Patient safety culture in a COVID-19 ICU compared to a clinical-surgical ICU in the Brazilian Eastern Amazon: A cross-sectional study

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Abstract.
BACKGROUND: The COVID-19 pandemic highlighted the need for a new dynamic in the organization and practices of health services, as it required rapid restructuring to promote safe and harm-free assistance.
OBJECTIVE: To assess the dimensions of the patient safety culture (PSC) from the perspective of the health team professionals in clinical-surgical ICU (G1) compared to a COVID-19 ICU (G2).
METHODS: Cross-sectional, analytical, descriptive and inferential study, using the "Hospital Survey on Patient Safety Culture" questionnaire.
RESULTS: The domain "Supervisor/Manager Expectations and Actions Promoting Patient Safety (PS)" was a potential weakness for G1 ($p = 0.003$). G2 was most positive on improving PS, being informed about errors, considering PS as a top priority to management, and that the units work together to provide the best care ($p > 0.05$). G1 was most negative about the work culture with staff from other units, exchange of information across units, and shift changes ($p > 0.05$). The highest PS grade was related to greater communication, and a smaller frequency of events was reported only for G2 ($p > 0.05$).
CONCLUSION: There must be a balance in terms of attention focused on PS between different ICUs in times of crisis, especially regarding the supervisors/managers actions.

Keywords: Patient safety, organizational culture, intensive care units, COVID-19

1. Introduction

Patient safety (PS) is an important and complex public health issue [1]. Patient safety culture (PSC) is defined as a component of organizational culture that encompasses a set of individual or group values, attitudes, perceptions, competencies, and behaviors. Organizations with a strengthened safety culture are characterized by good communication among professionals, mutual trust, and a shared perception of the importance and effectiveness of preventive measures [2,3]. PSC is also an important strategy that favors the

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implementation of safe practices and the mitigation of adverse events (AE) [4]. As AE harms patients, it is therefore considered a failure in medical care processes, and its occurrence is related to the characteristics of specific populations and PSC [5].

The COVID-19 pandemic promoted changes in behavior and attitudes toward PS, due to new dynamics and higher stress levels among workers and managers. The pandemic created a context of excessive pressure on frontline health care workers and hospitals, increased workload, increased number of patients, lack of knowledge about the virus, and lack of infrastructure. This scenario impairs performance, affects the quality of health care, increases the incidence of adverse events, and promotes poor PS [6–9].

In this moment of crisis, organizational planning had to be created in a short time to improve the environment of professional practice and ensure the conditions for safe and quality care. Accordingly, research conducted to analyze PS in the pandemic context shows that the dimensions that most often show weaknesses are: staffing, hospital leadership support for safety, interdepartmental teamwork, handoffs and transitions, openness of communication, nonpunitive response to errors, and overall perception of PS [10–12].

Considering the changes that the pandemic has caused in the organization of services, the evaluation of PSC in hospitals, especially in the Intensive Care Units (ICU), is imperative, since at least 20% of patients with COVID-19 have to be admitted to the ICU due to acute respiratory distress syndrome (ARDS) [13] and the occurrence of SARs in the ICU is more likely due to the complexity of interventions, protocols, and the need to make decisions within a short time [14,15]. A study of 343 event reports from 71 hospitals in Pennsylvania showed that 17% of SARs occur in the ICU, resulting in the following: Exposure to COVID-19 positive or presumptive positive patients, missed/delayed care or treatment, missed/delayed tests or results, and wasted resources [16].

In developing countries, basic hospital safety indicators are usually incomplete or unavailable. The few data found indicate that the prevalence of adverse events in South American countries is much higher than in developed countries [17]. The safety culture within a country's health organization is strongly influenced by factors such as cultural norms, expectations, race, religion, and other personal characteristics [18]. In Brazil, Ordinance No. 529 of 2013 was launched by the National PS Program (PNSP) and aims to provide subsidies for health institutions in the national territory to have a framework to implement and promote measures of security [19] and thus direct and unify/standardize actions.

Brazil is a country with a large territorial extension, and the Brazilian Eastern Amazon has a particular reality with a lack of research on safety culture. Therefore, this study aimed to assess the PSC from the perspective of the health team professionals in COVID-19 ICU compared to clinical-surgical ICU in hospital references in infectious diseases in the Brazilian North Amazon.

