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Impact of COVID-19 on professional nursing practice environments and patient safety culture

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Abstract

Aim: To analyse the impact of COVID-19 on professional nursing practice environments and patient safety culture.

Background: The relationship between work environments and patient safety has been internationally recognized. In 2020, the pandemic imposed enormous challenges, yet the impact on these variables remains unknown.

Method: This is a quantitative observational study, conducted in a Portuguese hospital, with 403 registered nurses. A self-completion questionnaire was used.

Results: The impact on the *Structure* and *Outcome* components of nursing professional practice environments was positive. Although the *Process* component remained favourable to quality of care, a negative trend was confirmed in almost all dimensions. The results regarding safety culture showed weaknesses; 'teamwork within units' was the only dimension that maintained a positive culture.

Conclusion: Positive responses regarding patient safety were significantly associated with the quality of the nursing professional practice environment. The need to invest in all dimensions of safety culture emerges to promote positive professional environments.

Implications for nursing management: Improving professional nursing practice environments can be achieved through managers' investment in the participation and involvement of nurses in the policies and functioning of institutions, as well as promoting an open, fair and participatory safety culture that encourages reporting events and provides adequate support for professionals.

KEYWORDS
coronavirus infection, hospitals, pandemic, patient safety, work environment

1 | BACKGROUND

In the last two decades, due to the technical-scientific evolution, the complexity of care and the growing demands of citizens, promoting patient safety has become one of the main challenges of the different health systems (Clark & Lake, 2020; Lake et al., 2021; Mihdawi et al., 2020).

In addition, in December 2019, an outbreak of pneumonia caused by the new SARS-CoV2 emerged in the city of Wuhan, China, whose rapid worldwide spread led the World Health Organization to designate it as a pandemic, thus making the disease known as COVID-19 (Almeida, 2020).

Around the world, the daily increase in the number of hospitalizations for COVID-19, besides causing immense pressure on all health care systems, has required organisational planning in a short time to improve professional practice environments, ensuring conditions for safe and quality care (Ventura-Silva et al., 2020).

Although during the pandemic it gained more attention, the work environment has already been one of the main discussion topics in the last decade. Robust research conducted in a pre-pandemic context has shown that hospitals can improve outcomes in relation to clients, nurses and the institution itself by investing in work environments (Al Ma'mari et al., 2020; Faridah et al., 2021; Fassarella et al., 2018). Research related to the *Registered Nurse Forecasting Study* (RN4CAST) has confirmed that the work environment explains much—or all—of the variation in patient safety culture (Clark & Lake, 2020). A good work environment is a prerequisite for a positive safety culture and high-quality care (Al Ma'mari et al., 2020; Lake et al., 2021).

In a pandemic situation, among nurses working in hospitals, there are growing concerns about heavier workloads, increased complexity of care, time pressure and limited resources. Therefore, a negative impact of COVID-19 is predicted on some dimensions of practice environments, which is of concern from the perspective of quality of care and patient safety.

The lack of studies in the country on the characteristics of nursing practice environments during the COVID-19 pandemic makes this research even more relevant, because the identified gaps will support the need for change. It is certain that a nursing practice environment with favourable characteristics will be, among other aspects, important to improve patient safety (Clark & Lake, 2020; Lake et al., 2021; Ribeiro et al., 2020).

Although previous studies have identified the weakest areas in patient safety (Fassarella et al., 2018; Mihdawi et al., 2020), the COVID-19 pandemic has imposed unprecedented readjustments on institutions, and evidence is currently needed to support new strategies that minimize the possibility of unexpected incidents. Working under conditions with high workloads, and lack of staff and resources, can increase the frequency of adverse events that threaten patient safety (Faridah et al., 2021).

Nurses are the health care professional group that remains 24 h a day with patients (Faridah et al., 2021; Fassarella, 2021) and have been central on the front line in the pandemic (Mohammed & Lelièvre, 2022). In this sense, assessing professional practice environments and patient safety culture from the perspective of these professionals, in addition to being a priority, can provide excellent inputs to managers, as it will allow them to identify the weakest areas and define improvement strategies (Fassarella et al., 2018).

Thus, embedded in a national research, this study aimed to analyse the impact of COVID-19 on professional nursing practice environments and patient safety culture. The established hypotheses were as follows: Pandemic by COVID-19 has different impact on the *Structure*, *Process* and *Outcome* components of nursing professional practice environments; and pandemic by COVID-19 has different impact on the dimensions of patient safety culture.

2 | METHOD

2.1 | Research design

Quantitative observational study presented with the support of the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE®) tool.

2.2 | Setting and sample

This study was conducted in one of the largest university hospitals in Portugal. Located in the North region, it is a centre of reference in the various clinical specialties, having, already before the pandemic, a quality management system that promotes effectiveness and efficiency to obtain sustained results, in permanent continuous improvement.

