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Safety implications of different forms of understaffing among nurses during the COVID-19 pandemic

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Abstract

Aim: The aim of this study was to investigate the processes through which personnel understaffing and expertise understaffing jointly shape near misses among nurses during the COVID-19 pandemic.

Background: Inadequate staffing is a chronic issue within the nursing profession, with the safety consequences of understaffing likely being exacerbated by the COVID-19 pandemic.

Design: This study used a three-wave, time-separated survey design and collected data from 120 nurses in the United States working on the frontline of the pandemic in hospital settings.

Methods: Participants were recruited through convenience sampling in early April 2020. Eligible nurses completed three surveys across a 6-week period during the COVID-19 pandemic from mid-April to the end of May 2020. Study hypotheses were tested with path analyses.

Results/Findings: Results reveal that personnel understaffing and expertise understaffing jointly shape near misses, which are known to precede and contribute to accidents and injuries, through different mechanisms. Specifically, personnel understaffing led to greater use of safety workarounds, which only induced near misses when cognitive failures were high. Further, higher levels of cognitive failures appeared to be the result of greater expertise understaffing.

Conclusion: This study highlights the importance of addressing issues of understaffing, especially during times of crisis, to better promote nurse and patient safety.

Impact: This study was the first to examine the distinct mechanisms by which two forms of understaffing impact safety outcomes in the form of near misses. Understanding these mechanisms can help leaders and policymakers make informed staffing decisions by considering the safety implications of understaffing issues.

KEYWORDS
cognitive failures, COVID-19, near misses, nurses, safety workarounds, understaffing

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1 | INTRODUCTION

The novel coronavirus (COVID-19) pandemic has tested the strength of healthcare systems worldwide. The United States in particular has faced a staggering and disproportionate number of COVID-19 cases—with over 22 million cases and 370,000 deaths recorded as of December 2020 (Dong et al., 2020). One group that has been heavily affected by this high case count is nurses working in hospital settings. In addition to shortages of personal protective equipment (PPE), one of the most pressing occupational stressors faced by these nurses during the pandemic is inadequate staffing (American Nurses Association, 2020), which is known to negatively impact nurse and patient safety and well-being outcomes, such as nurse burnout, (Lasater et al., 2020), adverse patient outcomes (Shang et al., 2019) and patient satisfaction (Aiken et al., 2018; Vahey et al., 2004).

This exacerbation of staffing problems occurs in a population that is already plagued by chronic understaffing (Lasater et al., 2020), and this additional pressure may have grave consequences for both nurse and patient safety. Thus, drawing upon the transactional model of stress and coping (Lazarus & Folkman, 1984), the purpose of this study is to examine the processes through which the stressor of nurse understaffing impacts safety within hospital settings during the COVID-19 pandemic. Specifically, we focus on the joint influence of personnel and expertise understaffing on near misses, which are events that have the potential to result in accidents and injuries (World Health Organization [WHO], 2005). We chose to focus on near misses as they are a key and leading indicator of accidents and injuries (Williamsen, 2013). Further, relative to near misses, accidents and injuries are low base rate phenomena with 2.8 cases per 100 US worker in 2019 (Bureau of Labor Statistics, 2020) and therefore may require longer time periods to emerge and adequately study. By better understanding the safety implications of understaffing during this public health crisis, healthcare organizations may be afforded opportunities to take preventative action against accidents and injuries in the workplace and better protect the health and safety of nurses.

Our study makes several important contributions to the literature. First, we document the experiences and safety-related behaviors of nurses during an unprecedented global pandemic. Second, whereas previous studies on the health and safety consequences of nurse understaffing have tended to focus on manpower understaffing (hereafter referred to as *personnel understaffing*) or the inability of the work unit to complete its primary tasks due to a lack of workers, often operationalized as nurse-to-patient ratios, our work highlights the importance of also considering expertise understaffing or the inability of the work unit to complete its primary tasks due to a lack of knowledge, skills or other abilities. Further, prior work considering a lack of expertise has primarily focused on staffing of registered nurses (RNs) versus other nursing personnel, such as nursing assistants, but this approach fails to consider how the requisite expertise may vary beyond overall qualifications depending on the context. For instance, during the current pandemic, expertise related to the intensive care unit (ICU) may be especially necessary.