2. Methods

2.1. Ethics

This research was approved by the local Research Ethics Committee, no. 29987220.3.0000.0017. The design was carried out according to the ethical principles provided for in Resolution 466/12 and Resolution No. 510, April 7, 2016, of the National Health Council of Brazil.

2.2. Study design

This is an observational and cross-sectional study with a descriptive and inferential analytical design.

2.3. Setting

The study took place in a hospital in the North region of Brazil from March 16 to June 9, 2021. The hospital provides health care to the population through the Unified Health System (SUS), being a regional reference in Pulmonology, Infectious Diseases, Endocrinology and Diabetes, for severe cases of Covid-19 in 2020, and also a national reference in AIDS, working in the area of Teaching and Research. The clinical-surgical ICU of this hospital has 9 beds to serve different patients with individual structures. For the COVID-19 ICU, 9 beds are also available for suspected and confirmed patients, where the space structure does not have partitions.

2.4. Population

This study examined the health team professionals in clinical-surgical ICU (G1) and COVID-19 ICU (G2). The clinical-surgical ICU presented 6 physicians, 9 nurses, 31 nursing technicians, and 5 physiotherapists, the COVID-19 ICU presented 6 physicians, 9 nurses, 29 nursing technicians and 7 physiotherapists, with a time of activity in the institution of at least 6 months, excluding those professionals who were on vacation or leave during the research period. Only 14% of workers were transferred to the COVID-19 ICU during the pandemic.

2.5. Inclusion and exclusion criteria

The time of activity in the institution of at least 6 months was defined as inclusion criteria. The professionals who were on vacation or recess during the research period were excluded.

2.6. Study size

The sampling was non-probabilistic of the intentional type, in which the entire team from both ICUs was invited to participate, respecting the inclusion and exclusion criteria. The final sample was composed of 50 health team professionals (G1: 29; G2:21): 4 physicians, 14 nurses, 25 nursing technicians and 7 physiotherapists (Table 1).

2.7. Potential sources of bias

Regarding the study design and sample, the results may be subject to selection bias (non-respondents). Statistical power analysis was performed to address this source of bias using current version of G*Power (3.1.9.2). The values of the patient safety grade (PSG) item were used to calculate the Effect Size dz (0.54). In addition, the probability of errors was determined for the analysis (α error probability = 0.05 and β error probability = 0.2. Finally, we obtained a non-centrality parameter $\delta = 2.59$ and high power (0.81) for analysis.

2.8. Data collection

Before data collection, the leader of each professional category sector was approached to obtain a list of all professionals of the two ICU under study and their respective telephone numbers. All participating professionals were informed about the objective of the study and the willingness of participation, as well as

Table 1
Characteristics of the health team professionals in clinical-surgical ICU (G1) and COVID-19 ICU (G2)

	G1 ($n = 29$)	G2 ($n = 21$)	χ^2 or Fisher test	p
Sex				
Male	7 (24.1)	8 (38.1)		
Female	22 (75.9)	13 (61.9)	Fisher test = 0.356	0.226
Staff position				
Clinical staff physician/Assistant physician	3 (10.3)	1 (4.8)		
Nurse	7 (24.1)	7 (33.3)		
Nursing technician	16 (55.2)	9 (42.9)		
Physiotherapist	3 (10.3)	4 (19)	$\chi^2 = 1.871$	0.600
How long have you worked in this hospital?				
Less than a year	2 (6.9)[*]	8 (38.1)[*]		
1 to 5 years	21 (72.4)	10 (47.6)		
6 to 10 years	0 (0)	0 (0)		
11 to 15 years	0 (0)	1 (4.8)		
16 to 20 years	1 (3.4)	1 (4.8)		
21 years or more	5 (17.2)	1 (4.8)	$\chi^2 = 10.150$	0.038[#]
How long have you worked in your current hospital work area/unit?				
Less than a year	2 (6.9)	4 (19)		
1 to 5 years	17 (58.6)	12 (57.1)		
6 to 10 years	3 (10.3)	1 (4.8)		
11 to 15 years	0 (0)	1 (4.8)		
16 to 20 years	3 (10.3)	2 (9.5)		
21 years or more	4 (13.8)	1 (4.8)	$\chi^2 = 4.360$	0.499
Typically, how many hours per week do you work in this hospital?				
Less than 20 h per week	0 (0)	1 (4.8)		
20 to 39 h per week	25 (86.2)	20 (95.2)		
40 to 59 h per week	4 (13.8)	0 (0)	$\chi^2 = 4.388$	0.111

[*]Significant values through the adjusted residual post-hoc tests with $Z_{crit} = 1.96$. [#]$p < 0.05$ by Pearson χ^2 (2-sided).

the need to read and sign the Free and Informed Consent Form Online, through an invitation to participate to then fill out the questionnaire digitally by Google forms. The invitations were sent through transmission networks by the Whatsapp app.