During the pandemic period, although the guidelines issued by the Directorate General of Health and the Ministry of Health allowed for the standardization of procedures in all hospitals of the country regarding the assistance to patients with COVID-19 and patients with other pathologies (Ventura-Silva et al., 2020), the readiness of the hospital institution in question has allowed for a differentiated response (Almeida, 2020). The logistical and structural adjustments in the hospital institution were continuous, and in accordance with the pandemic evolution, seeking to meet the needs of the community and professionals. The top management bodies anticipated the need for reorganisation and established several contingency plans, with sequential definition of services to be opened in case of increasing need for hospitalization in the different care areas. Of the various implemented measures, we highlight the acquisition of clinical and non-clinical material and the early definition of independent circuits for patients with COVID-19. In addition, some services were remodelled, and professionals were hired to satisfy more adequate ratios, as well as reinforced training and constant dissemination of guidelines issued by national and international entities (Almeida, 2020; Cardoso et al., 2021; Ventura-Silva et al., 2020).

Since the beginning of the pandemic, in March 2020, the definition of areas for hospitalization of COVID patients, non-COVID

patients and areas for patients awaiting the results of disease testing assisted to reduce the risk of cross infection and to ensure the assistance of those who sought the institution for other pathologies (Cardoso et al., 2021).

Because the creation of specific care areas essentially occurred in the departments of medicine, surgery and intensive and emergency care, these were the settings selected for this study. Based on the total population of these departments (913 nurses), the sample size was calculated, by adopting a confidence level of 95% and a sampling error of 5%, resulting in a sample size of 385. With the use of a non-probability convenience sampling technique, we obtained the participation of 403 nurses (higher than necessary), of whom 208 worked in areas of care for COVID-19 patients.

The inclusion criteria were being a nurse or a specialist nurse; working in the adult services of the departments of medicine, surgery, intensive and emergency care; and having worked at the institution for more than 18 months (at least since the pre-pandemic period). All professionals who were absent on leave or holiday during the data collection period were excluded.

2.3 | Variables and measures

Considering the variables under study, the data collection instrument used was a self-completion questionnaire composed of three sections: socio-demographic and professional characterization of the participants; Scale for the Environments Evaluation of Professional Nursing Practice (SEE-Nursing Practice) (Ribeiro et al., 2021); and the Hospital Survey on Patient Safety Culture (HSOPSC), in its translated and adapted version for Portugal (Eiras et al., 2014).

The SEE-Nursing Practice is composed of three subscales: the SEE-Nursing Practice—*Structure* (with 43 items distributed by 6 dimensions), the SEE-Nursing Practice—*Process* (with 37 items distributed by 6 dimensions) and the SEE-Nursing Practice—*Outcome* (with 13 items distributed by two dimensions). In the SEE-Nursing Practice, the response to each item is scored on a Likert-type scale with five options, where one corresponds to 'never', two 'rarely', three 'sometimes', four 'often' and five 'always' (Ribeiro et al., 2021).

The HSOPSC is composed of 42 items distributed by 12 dimensions. Each item is answered on a Likert-type scale with five response options, from one "strongly disagree" or "never" to five "strongly agree" or "always" (Eiras et al., 2014).

While completing the questionnaire, which took place from 1 to 30 June 2021, the participants were asked to respond in relation to the items of the SEE-Nursing Practice and the HSOPSC (Eiras et al., 2014; Ribeiro et al., 2021), regarding two distinct moments in time: the pre-pandemic period and the 'current' moment, which in this study corresponds to the third critical period of the COVID-19 pandemic in Portugal (considered as the one in which there was a higher number of hospitalized patients, with a subsequent decrease in the number of new cases and deaths) (Santos et al., 2021).

2.4 | Ethical considerations and data collection

The study was approved by the ethics committee of the hospital under number 104/21. Data collection was carried out by two researchers. The questionnaires were delivered in each department under study and, subsequently, collected on site. Given the movement restrictions and the nurses' heavy workload, the researchers' visits were previously scheduled with the nurse managers. All those who agreed to participate signed the informed consent form. Confidentiality was guaranteed in the use and disclosure of the obtained data.

2.5 | Data analysis

Descriptive and inferential statistics were used using the Statistical Package for the Social Sciences (SPSS) software, version 26.0. When analysing the results, the higher the score in the SEE-Nursing Practice, the more favourable the environment of professional nursing practice is to the quality of care. Regarding the subscales, the higher the score, the more the *Structure*, *Process* or *Outcome* are favourable to the quality of care. For the analysis of the results related to nursing professional practice environments, the following criteria were established: score < 35%—component not very favourable to care quality; between 35% and 55%—component moderately favourable to care quality; between 55% and 75%—component favourable to care quality; and finally, >75%—component very favourable to care quality (Ribeiro et al., 2021).