Finally, the Occupational Health and Safety Administration (OSHA) strongly encourages the tracking and investigation of near misses to pre-emptively identify shortcomings in organizations' safety systems (OSHA, 2015). We support that call by investigating the mechanisms through which the dual stressors of personnel and expertise understaffing influence nurses' behaviors and cognitions that capture their attempts to cope with these stressors, which in turn impact the occurrence of near misses. Thus, our work provides healthcare organizations critical insight into preventative measures for guarding against workplace accidents and injuries.

1.1 | Background

1.1.1 | Personnel understaffing and near misses via safety workarounds

Medical errors have been identified as a leading cause of death and injury, with research suggesting that around 50% of adverse medical events are preventable (Schwendimann et al., 2018; de Vries et al., 2008). As a result, identifying events that have the potential to result in accidents and injuries has become an increasingly important practice in healthcare, as recognizing such events allows organizations to investigate underlying system failures and take corrective and preventative actions against accidents and injuries (OSHA, 2015; WHO, 2005). Drawing upon the transactional model of stress and coping (Lazarus & Folkman, 1984), which states that individuals respond to stressful situations with various coping strategies, we contend that the heightened and severe levels of personnel understaffing commonly faced by hospitals during this pandemic serve as a work-related stressor to increase the frequency of such near-miss events.

The increase in hospitals' workloads due to surging cases of COVID-19 makes personnel understaffing an especially critical stressor during the current pandemic (Cleeland, 2020). As situations of greater personnel understaffing may require fewer nurses to take on more tasks, nurses may cope with this stressor by taking safety-related shortcuts to bypass obstacles and get work done quickly (Halbesleben & Rathert, 2008). Indeed, these shortcuts, termed *safety workarounds*, are so common in the nursing profession that nurses are often deemed the 'master of workarounds' (Morath & Turnbull, 2005). Safety workarounds occur frequently in the nursing population due to the heavy workload and time pressures associated with the industry (Aiken et al., 2014; MacPhee et al., 2017; Tsiga et al., 2013), which could result in perceptions that shortcuts are necessary to get the job done. Given the severe constraints faced by nurses during the COVID-19 pandemic (Cleeland, 2020), beliefs that safety workarounds are inevitable may be heightened. Therefore, in alignment with the transactional model of stress and coping (Lazarus & Folkman, 1984), we predict that personnel understaffing is related to safety workarounds, which can be considered a behavioral coping response to a highly salient stressor (Nixon et al., 2015).

Although safety workarounds may be viewed by some as common, necessary and even productive (Eisenhauer et al., 2007; Tucker, 2009),

engaging in this coping behavior essentially renders safety policies and procedures ineffective (Halbesleben & Rathert, 2008). Empirical evidence supports the idea that safety workarounds are related to increased risks of accidents and injuries at work (Tucker et al., 2020). Therefore, circumventing safety policies and practices put in place to protect healthcare workers and patients is likely to be associated with near misses, as engaging in safety workarounds can result in medical errors and injuries (Halbesleben, 2010; Tucker et al., 2020; Van Der Veen et al., 2018). Overall, we predict that safety workarounds will mediate the relationship between personnel understaffing and near misses, as insufficient staff to complete tasks during an urgent pandemic may result in nurses engaging in more safety workarounds to get the job done, which in turn increases the number of near misses.

Hypothesis 1 *(a) Personnel understaffing is positively related to safety workarounds, and (b) safety workarounds are positively related to near misses such that (c) safety workarounds mediate the relationship between personnel understaffing and near misses.*

1.1.2 | The moderating role of expertise understaffing via cognitive failures

In addition to the more typically examined personnel understaffing, the COVID-19 pandemic has also resulted in increased expertise understaffing—i.e., missing key expertise within one's work group needed to complete group tasks and responsibilities. As an example, many nurses on the frontline may have been redeployed to work in the ICU as a result of the pandemic, even if they are not trained to work in that highly specialized clinical area (Liu et al., 2020). More broadly, given the rapid rise in COVID-19 cases, nurses are often being reassigned from their regular work or department to needed areas in an effort to manage the caseload (Retzlaff, 2020). As a result, under contexts of greater expertise understaffing, individuals are often asked to take on tasks for which they are not familiar or trained to complete (Hudson & Shen, 2018). Therefore, we posit that nurses who are in units experiencing higher levels of expertise understaffing may be especially likely to feel mentally 'stretched', leading to more cognitive failures, such as lapses in memory, perceptions or attention (Allahyari et al., 2014).