2.9. Study variables

To assess the knowledge of health team professionals about the definitions of adverse events and PS in care, the questionnaire "Hospital Survey on Patient Safety Culture" (HSOPSC) was applied, in the version adapted from the instrument that was translated and validated for the Brazilian context [17,20].

The HSOPSC consists of questions for the collection of sociodemographic variables (sex, age, professional category, degree of education and length of time working in the hospital) followed by 12

dimensions with 47 items distributed in 9 sections to assess the degree of agreement of professionals on issues related to the safety culture, evaluated through a Likert scale, a 5-point scale, whose possibilities of answers vary between "I totally disagree" to "I totally agree" or "never" to "always".

Seven of the dimensions evaluate the characteristics of the department/unit of work and three evaluate the safety culture within the hospital organization. In addition, two other dimensions assess the general perception of PS and the frequency of adverse events reported in the last 12 months. The negatively worded item of domain score PSG are coded in reverse because the higher scores indicate worse PS, thus disagreeing or responding "never" to a negatively worded item indicates a positive response. To determine a dimension such as strength, ≥75% of positive responses to questions formulated in a positive direction were needed or ≥75% of negative responses to questions formulated in a negative direction. In order to qualify a question or dimension as a weakness, it must have ≥50% of negative responses to questions formulated in the positive, or ≥50% of positive responses to questions formulated in the negative.

The information obtained through the questionnaire was stored in a database for statistical analysis and production of pertinent graphs and tables.

2.10. Statistical analysis

For descriptive statistics, the absolute and relative (%) frequency for each item was presented according to the groups, clinical-surgical ICU (G1) and COVID-19 ICU (G2). As for the inferential analysis, Pearson's Chi-Square test (2-tails) and Fisher's test were applied to verify the difference between variables and the adjusted residual values were considered (significant values with $Z_{crit} = 1.96$). The t-test and the Mann–Whitney U test were used to compare the total score in the different domains for the two groups. The Pearson r (parametric) or Spearman r (non-parametric) correlation test was used to verify the level of correlation between the total scores in the different domains. Participants with missing data were not included in the analysis of the specific variables. Statistical significance considered $p > 0.05$.

3. Results

The characteristics of the health team professionals are presented in Table 1. The individuals of COVID-19 ICU (47.86 ± 8.11) were older than clinical-surgical ICU (41.04 ± 10.48) ($t = -2.568$, $p = 0.013$). Health team professionals of COVID-19 ICU work less time in the hospital. The time of work of participants in their current specialty or profession did not present statistical differences (G1: 15.74 ± 7.32 years; G2: 15.55 ± 8.09; $t = 0.083$, $p = 0.934$).

Table 2 shows the frequency of PSC responses overall, as well as positive, neutral, and negative responses for both groups. In the domain "Supervisor/Manager Expectations and Actions Promoting PS" ($p = 0.003$), individuals from G1 were more negative and neutral, as well as for "Management Support for PS", although G2 had a more positive "Overall Perceptions of PS".

In the analysis of session items, the perspective on work area/unit and supervisor/manager session (Table 3) revealed that G2s most positively agreed with the statement that they are actively doing things to improve PS ($p = 0.038$). They also responded most positively that they get the most help from other professionals, most negatively that the supervisor/manager overlooks PS problems, and more neutral about when in "crisis mode" trying to do too much too quickly. G2 was more positive in thinking that there are problems in this unit.