Regarding patient safety culture, the positive responses refer to the responses in which Options 4 or 5 (agree/strongly agree) were marked for the positively formulated statements or 1 or 2 (strongly disagre/disagree) for the negatively formulated statements. Negative responses refer to responses in which Options 1 or 2 (strongly disagree/disagree) were marked for the positively formulated statements or 4 or 5 (agree/strongly agree) for the negatively formulated statements (Sorra et al., 2016). The percentage of positive responses represents a positive reaction towards patient safety culture and allows for the identification of strong and weak areas in patient safety. For interpreting the results, 'strong areas of patient safety' are those items with 75% or more positive responses ('strongly agree' or 'agree') or those items that when written negatively, scored 75% negative responses ('strongly disagree' or 'disagree'). Similarly, 'weak areas of patient safety' and those needing improvement were those whose items scored 50% or less positive responses. Positive responses between 51% and 74% refer to 'neutral or undefined areas of patient safety' (Sorra et al., 2016).

At the beginning of the statistical analysis, using the *Shapiro–Wilk* and *Lilliefors* tests, normality was rejected for all dimensions and subscales. Consequently, for the variable 'nursing professional practice environments', comparisons between the pre-pandemic moment and after the third critical period of COVID-19 were based on the *Wilcoxon* test (paired samples). Regarding patient

safety culture, comparisons were based on the *McNemar* test. The significance level adopted was .05. Subsequently, to test the relationships between nursing professional practice environments and patient safety culture, the mean score of each subscale of the professional practice environments was considered for the 'positive responses' of each safety culture dimension in the pre-pandemic and after the third critical period of COVID-19. The changes in the scores of each component of the professional practice environment as a function of the 'positive responses' to the patient safety dimensions in each period were compared using the *Kruskal–Wallis* test.

3 | RESULTS

3.1 | Participants' socio-demographic and professional description

A total of 403 nurses participated in the study, whose socio-demographic and professional characteristics are exposed in Table 1.

TABLE 1 Socio-demographic and professional characterization of the participants

Gender *n* (%)	
Female	304 (75.4)
Male	99 (24.6)
Marital status *n* (%)	
Single	151 (37.5)
Married/non-marital partnership	229 (56.8)
Divorced	22 (5.5)
Widower	1 (0.2)
Age (years) Mean; median; SD[a]	38; 37; 8.3
Education *n* (%)	
Bachelor's degree	362 (89.8)
Master's degree	41 (10.2)
Work department *n* (%)	
Medicine department	202 (50.2)
Surgery department	142 (35.2)
Emergency and intensive care department	59 (14.6)
Areas of care for COVID-19 patients	208 (51.6)
Time (months) Mean; median; SD[a]	6.7; 6; 4
Professional category *n* (%)	
Nurse	295 (73.2)
Specialist nurse	108 (26.8)
Time of professional practice (years) Mean; median; SD	14.7; 15; 8.3
Time of professional practice in the service (years) Mean; median; SD[a]	8.6; 5; 7.7
Nursing specialization *n* (%)	
Rehabilitation	59 (54.7)
Medical-surgical	32 (29.7)
Mental and psychiatric health	11 (10.2)
Maternal and obstetric health	4 (3.7)
Community and public health	2 (1.6)

Source: Authors.
[a]SD—standard deviation.

3.2 | Environments of professional nursing practice

Regarding the environments of professional nursing practice, the results are shown in Table 2.

Regarding the *Structure* component, it was found that the average percentage in all dimensions and in the subscale itself was higher after the third critical period of COVID-19. In the *Process* component, except for the dimensions 'collaboration and teamwork' and 'interdependent practices in professional practice', the percentage was lower after the third critical period of COVID-19 for all other dimensions. Finally, in the *Outcome* component, the average percentage in both dimensions and in the subscale was higher after the third critical period of COVID-19.

3.3 | Patient safety culture

Regarding patient safety culture, Table 3 explains the percentages of 'positive responses' in relation to the pre-pandemic moment and after the third critical period of COVID-19.

The analysis of the results of both moments showed that eight dimensions presented less than 50% of positive answers in both moments, thus being fragile areas of patient safety. Of these, three dimensions should be highlighted, which, although still fragile, showed significantly higher percentages after the third critical period of COVID-19: 'feedback and communication about error', 'communication openness' and 'frequency of event reported'. Furthermore, four dimensions showed significantly lower percentages after the third critical period: 'overall perceptions of patient safety', 'teamwork across units', 'staffing' and 'handoffs and transitions'.