In turn, we argue that the strain of cognitive failures will moderate the relationship between safety workarounds and near misses. Workarounds can sometimes be productive coping behaviors and beneficial when nurses engage in problem-solving and critical-thinking behavior to improve workflow being blocked by a dysfunctional policy or procedure (Tucker, 2009). However, if nurses are generally experiencing high levels of cognitive failure while trying to engage in safety workarounds, the workaround may be more ill-conceived or haphazard, increasing the chances of errors or injuries. More generally, cognitive failures have been shown to play a key mediating role in the process through which occupational stress can lead to near misses (Day et al., 2012; Elfering et al., 2015). Therefore, we predict that expertise understaffing will moderate the relationship between safety workarounds and near misses through this moderating effect of cognitive failures. In other words, because expertise understaffing acts as an occupational stressor, being assigned with tasks outside of one's expertise may use up significant mental resources, leading to more cognitive failures, which then enhances the likelihood that safety workarounds will result in near misses.

Hypothesis 2 *(a) Expertise understaffing is positively related to cognitive failures, and (b) cognitive failures strengthen the positive relationship between safety workarounds and near misses such that (c) cognitive failures mediate the moderation effect of expertise understaffing on the relationship between safety workarounds and near misses.*

2 | THE STUDY

2.1 | Aim

On the basis of the transactional model of stress and coping, the aim of the present study was to investigate the processes through which the stressors of personnel and expertise understaffing jointly shape near misses among nurses during the COVID-19 pandemic through safety workarounds and cognitive failures, respectively. Our overarching conceptual model is depicted in Figure 1. By better understanding the implications of personnel and expertise understaffing on safety-related cognitions, behaviors and outcomes, our

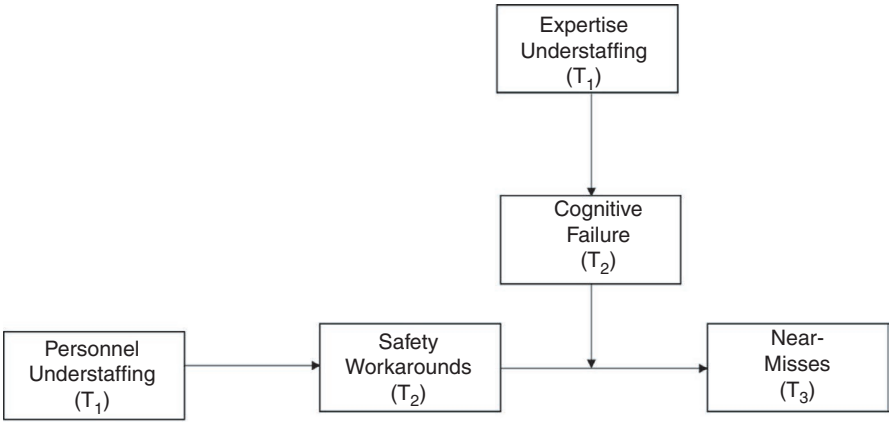

FIGURE 1 Overall conceptual model

work helps healthcare organizations to be better prepared to face safety-related challenges associated with staffing issues during the current pandemic, as well as future crises where staffing shortages may be prevalent or magnified.

2.2 | Study design

The study design consisted of survey data from three waves and quantitative methods.

2.3 | Participants

A convenience sample of 120 US RNs were recruited through nurse interest groups on Facebook and Reddit from 27 April 2020 through April 30 April 2020. Specifically, study information was posted to the interest groups on both social media platforms, and those interested completed a screening survey to ensure that they met the study inclusion criteria. The informed consent form was provided on the first page of the screening survey. In terms of the eligibility criteria, individuals had to be RNs working in direct patient care at a hospital. Further, they needed to work an average of 30+ h per week. Ultimately, 470 individuals indicated interest in the study.

Given our social media recruitment strategy and our participant incentive structure, we were concerned that some individuals may have been motivated to complete the eligibility questionnaire even if they were not RNs. Therefore, to further authenticate eligibility, the 470 individuals were asked to provide their nursing license number, which was subsequently verified by the first author using official state records. Overall, 151 individuals responded with a valid nursing license number. These 151 individuals were invited to complete the first survey of the main study, and 120 participants completed it.

We did not conduct a priori power analyses or sample size calculations prior to undertaking our study. Given the novelty and speed at which the pandemic was unfolding, we were unsure how many nurses would have the capacity or willingness to be a part of a multi-wave research study during this stressful and trying time, and we were focused on quickly capturing the experiences of nurses on the frontlines, even if it was only for a limited group of individuals. Fortunately, our results reveal that we were able to detect our hypothesized effects, and once effects are detected, statisticians have argued that it renders questions of whether a study had adequate power to detect it and power analyses moot (Hoenig & Heisey, 2001).