The perspectives on communication (Table 4) showed that G2 was more neutral towards information about errors in their unit ($p = 0.009$). In addition, G2 more positively indicated that they discuss ways to

Table 2

Frequencies of positive, neutral and negative responses in the composites for the clinical-surgical ICU (G1) and COVID-19 ICU (G2)

	Groups	Negative (%)	Neutral (%)	Positive (%)	χ^2	p
Overall patient safety culture		48	19	33		
	G1	54	19	27	2.836	0.242
	G2	43	20	37		
Teamwork within units	G1	8	6	85	1.645	0.439
	G2	14	8	78		
Supervisor/Manager expectations and actions promoting patient safety	G1	48[*]	21[*]	31[*]	11.49	0.003[#]
	G2	40[*]	7[*]	53[*]		
Organizational learning—continuous improvement	G1	36	22	42	4.326	0.115
	G2	20	27	53		
Management support for patient safety	G1	42[*]	20	38[*]	5.260	0.072
	G2	25[*]	19	56[*]		
Overall perceptions of patient safety	G1	31[*]	17	53[*]	5.401	0.067
	G2	46[*]	18	36[*]		
Feedback and communication about errors	G1	39	19	42	2.517	0.284
	G2	26	25	49		
Communication openness	G1	27	31	42	0.286	0.867
	G2	26	35	39		
Frequency of events reported	G1	51	19	31	3.975	0.137
	G2	37	16	47		
Teamwork across units	G1	35	29	37	3.010	0.222
	G2	39	17	44		
Staffing	G1	44	17	39	0.763	0.683
	G2	44	21	34		
Handoffs and transitions	G1	46	22	31	0.323	0.851
	G2	51	20	29		
Nonpunitive response to errors	G1	22	30	48	3.112	0.211
	G2	34	19	47		

[*]Significant values through the adjusted residual post-hoc tests with $Z_{crit} = 1.96$. [#]$p < 0.05$ by Pearson χ^2 (2-sided).

prevent errors from recurring. G2 assumes that when a mistake is corrected before the patient, the event is never reported in the clinical surgical ICU.

Perspectives on the hospital (Table 5) showed that G1 was more negative in the view that hospital management provides a work climate that promotes PS ($p = 0.047$); more positive in agreeing that it is often unpleasant to work with staff from other hospital units ($p = 0.008$); and that problems often occur in the exchange of information across hospital units ($p = 0.047$). In addition, G2 was more positive about

Table 3
Perspective of the health team professionals in your work area/unit and your supervisor/manager session

Questions	Groups (*n*)	I totally disagree	I disagree	I do not agree nor disagree	I agree	I totally agree	χ^2	*p*
Work area/unit								
People support one another in this unit?	G1 (27)	0 (0)	1 (3.7)	1 (3.7)	19 (70.4)	6 (22.2)		
	G2 (18)	1 (5.6)	2 (11.1)	2 (11.1)	10 (55.6)	3 (16.7)	3.812	0.432
We have enough staff to handle the workload	G1 (27)	6 (22.2)	14 (51.9)	2 (7.4)	5 (18.5)	0 (0)		
	G2 (18)	2 (11.1)	6 (33.3)	3 (16.7)	6 (33.3)	1 (5.6)	4.886	0.299
When a lot of work needs to be done quickly, we work together as a team to get the work done	G1 (27)	1 (3.7)	3 (11.1)	1 (3.7)	13 (48.1)	9 (33.3)		
	G2 (19)	2 (10.5)	1 (5.3)	1 (5.3)	8 (42.1)	7 (36.8)	1.426	0.840
In this unit, people treat each other with respect	G1 (27)	1 (3.7)	1 (3.7)	1 (3.7)	16 (59.3)	8 (29.6)		
	G2 (18)	2 (11.1)	0 (0)	1 (5.6)	9 (50)	6 (33.3)	1.853	0.763
Staff in this unit work longer hours than is best for patient care	G1 (27)	3 (11.5)	3 (11.5)	7 (26.9)	10 (38.5)	3 (11.5)		
	G2 (17)	4 (23.5)	4 (23.5)	4 (23.5)	4 (23.5)	1 (5.9)	2.919	0.571
We are actively doing things to improve patient safety	G1 (27)	1 (3.7)	6 (22.2)	7 (25.9)*	8 (29.6)	5 (18.5)*		
	G2 (17)	2 (11.8)	1 (5.9)	0 (0)*	6 (35.3)	8 (47.1)*	10.133	0.038#
We use more agency/ temporary staff than is best for patient care	G1 (27)	3 (11.1)	7 (25.9)	7 (25.9)	7 (25.9)	3 (11.1)		
	G2 (17)	1 (5.9)	4 (23.5)	7 (41.2)	1 (5.9)	4 (23.5)	4.416	0.353
Staff feel like their mistakes are held against them	G1 (27)	5 (18.5)	2 (7.4)	5 (18.5)	14 (51.9)	1 (3.7)		
	G2 (18)	1 (5.6)	5 (18.5)	1 (5.6)	11 (61.1)	0 (0)	6.437	0.169
Mistakes have led to positive changes here	G1 (26)	2 (7.4)	7 (25.9)	7 (25.9)	9 (33.3)	2 (7.4)		
	G2 (19)	2 (11.1)	4 (22.2)	3 (16.7)	7 (38.9)	2 (11.1)	0.904	0.924
It is just by chance that more serious mistakes don't happen around here	G1 (26)	4 (15.4)	8 (30.8)	(19.2)	8 (30.8)	1 (3.8)		
	G2 (17)	6 (33.3)	4 (22.2)	3 (16.7)	3 (16.7)	2 (11.1)	3.501	0.478
When one area in this unit gets really busy, others help out	G1 (27)	0 (0)	2 (7.4)	4 (14.8)	17 (63)	4 (14.8)*		
	G2 (18)	1 (5.6)	1 (5.6)	2 (11.1)	6 (33.3)	8 (44.4)*	7.077	0.132
When an event is reported, it feels like the person is being written up, not the problem	G1 (27)	3 (11.1)	5 (18.5)	10 (37)	8 (29.6)	1 (3.7)		
	G2 (18)	4 (23.5)	2 (11.8)	7 (41.2)	4 (23.5)	0 (0)	2.129	0.712
After we make changes to improve patient safety, we evaluate their effectiveness	G1 (27)	4 (15.4)	6 (23.1)	6 (23.1)	9 (34.6)	1 (3.8)		
	G2 (18)	4 (22.2)	1 (5.6)	2 (11.1)	9 (50)	2 (11.1)	4.602	0.331