3.4 | Environments of professional nursing practice and patient safety culture

Regarding the relationship between professional practice environments and patient safety culture, Table 4 presents the mean percentages of each component of nursing professional practice environments for the 'positive responses' for each dimension of patient safety culture at the pre-pandemic moment and after the third critical period of COVID-19.

About the *Structure* and *Process* components of nursing professional practice environments, in relation to the 12 dimensions of safety culture, the scores were higher after the third critical period of COVID-19.

TABLE 2 Mean percentages of the components/dimensions of nursing professional practice environments at the pre-pandemic moment and after the third critical period of COVID-19

Components/dimensions	Pre-pandemic moment		After the 3rd critical period COVID-19		
	Mean	Standard deviation	Mean	Standard deviation	*p* values*
Structure component					
People management and service leadership	54.4	15.7	58.3	14.6	<.001
Physical environment and conditions for appropriate service running	52.3	14.4	53.4	14.9	<.001
Nurses' participation and involvement in the institution's policies, strategies and management	39.7	15.6	46.8	15.6	<.001
Institutional policy for professional qualification	42.3	17.5	47.3	16.5	<.001
Organisation and guidance of nursing practice	53.4	17.1	56.4	15.5	<.001
Quality and safety of nursing care	56.2	18.9	61.3	16.2	<.001
Structure subscale	50.2	12.7	53.8	12.1	<.001
Process component					
Collaboration and teamwork	64.4	11.4	64.8	11.3	.022
Strategies for ensuring quality in professional practice	57.4	14.6	55.7	14.5	<.001
Autonomous practices in professional practice	71.6	11.8	70.0	11.8	<.001
Care planning, evaluation and continuity	70.7	12.1	62.4	15.2	<.001
Theoretical and legal support of professional practice	72.5	13.4	70.3	14.1	<.001
Interdependent practices in professional practice	40.7	17.5	47.7	15.2	<.001
Process subscale	64.2	8.7	62.3	9.2	<.001
Outcome component					
Systematic assessment of nursing care and indicators	48.8	15.9	51.6	15.2	<.001
Systematic assessment of nurses' performance and supervision	42.7	15.2	47.0	16.7	<.001
Outcome subscale	46.0	14.1	49.5	14.3	<.001

Source: Authors.
*Significance—Wilcoxon test.

Regarding the *Outcome* component, except in dimensions 'feedback and communication about error', 'frequency of events reported' and 'nonpunitive response to errors', the score of this component of the practice environments is higher after the third critical period of COVID-19 in all other dimensions.

4 | DISCUSSION

With regard to nursing professional practice environments, the investment made in the institution during the first two critical periods of the pandemic, such as the increased availability of material resources, the hiring of more nurses, the mobilization of nurses from services with decreased activity to those that ensured care for COVID-19 patients, the strict separation of COVID and non-COVID areas and the frequent assessment of the adopted strategies (Almeida, 2020; Cardoso et al., 2021), had a positive impact on the *Structure* and *Outcome* components. However, the mean percentages confirm that, similarly to the pre-pandemic context, these components remained moderately favourable to the quality of care. Despite the strategies adopted by the institution, in view of the adversities and demands during several months of the pandemic, there is an urgent need to continue the investment that was initiated, especially because the physical and emotional wear and tear to which the professionals were continuously subjected increased. With greater opportunity to collaborate in defining the institution's strategies, nurse managers gained special emphasis on the organisation of services and care management (Ventura-Silva et al., 2020). This justifies that in the dimensions 'people management and service leadership', 'organisation and guidance of nursing practice' and 'quality and safety of nursing care' the mean percentage was significantly higher after the third critical period of COVID-19. As observed by other authors, in a crisis scenario, the nurse manager plays a key role by providing the physical, human and material resources necessary to ensure the safety and quality of care (Santos et al., 2022) and also by supporting the care providers, not only in the scientific and instrumental domains but also emotionally.

Additionally, although the *Process* component remains favourable to the quality of care, a negative trend was confirmed in almost all dimensions, except for 'collaboration and teamwork' and 'interdependent practices in professional practice'. The high workload and complexity of care, in addition to determining the focus on the interdependent dimension of the profession, made teamwork

TABLE 3 Percentages of positive responses on patient safety culture at the pre-pandemic moment and after the third critical period of COVID-19