2.4 | Data collection

Beginning on 1 May 2020, the 151 eligible participants were invited to complete three main study surveys each separated by a 2-week period. A 2-week period was chosen in order to reduce participant burden during the pandemic and to ensure that we would be able to capture sufficient variance in near misses. Each survey asked participants to report on their work experiences in reference to the prior 2 weeks.

2.4.1 | Questionnaires

A 6-item measure by Hudson and Shen (2018) was used to measure perceptions of understaffing at Time 1 (T_1). One 3-item subscale examined personnel understaffing. A sample item is 'Over the last two weeks, if work went undone in our unit, it was primarily due to not having enough employees to do it'. The other 3-item subscale examined expertise understaffing. A sample item is 'Over the last two weeks, if work went undone in our unit, it was primarily due to not having someone who knows how to do it properly'. Response options were on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*.

A 3-item measure by Halbesleben (2010) was used to measure safety workarounds at Time 2 (T_2). Response options were on a 5-point frequency scale ranging from *never* to *every day*. A sample item is 'Over the last two weeks, I bypassed the safety rules that are prescribed by my hospital in order to get work done'.

Cognitive failures were measured at Time 2 (T_2) using a 7-item scale by Paul et al., (1998). Response options were on a 5-point frequency scale ranging from *never* to *always*. A sample item is 'Over the last two weeks, how often have you had problems concentrating?'.

Near misses were assessed by first providing participants with the National Safety Council definition of near misses, which is 'an unplanned event that did not result in injury, illness, or damage—but had the potential to do so' (National Safety Council, 2013, p. 1), and then asking participants to report how many times they experienced a 'near miss' at work over the past 2 weeks.

2.5 | Ethical consideration

Ethics committee approval was obtained from a university institutional review board before the study was conducted. Participants received a $5 Amazon gift card in exchange for each survey completed.

2.6 | Data analysis

Mplus 8.4 (Muthén & Muthén, 2017) was used to conduct a series of path analyses to test the study hypotheses. We utilized full information maximum likelihood estimation with robust standard errors in order to account for missing values (Muthén & Muthén, 2017). Further, given that the measure of near misses is a count, this outcome variable was modeled with a standard Poisson distribution in each path analysis (Coxe et al., 2009). Additionally, predictor variables were mean centred at zero prior to calculating interaction terms (Cohen et al., 2003).

To test Hypothesis 1, we first specified a model (Model 1) in which personnel understaffing (T_1) was associated with safety

workarounds (T_2), and safety workarounds (T_2) were associated with near misses (T_3), and then examined the significance of the indirect effect between personnel understaffing and near misses via safety workarounds. To test Hypothesis 2, in alignment with procedures outlined by Edwards and Lambert (2007) and used by Grant and Berry (2011), we tested our mediated moderation hypotheses by estimating two more models—Model 2a and Model 2b. In Model 2a, we specified a simple moderation model in which expertise understaffing (T_1) moderates the relationship between safety workarounds and near misses. Then, with evidence of this moderation effect, we proceeded with specifying Model 2b in order to assess whether the moderating effect of expertise understaffing (T_1) is mediated by cognitive failures (T_2). This model built upon Model 2a by adding cognitive failures (T_2) as a moderator of safety workarounds and near misses and by specifying a path from expertise understaffing (T_1) to cognitive failures (T_2).

Finally, given the complexity of our model, it was not feasible to test our entire conceptual model altogether. However, to ascertain that the moderating effects impacted the underlying *process*, or the full indirect relationship rather than only the second-stage relationship, we also estimated a moderated mediation model (Model 3). Specifically, we sought to demonstrate that cognitive failures (T_2)—the more proximal moderator—strengthened the indirect effect between personnel understaffing and near misses via safety workarounds. See Figure 2 for a depiction of all models that were estimated with path analysis.

2.7 | Validity, reliability and rigour

Psychometric validation evidence for all multi-item scales have been reported in past studies (Halbesleban, 2010; Hudson & Shen, 2018; Paul et al., 1998). Additionally, all multi-item scales demonstrate high reliability in the current study: 'personnel understaffing' (α = .89), 'expertise understaffing' (α = .82), 'safety workarounds' (α = .84) and 'cognitive failures' (α = .90). Finally, asking participants to report the number of near misses experienced within a given time frame is a common practice when measuring this variable (e.g., Crane et al., 2015).

