisfaction for multiple parties. A senior grade physiotherapist reflected these tensions, "So sometimes the nurses get a bit cross when you can't come and sit the patient out of bed now. And you say "well our priority is to get the discharges and the chest patient seen first. Then we can come in the afternoon." But you see they want to start their day so it's a bit difficult to get that across" as well as a senior grade nurse, "I think therapists are not necessarily looking at it from the same point of view as we are, because they visit to do their little bit and then disappear."

A further finding was that of managing emotion and stress. Doctors appeared to manage their emotions differently to nurses. Their interview responses were briefer and relatively objective with respect to clinical decision-making, whereas nurses were more detailed and expansive. Doctors were generally less worried about their own stress levels and instead expressed concern for nurses in particular. This sometimes involved detaching themselves from the emotion of individual cases and taking a wider systems perspective. Nurses were generally aware of their own stress levels (which they felt had potential to impact on their home lives). Nurses reported reassessing and reflecting upon their actions and behaviors toward patients after their shift had ended. A junior grade doctor explained, "Doctors and nurses stress for different reasons and then they don't really communicate that and then people can get cross and that kind of stuff."

Unit Factors

The focus of this theme was the requirement for units to continuously manage ongoing fluidity within and across teams, patients, and external organizational factors. It was reported that there is a fine margin between safety and risk on the ICU and only one thing needs to "go wrong," or change unexpectedly, in order to set off a train of potentially risky events as reflected by a junior grade nurse, "It usually happens in this kind of situation where someone's needing to go to a scan and then a level two becomes a level three, you know, things you can't kind of plan for. So someone who maybe was doing a "double" [one registered nurse allocated to look after two

patients] one of them has been intubated, so we have to rejig everyone around to kind of look after them." Interviewees felt that within the midst of constant pressure it is extremely difficult for staff members to keep everything under control and to juggle multiple issues without negative consequences for themselves or for patients, as described by a junior grade doctor, "So those factors could change; just what appears to be stable might change suddenly and that might need more senior input more urgently."

Two contributory factors to maintaining a dynamic balance were staff perceptions of the changing clinical status of patients and the burden of local processes. Professional perceptions of patient acuity differed from established regulatory guidelines and tended to develop over time based on experiences, as described by a senior grade doctor, "Yeah I mean I think the level twos are sometimes more demanding than a level three which is ventilated, silent, quiet, so they're easier sometimes to double them up than level two which can be very demanding."

Local processes and policy influenced experiences of competing workload demands, risk, and safety, such as not having the option to refuse admission, with the associated difficulties of balancing patient flow; the time spent providing multiple updates to different family members; "excessive" visiting hours in units with very "open" visiting policies; and extensive and difficult processes of documentation.

Organizational Factors

There were differing views as to where the accountability of the individual/team ends (i.e., at the unit or beyond), even where individual's job roles required them to prioritize patients from the wider hospital. Coping mechanisms were demonstrated where (particularly junior) staff focused in on the unit or individual patient, although their role required a wider focus, and chose not to look outside and take on the responsibility of critically ill patients in other areas (e.g., in theatre, emergency department, deteriorating on the wards) as described by a junior grade doctor, "You know you've got to try and separate yourself from what's going on outside because that would get dealt with, if we just manage the patients we have safely." This was demonstrated through both physical (e.g., a junior nurse drawing the curtains round the bed to shut off the rest of the unit) and mental separation (e.g., a junior doctor mentally separating themselves by switching off from concerns about patients outside the unit). A senior grade nurse reflected that it "helps to have someone who can take less of a bedside picture and more of a broader picture." Alternatively, other staff members were better able to assess the risk of patients outside of the unit and juggle priorities in terms of admission. Interviewees that reported feeling able to detach and take a systems view of their work were more aware of how risk could be unintentionally transferred around the organization (i.e., like squeezing a balloon, such as refusing an admission on internal "safety" grounds, who is then cared for by anesthesiology staff in an operating room).

DISCUSSION

The majority of behavioral work in ICU has drawn on human factors (17), systems thinking (11), and the application of nontechnical skills analysis (18) to better understand safety in this clinical context. A less well-researched area is the examination of staff cognitive processes in ICU safety (18). The aims of this study were to 1) examine individual professionals' perceptions of staffing risks and safe staffing in intensive care and 2) identify and examine the cognitive processes that underlie these perceptions.