Dimensions (pacient safety culture)	Pre-pandemic moment Mean	After the 3rd critical period COVID-19 Mean	*p* values*
Dim 1—Teamwork within units	79.5	81.1	.002
Dim 2—Manager expectations and actions promoting patient safety	38.8	37.5	.239
Dim 3—Organisational learning - continuous improvement	55.3	58.9	<.001
Dim 4—Management support for patient safety	47.9	47.6	.505
Dim 5—Overall perceptions of patient safety	49.9	47.3	<.001
Dim 6—Feedback and communication about error	21.8	27.0	<.001
Dim 7—Communication openness	31.3	37.4	<.001
Dim 8—Frequency of events reported	24.3	26.1	<.001
Dim 9—Teamwork across units	49.6	37.4	<.001
Dim 10—Staffing	50.4	24.6	<.001
Dim 11—Handoffs and transitions	54.0	41.1	<.001
Dim 12—Nonpunitive response to errors	20.2	20.2	>.999

Abbreviation: Dim, dimension.
Source: Authors.
*Significance—McNemar test.

essential (Santos, Balsanelli, et al., 2021). Moreover, the difficulties inherent to the planning, assessment and continuity of care were aggravated, the dimension that in this study showed the greatest percentage decrease (70.7% before the pandemic and 62.4% after the 3rd critical period). In the dimensions 'strategies for ensuring quality in professional practice', 'autonomous practices in professional practice' and 'theoretical and legal support of professional practice', the significant decrease in the mean percentage after the third critical period of COVID-19 points to the need to invest in the weaknesses that may be compromising a congruent performance with the essence of nursing and the profession's social mandate.

Out of the 14 dimensions of the SEE-Nursing Practice, the worst scored dimension refers to 'nurses' participation and involvement in the institution's policies, strategies and management', which justifies an emerging action at this level. According to some authors, the effective involvement of nursing professionals in hospital management would empower them to make decisions regarding patient safety, which, in turn, would lead to positive outcomes for the patient (Mihdawi et al., 2020). In a study conducted in a pandemic context, the unfavourable aspects also highlighted the low participation of nurses in decision-making (Santos, Balsanelli, et al., 2021).

Regarding patient safety culture, in the pre-pandemic moment, nine dimensions were considered mostly weak and subject to improvement. After the third critical period of COVID-19, the number of predominantly weak dimensions increased to 10. The dimension that registered this negative trend was 'handoffs and transitions'. Transitions (between shifts and/or services) are known to be one of the most complex moments in care delivery and can trigger loss of information relevant to the continuity of care (Fassarella et al., 2018). In the context of a pandemic crisis, the increase in the number of patients, the complexity of their clinical condition and the lack of time can compromise patient safety, and the adoption of strategies that facilitate the transmission of relevant information is recommended.

The dimension in which the greatest decrease in the percentage of positive responses was found from the pre-pandemic to the third critical period of COVID-19 was in 'staffing', which decreased from 50.4% to 24.6%. Although the lack of nurses in adequate numbers had been confirmed previously in Portugal and abroad (Eiras et al., 2014; Fassarella, 2021; Fassarella et al., 2018), the pandemic by COVID-19 aggravated the lack of professionals worldwide, with important repercussions on the quality and safety of the provided care (Fassarella, 2021; Santos, Balsanelli, et al., 2021) and on the demands on these professionals (Mohammed & Lelièvre, 2022).

In this study, the dimensions with the lowest percentage of positive responses were, in both moments, the 'feedback and communication about error', the 'frequency of events reported' and the 'nonpunitive response to errors'. The consistency between these results shows that, in addition to the underreporting of events, the lack of communication and feedback regarding errors may hinder the definition and implementation of strategies to avoid them, which had already been confirmed in studies conducted before the pandemic (Fassarella et al., 2018). In addition, because of poor communication about the error, professionals are less informed about the errors that occur in the service, which, if not properly discussed, may become recurrent.

Although, currently, 10 dimensions of patient safety are considered mostly weak and subject to improvement, it should be noted that comparing the results of the two moments, there was a positive trend

TABLE 4 Mean percentages of professional practice environments for positive patient safety culture responses

	Structure component			Process component			Outcome component		
	Pre-pandemic Mean	After the 3rd critical period COVID-19 Mean	*p* values*	Pre-pandemic Mean	After the 3rd critical period COVID-19 Mean	*p* values*	Pre-pandemic Mean	After the 3rd critical period COVID-19 Mean	*p* values*
Dim 1	50.9	55.3	<.001	59.7	65.4	<.001	46.8	51.5	<.001
Dim 2	53.0	56.7	<.001	63.1	66.0	<.001	48.3	52.1	<.001
Dim 3	54.0	57.3	<.001	60.6	67.2	<.001	50.3	53.7	<.001
Dim 4	52.0	57.5	.047	61.6	67.0	.035	48.4	54.1	.025
Dim 5	62.7	62.9	<.001	62.4	70.9	<.001	57.5	58.0	<.001
Dim 6	53.6	53.9	<.001	62.0	66.5	<.001	49.5	49.0	<.001
Dim 7	58.4	59.2	<.001	62.4	68.2	.026	53.3	54.1	<.001
Dim 8	58.1	58.7	<.001	62.8	68.7	<.001	54.4	54.1	<.001
Dim 9	52.8	58.0	<.001	62.2	66.3	<.001	48.3	52.7	<.001
Dim 10	51.2	56.7	<.001	62.9	65.5	<.001	47.3	50.0	<.001
Dim 11	52.7	56.6	<.001	62.6	65.6	<.001	48.2	51.3	<.001
Dim 12	56.0	55.9	<.107	63.7	66.3	.038	49.8	49.5	.044