3 | RESULTS

3.1 | Participants

As detailed above, our social media recruitment effort resulted in 151 eligible individuals, of whom 120 completed the first survey of the main study. Of these 120 participants, 114 completed the second survey, and 95 completed the third survey, thereby resulting in a final retention rate of 79.2%. Note that our analytic techniques estimate the parameters and standard errors by giving more weight to those who completed more surveys to address issues associated with missing data.

The 120 study participants were all RNs who worked in hospitals across 31 states in the United States. The majority of participants were identified as female (83.3%). The average age of participants was 31.49 (*SD* = 6.85), and the average hospital tenure was 34.79 months (*SD* = 39.78). Overall, the gender distribution of our sample was slightly more diverse than the national population of RNs (83.3% female in the current sample vs. 90.4% female in the national population), and our sample was much younger than the national population of RNs (31.49 average age in the current sample vs. 47.90 in the national population; U.S. Department of Health & Human Services, 2019). This may be due to our recruitment via social media, which likely resulted in a relatively young sample.

3.2 | Main results

Descriptive statistics and correlations are presented in Table 1. Study hypotheses were tested with a series of three path analyses. The results of Model 1 (see Figure 2) demonstrated that personnel understaffing at T_1 was positively and significantly related to safety workarounds at T_2 (b = .16, SE = 0.06, p = .010), thereby supporting Hypothesis 1a. Further, safety workarounds at T_2 were positively and significantly related to near misses at T_3 (b = .61, SE = 0.28, p = .027), thereby supporting Hypothesis 1b. Finally, the indirect effect of personnel understaffing (T_1) on near misses (T_3) through safety workarounds (T_2) was not significant (unstandardized indirect effect: 0.10, SE = 0.06, p = .130). Accordingly, Hypothesis 1c was not supported.

The results of Model 2a demonstrated that the moderating effect of expertise understaffing on the relationship between safety workarounds and near misses was significant (b = .29, SE = 0.14, p = .036). An examination of the simple slopes at high and low levels (±1 *SD*) of expertise understaffing showed that the relationship between safety workarounds and near misses was significant when expertise understaffing was higher (b = .96, SE = 0.38, p = .011) but not when expertise understaffing was lower (b = .37, SE = 0.33, p = .257).

Results of Model 2b revealed that expertise understaffing at T_1 was significantly and positively related to cognitive failures at T_2 (b = .29, SE = 0.07, p < .001), thereby supporting Hypothesis 2a. Further, cognitive failures significantly moderated the relationship between safety workarounds and near misses (b = .50, SE = 0.16, p = .001), and the moderating effect of expertise understaffing on this relationship was no longer significant (b = .12, SE = 0.19, p = .519), supporting Hypothesis 2b. An examination of the simple slopes at high and low levels (±1 *SD*) of cognitive failures uncovered that the relationship between safety workarounds and near misses was significant when cognitive failures were higher (b = .62, SE = 0.25, p = .011) but not when cognitive failures were lower (b = −.11, SE = 0.27, p = .694; see Figure 3). Lastly, we calculated the indirect effect of expertise understaffing on near misses via the cognitive failures and safety workarounds interaction. In support of Hypothesis 2c, this indirect effect was significant (unstandardized indirect effect = 0.14, SE = 0.06, p = .015).