Our study identified individual characteristics of pragmatism and perfectionism. Although we found ICU studies that focused on the conceivable consequences of such behavioral inclinations, such as moral distress (19, 20) and "burnout," (21, 22) few studies explored an underpinning psychologic concept called "cognitive dissonance," defined as the experiences of individuals when they perform an action, or confront new information that is contradictory to their existing beliefs, ideas, or values (23, 24). We found that clinicians exhibiting perfectionist tendencies from all professions may experience cognitive dissonance in performing their work. This was mainly experienced when the clinician had to perform an action, usually the provision of patient care that was at odds with their beliefs about the optimal level of care that should be given. The impact of cognitive dissonance in this setting is that individuals with perfectionist tendencies may experience greater stress and isolation over time, as the dissonance between their belief system and the practical reality of delivering what they perceive to be compromised care becomes more pronounced. The negative emotion experienced when an individual is in cognitive dissonance can be related to the concept of moral distress in the ICU literature (19, 20) and over time may contribute to "burnout" or change of role (e.g., stopping work in ICU) (21, 22, 25).

Our second finding related to team factors. A body of work exists on the role of team behaviors in the ICU including team working (18), decision-making (18), team coordination (26), and interdisciplinary communication (26–30). In contrast, limited research exists on cognitive processes in ICU, such as the process by which team members' thoughts and attitudes affect team dynamics and performance (31). We draw upon the concept of psychological safety, a group-level phenomenon to examine issues of team dynamics that we encountered in our study. Psychological safety can be defined as "people's perceptions of the consequences of taking interpersonal risks (such as speaking up or admitting errors) in a particular context such as a workplace" ([32], p. 23) Research evidence indicates that in conditions of high psychological safety, greater knowledge sharing, reflection, engagement, learning, and communication take place (32–35). Participants perceived their ideal "A team" for a shift as comprising individuals they thought had a high level of team orientation. Preferences for "A team" individuals related to having a sense of security and confidence in the person, over external factors such as education, experience, or seniority. This finding suggested that shifts comprising perceived "A team" members are more likely to experience a higher

degree of psychological safety than shifts that do not. One component of the team orientation was pragmatism rather than perfectionism, the factor that we found to influence the delivery of patient care at individual level. At team level, pragmatists were perceived to have team priorities uppermost which enabled maintenance of the dynamic balance within the unit.

Research suggests that interprofessional tensions can also compromise or prevent team working and impact negatively on the psychological safety in teams (27, 29, 36). These findings resonated with our study. We found that team-level relationships were complicated by interprofessional tensions that resulted in potentially conflicting priorities. Nurses, doctors, and physiotherapists described different perceptions of care priorities, goal setting, emotional attachment, and stress management. These differences may suggest that, unless actively pursued, authentic team working is unlikely and conflicts may arise around key processes in the unit, such as patient management, admission, and discharge.

Situational awareness (SA) research provided an explanation for our unit-level findings. In simple terms, SA describes an individual's awareness of the environment around them and has been defined as "the perception of the elements in the environment, within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future." (37) Research in a number of industries suggests that to maintain safety and reduce risk, workers should maintain high levels of SA (38).

We found a high level of SA at unit level, evidenced by participants' continual reassessment of the patients' condition. A high level of SA was not only within the immediate clinical situation but, particularly for more senior team members, assessing the patient flow internally and externally to the unit. The "awareness" and "comprehension" elements of SA which translated as knowledge of the patient's condition, personal experiences of deteriorating patients, and attention to the patient's current clinical state were evidenced by all grades of staff. The more senior the team member, the more complex the process, as more patients were involved within and beyond the unit. The "projection" element of SA was evidenced through unit planning to achieve the dynamic balance required to manage local processes, including admission and discharge, documentation and supporting relatives, and visitors to the unit. An unexpected and counter-intuitive finding was that some senior individuals responded with anxiety to higher SA, as they became more aware of potential risks and patient safety threats, not only within the unit but across the hospital.