Note: Dim 1—Teamwork within units; Dim 2—Manager expectations and actions promoting patient safety; Dim 3—Organisational learning—continuous improvement; Dim 4—Management support for patient safety; Dim 5—Overall perceptions of patient safety; Dim 6—Feedback and communication about error; Dim 7—Communication openness; Dim 8—Frequency of events reported; Dim 9—Teamwork across units; Dim 10—Staffing; Dim 11—Handoffs and transitions; Dim 12—Nonpunitive response to errors.
Abbreviation: Dim, dimension.
Source: Authors.
*Significance—Kruskal–Wallis test.

in five dimensions: 'teamwork within units'; 'organizational learning - continuous improvement'; 'feedback and communication about error'; 'communication openness' and 'frequency of events reported', confirming that despite the less favourable aspects, the pandemic also imposed positive changes in patient safety (Fassarella, 2021).

In the case of 'communication openness', the percentage of positive responses increased from 31.3% to 37.4%, which is still a low value, justifying that nurse managers invest in improving the dynamics and communication among the health care team, even advocating openness in communication as fundamental to patient safety and team performance (Clark & Lake, 2020; Silla et al., 2017).

Regarding dimensions 'manager expectations and actions promoting patient safety' and 'management support for patient safety', in addition to the percentages of positive answers being lower than 50%, both in the pre-pandemic moment and after the third critical period of COVID-19, the differences are not significant. Similarly to another study conducted in Portugal (Fassarella et al., 2018), in these dimensions, nurses perceived that managers are insufficiently concerned with patient safety issues, revealing that not even the pandemic context has changed this trend.

Regarding the relationship between professional practice environments and positive responses to patient safety culture, it was found that after the third critical period of COVID-19, in the *Structure* and *Process* components, the score was higher in all dimensions. Concerning the *Outcome* component, the score was only lower in relation to dimensions 'feedback and communication about error', 'frequency of events reported' and 'nonpunitive response to errors', which besides the 'staffing' dimension are those in which the average percentage of positive responses was lower.

Although during the pandemic the investment in some areas of practice environments was evident, the lack of a culture of event reporting, already known in Portugal in the pre-pandemic context (Fassarella et al., 2018), hampered the adoption of different attitudes and behaviours by the professionals. This draws attention to the need to invest in this area, because notification can minimize the occurrence of errors and harm to patients, a particularly important aspect given the workload and complexity of care in a pandemic context. Silla et al. (2017) confirmed that the most difficult obstacle in the implementation of patient safety is to create 'the culture of safety', and it is evident in the results of this study the need to invest in an event reporting policy, what constitutes an emerging challenge.

Thus, it is important that hospital administrators and nursing managers work towards building and supporting a safety culture where errors are recognized, reported and studied to prevent recurrence and implement actions that mitigate patient harm, without penalizing the nurses (Clark & Lake, 2020), which in fact is not current practice in the country's hospitals. In this sense, the present study contributes with new findings that significantly support the development of quality of care and patient safety culture in Portuguese hospitals.

Following the above, it should be noted that overall positive patient safety responses are significantly associated with the quality of the nursing professional practice environment, which is in line with what has been reported by other authors (Clark & Lake, 2020; Faridah et al., 2021; Mihdawi et al., 2020). In addition, positive levels of 'overall perceptions of patient safety' were associated with better scores in nursing professional practice environments, which corroborates the results obtained in different public and private hospitals in Jordan (Mihdawi et al., 2020) and in specific care settings (Al Ma'mari et al., 2020; Lake et al., 2021).

When nurses perceive that their work environment is favourable to the professional practice, they are more likely to engage in their work, thus ensuring safe patient care (Faridah et al., 2021). In the perspective of the same authors, in this context, the main role of a strong nursing leadership is to create conditions for nurses to be involved in their work environment, which will consequently promote safe and quality care.

Although the overall results showed the existence of a moderately quality-promoting professional practice environment, the safety culture is fragile, lacking greater investment, both in professional practice and in training. In this sense, it is worth highlighting the importance of managers in raising nurses' awareness about patient safety, as well as in addressing the professionals' questions/complaints, by adopting strategies to solve them as quickly as possible (Santos et al., 2022).