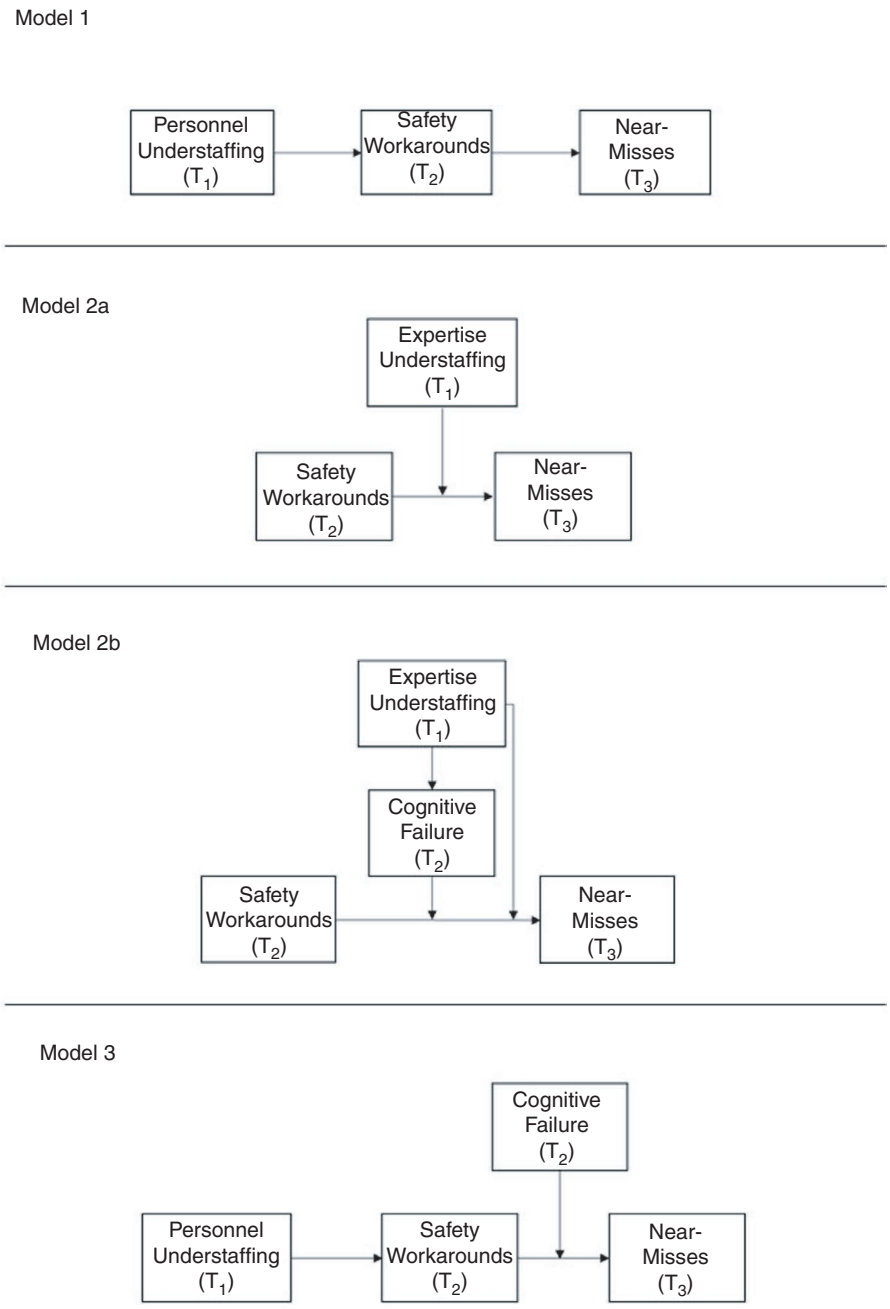

FIGURE 2 Models estimated with path analysis

TABLE 1 Descriptive statistics and bivariate correlations

Variable	*M*	*SD*	1	2	3	4	5
1. Personnel understaffing (T_1)	3.26	1.27	(.89)				
2. Expertise understaffing (T_1)	2.81	1.03	.48**	(.82)			
3. Safety workarounds (T_2)	2.17	0.88	.24*	.15	(.84)		
4. Cognitive failures (T_2)	2.94	0.73	.23*	.39**	.28**	(.90)	
5. Near misses (T_3)	0.63	1.35	.22*	.13	.32**	.26*	–

Note: N = 90–120. Alpha coefficients are presented along the diagonal.
*p < .05.; **p < .01.

Finally, we sought to confirm that the significant moderating effects did shape the entire underlying process or indirect effect, linking personnel understaffing to near misses via safety workarounds by focusing on the moderator that was theorized to be most proximal—cognitive failures (Model 3). Specifically, we followed guidelines by Hayes (2015) to calculate an index of moderated

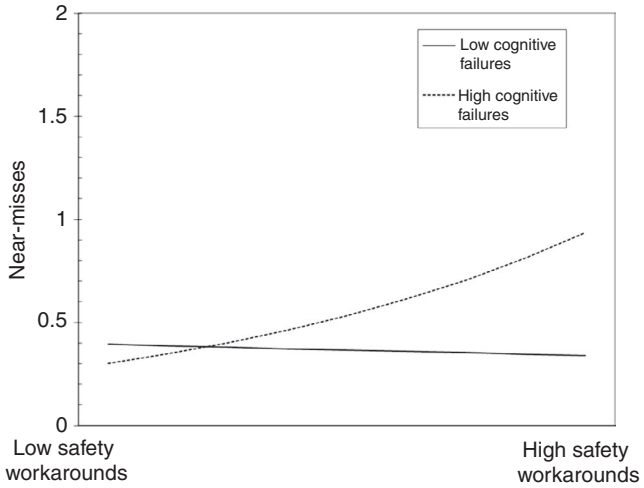

FIGURE 3 The moderating effect of cognitive failures on the relationship between safety workarounds and near misses at high and low (±1 *SD*) levels of the moderator