Although there is a body of literature relating to public perceptions of risk (39), the literature on professional risk perceptions in health is limited to specific clinical aspects of risk, for example, genetic testing and smoking cessation in pregnancy (40, 41). We identify a cognitive characteristic, "risk horizon," which has been developed in other disciplines such as banking (42), but not to our knowledge in the health sector. We define "risk horizon" as the influence of an individual's risk perception on their interaction with the broader context, that is, the point beyond which an individual feels their personal responsibility to management of safety ends. We differentiate between "near" risk horizons (attention focused on immediate task with attempts to filter out additional potential risks); "midrange" risk horizons (openness to acknowledge risks beyond the immediate task but within the unit); and "far" risk horizons (willingness to balance risks in the unit against those in the rest of the hospital). Instances of physical and mental separation from the unit were evident in individuals describing "near" risk horizons, as mechanisms to "filter out" additional risks. In contrast, certain individuals demonstrated "far" risk horizons, successfully balancing multiple organizational risks, such as patient demand in emergency/operating departments and deteriorating patients on wards alongside high patient acuity within the unit. These external demands were experienced more by middle and senior grade nursing staff, who had to function as shift managers and middle and senior grade physicians who had to attend to patients externally and balance internal and external demands. Physicians in training of all seniorities also tend to run multiple "thought experiments" during which they mentally rehearse hypothetical solutions to problems which they will face once they become more senior decision makers. We expected to find that more senior professionals described "far" risk horizons and vice versa but under situations of stress, even senior professionals occasionally described themselves retreating to "near" risk horizons to cope with immediately stressful situations.

Our qualitative study was undertaken in a U.K. setting, and we recognize the different contexts of British and non-British ICUs (i.e., professional staff profiles and workflows may differ). However, our use of a qualitative design has provided an in-depth exploration of these issues based on a rich dataset. We adopted a purposive sample to ensure adequate participation in the study, while ensuring the sample was representative of professional ratios on the unit. Although the data were generated in the United Kingdom, perhaps these findings can be viewed as challenges for colleagues reflecting on their own local circumstances and offer a starting point for future research on cognitive processes in different settings.

PRACTICAL IMPLICATIONS

Although we have no empirical evidence to support any particular recommendation, it would seem useful that people in leadership roles in ICU and their team members are aware of the potential heterogeneity of response that can result from individual cognitive processes. We propose a number of practical suggestions to support teams:

1) For ICU leaders, understanding the heterogeneity of response to changing situations in a multidisciplinary team environment should help people manage situations in a nonconfrontational way;
2) Some individuals find SA of events outside the ICU which may impose future stress, as particularly anxiety-provoking; developing scenario-based training exercises that explore these events may assist in developing mutual understanding and broadening individuals' risk horizon boundaries;

3) Use of table-top scenarios in training sessions to support intensive care teams to develop mutual awareness of roles and responsibilities to manage effectively the dynamic balance on the unit;
4) Explicit institutional management support for individuals required to make compromise decisions;
5) Making use of in-house counselling services to support individuals who feel that the reality of their work does not align with their professional identity, experiencing the burden of cognitive dissonance; and
6) Use of interdisciplinary forums, for example, Schwartz Center Rounds that address the psychosocial aspects of care, can improve the sense of support and decrease work-related stress and isolation that participants may otherwise feel. (29)

CONCLUSION

The aims of this study were to 1) examine individual professionals' perceptions of staffing risks and safe staffing in intensive care and 2) identify and examine the cognitive processes that underlie these perceptions. Overall there are a number of issues that emerged from this study that we would argue may be generalizable beyond the immediate study context:

1) Some individuals have highly adaptive "pragmatist" tendencies, others tend to be more "perfectionist"; thus, responses to seemingly similar situations may differ, and be a potential source of conflict unless well managed;
2) Staff often have a concept of an "A-team"; their own feelings of resilience and willingness to adapt and take on tasks thus vary depending on who is part of that shift's team;
3) Although the concept of "SA" is highly promoted- for some people increasing awareness may increase stress and cause, from a team perspective, maladaptive behaviors; and
4) Individuals have varying concepts of where their own responsibility to minimize risk begins and ends—their own "risk horizons" regardless of role—this may change depending on team and environmental factors.

Our results have implications for relationships, management, and leadership in ICUs. Based on our findings, an appreciation of the impact that cognitive processes might have on individual and team behaviors might assist ICU clinicians in determining how to work and lead in teams and manage patient flows effectively.

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