In this sense, in addition to the relevance of maintaining a positive work environment (Al Ma'mari et al., 2020), this study highlights the need to invest in promoting a culture of safety and organisational learning, which encourages the events' reporting, ensures feedback and communication about errors and is characterized by non-punitive responses. Therefore, it is essential that the institution's managers adopt an adverse event prevention policy as a requirement for patient safety, which, instead of highlighting individual failures, focuses on a systemic perspective that encompasses organisational and technological factors, as well as human factors (Fassarella, 2021; Fassarella et al., 2018).

4.1 | Limitations and future research

Despite the relevance of the findings, this study has some limitations. First, at the time of data collection, participants were asked to answer in relation to two different moments in time: the pre-pandemic moment and the current moment. Even though this strategy would have allowed us to assess the impact of the pandemic on some dimensions of the practice environments, we assumed the risk of response bias. Second, the study focused on the nurses' perception of patient safety culture and did not identify data on actual incidents in this area, which is a limitation and calls for further studies. Third, the fact that this research was conducted in a single institution, and the use of only one professional category in the assessment of safety culture. Thus, studies in other institutions are suggested to contribute to the validation and generalization of the results. However, by providing an initial understanding of the variables studied in a pandemic context, the results are extremely relevant for the managers of this institution, as they allow for the definition of improvement strategies for the future.

5 | CONCLUSION

During the pandemic, the necessary investment in working conditions had a positive impact on the *Structure* and *Outcome* components of nursing professional practice environments. On the other hand, the high workload and the complexity of care had a negative impact on the *Process* component.

Regarding patient safety culture, only the dimension 'teamwork within units' showed a positive culture before the pandemic and after the third critical period of COVID-19. Unfortunately, the pandemic continues, and alongside the emerging investment in staff adequacy, it is urgent to promote a patient safety culture that is characterized by open communication, non-punitive responses to errors and the reporting of events. Given that positive patient safety responses are significantly associated with the quality of the practice environment, continued investment in working conditions and the promotion of an open and participatory safety culture can be expected to qualify professional nursing practice environments.

6 | IMPLICATIONS FOR NURSING MANAGEMENT

The results of this study can be used by the different levels of management to adopt strategies that improve professional practice environments and, consequently, patient safety. The role of managers is fundamental not only in improving the weakest dimensions of professional practice environments but also in developing a positive safety culture.

In this context, the nurses' participation and involvement in the institutions' policies, the creation of institutional professional qualification programmes, the investment in ensuring adequate nurse-to-patient ratios and the development of conditions that promote the autonomous practices of these professionals are aspects that may contribute to the development of practice environments. In addition, in each service, it is up to the nurse manager to invest in actions that promote a safety culture, which encourages the reporting of events, ensures open communication about errors and prevents the professional from becoming the second victim, with possible psychological and physical repercussions.

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CONFLIT OF INTEREST

The authors have no conflict of interest to declare.

AUTHOR CONTRIBUTIONS

OR, LT and CS contributed to conception and design. OR, JVS and CS were responsible for the acquisition of data. OR, LT, CF, SP and PT analysed and interpreted the data. OR, LT, CF, SP, CR and PL have been involved in drafting the manuscript or revising it critically for important intellectual content. OR, LT, CF, SP, PT, CR, PL, JVS and CS have given final approval of the version to be published. OR 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.

ETHICAL APPROVAL

This study was approved by the Ethics Commmitee of the Centro Hospitalar (No. 104-21).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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REFERENCES

Al Ma'mari, Q., Sharour, L. A., & Al Omari, O. (2020). Fatigue, burnout, work environment, workload and perceived patient safety culture among critical care nurses. *British Journal of Nursing*, *29*(1), 28–34. https://doi.org/10.12968/bjon.2020.29.1.28

Almeida, J. A. (2020). Internal Medicine in Centro Hospitalar Universitário S. João and the COVID-19 Pandemic. *Revista da Sociedade Portuguesa de Medicina Interna*, *2020*(esp), 1–6. https://doi.org/10.24950/rspmi/COVID19/J.Almeida/CHUSJOAOS/2020

Cardoso, M. F. P. T., Martins, M. M. F. P. D. S., Trindade, L. D. L., Ribeiro, O. M. P. L., & Fonseca, E. F. (2021). The COVID-19 pandemic and nurses' attitudes toward death. *Revista Latino-Americana de Enfermagem*, *29*, 1–11. https://doi.org/10.1590/1518-8345.4769.3448

Clark, R., & Lake, E. T. (2020). Association of clinical nursing work environment with quality and safety in maternity care in the United States. *MCN. The American Journal of Maternal Child Nursing*, *45*(5), 265–270. https://doi.org/10.1097/NMC.0000000000000653