mediation (IMM). Results revealed that the IMM was significant (IMM = 0.08, *SE* = 0.04, *p* = .049). A test of the conditional indirect effects at high and low levels (±1 *SD*) of cognitive failures revealed that the indirect effect from personnel understaffing to near misses via safety workarounds was significant when cognitive failures were higher (*b* = .09, *SE* = 0.04, *p* = .029) but not when cognitive failures were lower (*b* = −.02, *SE* = 0.04, *p* = .626).

4 | DISCUSSION

4.1 | Summary of findings

The present study illuminates some key staffing challenges faced by frontline nurses during the COVID-19 pandemic and their implications for nurse and patient safety. First, our study suggests that safety workarounds mediate the relationship between personnel understaffing and near misses. In alignment with the transactional model of stress and coping (Lazarus & Folkman, 1984), these findings tie together prior works that suggest that nurses may be engaging in safety workarounds as a coping response to various constraints such as time pressures and workload (MacPhee et al., 2017; Tsiga et al., 2013) associated with insufficient staff, with these constraints likely heightened during the COVID-19 pandemic (Cleeland, 2020). Our findings also converge with past research showing that safety workarounds are associated with medical errors and injuries (Halbesleben, 2010; Tucker et al., 2020; Van Der Veen et al., 2018) by uncovering that safety workarounds are associated with increased experiences of near misses, which could be due to committing more errors when performing safety shortcuts.

Second, in line with prior work suggesting that cognitive failures play a key mediating role in the relationship between occupational stress and near misses (e.g., Day et al., 2012; Elfering et al., 2015), our study finds that expertise understaffing strengthens the relationship between safety workarounds and near misses through increasing cognitive failures. A greater cognitive strain or burden may be placed on nurses when they are tasked with duties outside of their expertise, which in turn can increase the likelihood of safety workarounds resulting in near misses. This finding brings to light the importance of considering the cognitive load being placed on nurses when the work unit lacks the proper expertise, as it can result in increased cognitive failures in nurses, which can ultimately have important implications for workplace safety.

Additionally, our study builds upon the nascent literature exploring the multidimensional nature of understaffing (Hudson & Shen, 2018), highlighting that attitudinal and behavioral reactions to personnel and expertise understaffing, including attempts to cope, are often different. In our study, we find that although both forms of understaffing influence near misses, the mechanisms through which near misses are influenced by the two forms of understaffing are quite distinct, calling for different interventions when each of these staffing challenges are faced.

4.2 | Limitations

Although we contend that this study has several important strengths, including its 6-week longitudinal design, it is not without limitations. First, given the correlational design of the study, it is not possible to infer causality or directionality among our study variables. For instance, although we propose that each form of understaffing lead to near misses through safety workarounds and cognitive failures, we are unable to rule out the possibility that near misses, which are indicative of a dangerous work environment, may motivate nurses to quit and thereby contribute to both increased personnel and expertise understaffing.

Second, our data come from a single source of survey participants, thereby increasing concerns regarding common method bias. We mitigated some of these concerns by separating the surveys across time (Podsakoff et al., 2003). Additionally, it is important to note that significant interaction effects are very unlikely to be due to common method bias (Siemsen et al., 2010). Regardless, future researchers should build upon our findings by incorporating additional sources of data in their study designs. For instance, it would be interesting to gather objective accident and injury hospital records and/or to gather surveys from other stakeholders, such as co-workers or patients, to supplement the survey responses of focal participants.

A third potential limitation is the generalizability of our findings. For instance, our sample is significantly younger than the national population of RNs (U.S. Department of Health & Human Services, 2019), which is likely due to our method of recruiting via social media. Therefore, future studies should aim to replicate our findings with a sample that is more representative of the national population. Further, given that this study took place during the early stages of the COVID-19 pandemic, it is possible that our results do not generalize to later stages in the pandemic when cases increased substantially across the country or when burnout may have set in. Indeed, it

is likely that staffing needs drastically increased after our study took place. Accordingly, studies that examine nurse understaffing over a longer period during the pandemic, ideally ones that capture nurses' experiences before, during and after a surge in COVID-19 cases, would be invaluable in elucidating the full impact of each type of understaffing stressor on employee outcomes throughout this crisis.