Table 3 (Continued)

Questions	Groups (n)	I totally disagree	I disagree	I do not agree nor disagree	I agree	I totally agree	χ^2	p
We work in "crisis mode" trying to do too much, too quickly	G1 (27)	4 (14.8)	7 (25.9)	2 (7.4)*	11 (40.7)	3 (11.1)		
	G2 (18)	3 (16.7)	6 (33.3)	6 (33.3)*	3 (16.7)	0 (0)	8.324	0.080
Patient safety is never sacrificed to get more work done	G1 (27)	3 (11.1)	11 (40.7)	5 (18.5)	6 (22.2)	2 (7.4)		
	G2 (18)	2 (11.1)	8 (44.4)	1 (5.6)	5 (27.8)	2 (11.1)	1.699	0.791
Staff worry that mistakes they make are kept in their personnel file	G1 (27)	2 (7.4)	1 (3.7)	9 (33.3)	11 (40.7)	4 (14.8)		
	G2 (18)	3 (16.7)	3 (16.7)	2 (11.1)	6 (33.3)	4 (22.2)	5.547	0.236
We have patient safety problems in this unit	G1 (27)	4 (14.8)	2 (7.4)	4 (14.8)	13 (48.1)*	4 (14.8)		
	G2 (18)	4 (22.2)	4 (22.2)	5 (27.8)	2 (11.1)*	3 (16.7)	7.487	0.112
Our procedures and systems are good at preventing errors from happening	G1 (27)	2 (7.4)	9 (33.3)	5 (18.5)	10 (37)	1 (3.7)		
	G2 (18)	3 (16.7)	1.7 (2)	4 (22.2)	8 (44.4)	1 (5.6)	3.321	0.506
Supervisor/manager								
My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	G1 (19)	1 (5.3)	0 (0)	5 (26.3)	12 (63.2)	1 (5.3)		
	G2 (16)	1 (7.1)	0 (0)	1 (7.1)	9 (64.3)	3 (21.4)	3.416	0.332
My supervisor/manager seriously considers staff suggestions for improving patient safety	G1 (26)	0 (0.0)	1 (3.8)	9 (64.3)	3 (21.4)	5 (19.2)		
	G2 (19)	2 (10.5)	0 (0.0)	2 (10.5)	12 (63.2)	3 (15.8)	4.130	0.389
Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts	G1 (27)	11 (40.7)	9 (33.3)	3 (11.1)	4 (14.8)	0 (0)		
	G2 (18)	9 (50.0)	8 (44.4)	5 (6.6)	0 (0.0)	0 (0)	3.603	0.308
My supervisor/manager overlooks patient safety problems that happen over and over	G1 (27)	7 (25.9)*	10 (37.0)	4 (14.8)	4 (14.8)	2 (7.4)	6.382	0.172
	G2 (18)	11 (61.1)*	22.2 (1.1)	2 (11.1)	1 (5.6)	0 (0.0)	6.382	0.172

G1: clinical-surgical ICU; G2: COVID-19 ICU. *Significant values through the adjusted residual post-hoc tests with $Z_{crit} = 1.96$. #$p < 0.05$ by Pearson χ^2 (2-sided).

the actions of hospital management, indicating that PS is a top priority and that hospital units work well together to provide the best care to patients. G1 expressed a more neutral view, assuming that shift changes are problematic for patients at this hospital.