Eiras, M., Escoval, A., Grillo, I. M., & Silva-Fortes, C. (2014). The hospital survey on patient safety culture in Portuguese hospitals: instrument validity and reliability. *International Journal of Health Care Quality Assurance*, *27*(2), 111–122. https://doi.org/10.1108/IJHCQA-07-2012-0072

Faridah, I., Setyowati, S., Lestari, F., & Hariyati, R. T. S. (2021). The correlation between work environment and patient safety in a general hospital in Indonesia. *Enfermería Clínica*, *31*(2), S220–S224. https://doi.org/10.1016/j.enfcli.2020.12.026

Fassarella, C. S. (2021). Organizational culture of safety during the COVID-19 pandemic. *Revista de Enfermagem Referência*, *5*(5), 1–3. https://doi.org/10.12707/RV21ED5

Fassarella, C. S., Camerini, F. G., Henrique, D. D. M., Almeida, L. F. D., & Figueiredo, M. D. C. B. (2018). Evaluation of patient safety culture: Comparative study in university hospitals. *Revista da Escola de Enfermagem da USP*, *52*(0), 1–7. https://doi.org/10.1590/S1980-220X2017033803379

Lake, E. T., Roberts, K. E., Agosto, P. D., Ely, E., Bettencourt, A. P., Schierholz, E. S., Frankenberger, W. D., Catania, G., & Aiken, L. H. (2021). The association of the nurse work environment and patient safety in pediatric acute care. *Journal of Patient Safety*, *17*(8), e1546–e1552. https://doi.org/10.1097/PTS.0000000000000559

Mihdawi, M., Al-Amer, R., Darwish, R., Randall, S., & Afaneh, T. (2020). The influence of nursing work environment on patient safety. *Workplace Health & Safety*, *68*(8), 384–390. https://doi.org/10.1177/2165079920901533

Mohammed, N., & Lelièvre, H. (2022). Lived experience of medicine nurses caring for COVID-19 patients: A quality improvement perspective. *Journal of Nursing Care Quality*, *37*(1), 35–41. https://doi.org/10.1097/NCQ.0000000000000590

Ribeiro, O., Vicente, C., Martins, M. M., Vandresen, L., & Silva, J. (2020). Instruments for assessing professional nursing practice environments: An integrative review. *Revista Gaúcha de Enfermagem*, *41*, e20190381. https://doi.org/10.1590/1983-1447.2020.20190381

Ribeiro, O., Vicente, C., Sousa, C. N., Teles, P., Trindade, L. L., Martins, M., & Cardoso, M. (2021). Scale for the environment evaluation of professional nursing practice: Construct VALIDATION. *Journal of Nursing Management*, *29*(6), 1809–1818. https://doi.org/10.1111/jonm.13290

Santos, A. P., Leite, P. P., Casaca, P., Fernandes, E., Mata, F., Dias, C. M., Nunes, B., Gomes, J. P., Borges, V., Silva, S., Rodrigues, A. P., Machado, A., Antunes, L., & Caetano, C. (2021). *Monitoring of Red Lines for COVID-19*. General Directorate of Health.

Santos, J., Balsanelli, A. P., Freitas, E. O., Menegon, F., Carneiro, I. A., Lazzari, D. D., Menezes, J., Erdmann, A. L., & Camponogara, S. (2021). Work environment of hospital nurses during the COVID-19 pandemic in Brazil. *International Nursing Review*, *68*(2), 228–237. https://doi.org/10.1111/inr.12662

Santos, J. L. G. D., Menegon, F. H. A., Andrade, G. B., Freitas, E. O., Camponogara, S., Balsanelli, A. P., & Erdmann, A. L. (2022). Changes implemented in the work environment of nurses in the COVID-19 pandemic. *Revista Brasileira de Enfermagem*, *75*(suppl 1), 1–6. https://doi.org/10.1590/0034-7167-2020-1381

Silla, I., Navajas, J., & Koves, G. K. (2017). Organizational culture and a safety-conscious work environment: The mediating role of employee

communication satisfaction. *Journal of Safety Research*, *61*, 121–127. https://doi.org/10.1016/j.jsr.2017.02.005

Sorra, J., Gray, L., Streagle, S., Famolaro, T., Yount, N., & Behm, J. (2016). *AHRQ Hospital Survey on Patient Safety Culture: User's Guide*. United States of America: Agency for Healthcare Research and Quality.

Ventura-Silva, J. M. A., Ribeiro, O. M. P. L., Reis Santos, M., Faria, A. C. A., Monteiro, M. A. J., & Vandresen, L. (2020). Organizational planning in pandemic context by COVID-19: implications for nursing management. *Journal Health NPEPS*, *5*(1), 1–7. https://doi.org/10.30681/252610104626

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