A final limitation is that we focused on *perceived* work unit understaffing. This is in contrast to existing nursing research, which typically operationalizes personnel understaffing using nurse-to-patient ratios and expertise understaffing by incorporating patient acuity or considering the representation of RNs relative to other nursing staff, such as nursing assistants, in calculations (Brennan et al., 2013). We maintain that a subjective approach to assessing the stressor of understaffing may be a better predictor of a given nurse's cognitions and behaviors than an objective approach, as it reflects their perceptions, which are more proximal predictors of their experience of psychosocial stress at work. Additionally, this approach may be more flexible, as the specific type of missing expertise may vary across departments and organizations, but all may still have similar consequences. However, we encourage future research that investigates when objective versus subjective understaffing indicators converge or diverge and the utility of each in predicting nurse and patient outcomes.

4.3 | Additional future directions

Other directions for future research include examining organizational factors, such as supervisor instrumental support, and individual factors, such as trait mindfulness, that may mitigate these negative effects of understaffing on safety outcomes that were unveiled in this study and continuing to conceptually differentiate between personnel and expertise understaffing as occupational stressors in healthcare settings. Indeed, it would be interesting for future studies to examine the potentially divergent relationships between each form of understaffing and other safety-related outcomes, including supervisor reports of safety performance as well as documented accidents and injuries.

4.4 | Practical implications

This study yields several practical implications for healthcare organizations, leaders and policymakers. First, hospitals should consider the safety implications of nurse staffing shortages, as they reach beyond outcomes commonly associated with understaffing. Indeed, despite evidence showing that setting nurse-to-patient ratios can be an effective way to improve staffing issues and patient outcomes (McHugh et al., 2021), to date, just 14 states have some legislation related to nurse staffing, with only two of those states mandating a specific nurse-to-patient ratio requirement (American Nurses Association, 2019). Policymakers at the state and hospital level are encouraged to consider the safety implications of personnel understaffing when setting nurse-to-patient ratio mandates or staffing policies, as inadequate personnel in a unit may be associated with increased safety workarounds and, in turn, near misses. In addition, this study brings to light the importance of considering expertise understaffing in staffing plans, as lacking expertise within units can also have safety implications. Healthcare organizations and policymakers are encouraged to take steps to address expertise understaffing issues through proper staffing or training initiatives, especially during periods in which the healthcare system is overburdened and/or facing a public health crisis, such as the COVID-19 pandemic, when new knowledge and skills demands may emerge.

Results from this study also indicate that hospitals may need to take additional measures to uphold safety guidelines when faced with personnel and expertise understaffing conditions. For instance, hospitals can ensure that their near-miss reporting system allows nurses to easily and promptly report near misses as they are experienced, especially when facing staffing shortages, as nurses may not want to go out of their way to report near misses when experiencing staffing-related pressures. In addition, hospitals should establish clear channels of upward communication to ensure that nurses feel comfortable speaking up about obstacles being faced in their unit. When facing staffing pressures, leaders should solicit feedback from nurses on barriers to getting their work done. Then, measures should be taken to address these obstacles, which could decrease the occurrence of safety workarounds.

5 | CONCLUSION

Understaffing is a perennial and chronic stressor and issue in the nursing profession, and the challenges it presents are being amplified by the COVID-19 pandemic. Our study sought to understand the effects of understaffing on nurses' cognitions, safety behaviors and outcomes, with results showing that personnel and expertise understaffing influence experiences of near misses through safety workarounds and cognitive failures, respectively. Understanding the mechanisms through which safety outcomes are affected by understaffing can help healthcare organizations be better prepared for safety challenges that may arise when staffing shortages are experienced. Further, hospital leadership and policymakers should consider both personnel and expertise understaffing when making staffing decisions and should prioritize addressing understaffing issues, given their safety implications.

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CONFLICT OF INTEREST

The authors have no known conflict of interest to disclose.

AUTHOR CONTRIBUTIONS

S. A. A., A. M. T., W. S. and M. L. A. made substantial contributions to conception and design of this study and acquisition, analysis and

interpretation of data. All the authors are involved in drafting the manuscript and revising it critically for important intellectual content. All the authors gave their final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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