Table 4
Perspective of the health team professionals in relation to communications session and frequency of events reported

Questions	Groups	Never	Rarely	Sometimes	Most of the time	Always	χ^2	p
Communications								
We are given feedback about changes put into place based on event reports	G1 (26) G2 (19)	3 (12.0) 4 (21.1)	9 (36.0) 4 (21.1)	7 (28.0) 3 (15.8)	2 (8.0) 1 (5.3)	4 (16.0) 7 (36.8)	4.075	0.396
Staff will freely speak up if they see something that may negatively affect patient care	G1 (27) G2 (19)	0 (0) 0 (0)	3 (11.1) 1 (5.3)	3 (11.1) 4 (21.1)	10 (3) 4 (21.1)	11 (40.7) 10 (52.6)	2.445	0.485
We are informed about errors that happen in this unit	G1 (27) G2 (19)	5 (18.5) 2 (10.5)	7 (25.9) 1 (5.3)	1 (3.7)* 9 (47.4)*	9 (33.3) 4 (21.1)	5 (18.5) 3 (15.8)	13.630	0.009#
Staff feel free to question the decisions or actions of those with more authority	G1 (27) G2 (19)	6 (22.2) 4 (21.1)	7 (25.9) 6 (31.6)	7 (25.9) 5 (26.3)	7 (25.9) 4 (21.1)	27 (100.0) 19 (100.0)	0.245	0.970
In this unit, we discuss ways to prevent errors from happening again	G1 (27) G2 (19)	3 (11.1) 1 (5.3)	4 (14.8) 3 (15.8)	7 (25.9) 2 (10.5)	10 (37.0) 4 (21.1)	3 (11.1)* 9 (47.4)*	8.353	0.079
Staff are afraid to ask questions when something does not seem right	G1 (27) G2 (19)	5 (18.5) 7 (36.8)	9 (33.3) 2 (10.5)	5 (18.5) 6 (31.6)	5 (18.5) 2 (10.5)	3 (11.1) 2 (10.5)	5.128	0.274
Frequency of events reported								
When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	G1 (27) G2 (19)	5 (18.5)* 0 (0.0)*	7 (25.9) 7 (36.8)	6 (22.2) 3 (15.8)	5 (18.5) 6 (31.6)	4 (14.8) 3 (15.8)	4.993	0.288
When a mistake is made, but has no potential to harm the patient, how often is this reported?	G1 (27) G2 (19)	6 (22.2) 1 (5.3)	10 (37.0) 8 (42.1)	3 (11.1) 2 (10.5)	5 (18.5) 5 (26.3)	3 (11.1) 3 (15.8)	2.684	0.612
When a mistake is made that could harm the patient, but does not, how often is this reported?	G1 (27) G2 (19)	3 (11.1) 1 (5.3)	10 (37.0) 4 (21.1)	6 (22.2) 4 (21.1)	4 (14.8) 3 (15.8)	4 (14.8) 7 (36.8)	3.652	0.455

G1: clinical-surgical ICU; G2: COVID-19 ICU. *Significant values through the adjusted residual post-hoc tests with $Z_{crit} = 1.96$.
#$p < 0.05$ by Pearson χ^2 (2-sided).

In relation to PSG, the participants' responses to the sentence "Please give your work area/unit in this hospital an overall grade on PS" showed no statistical difference (Excellent G1: 2 (7.4), G2: 3 (15.8); Very

Table 5
Perspectives of the health team professionals in relation to your hospital session

Questions	Groups	I totally disagree	I dis-agree	I do not agree nor disagree	I agree	I totally agree	χ^2	p
Hospital management provides a work climate that promotes patient safety	G1 (27) G2 (19)	8 (29.6)* 1 (5.3)*	6 (22.2) 2 (10.5)	7 (25.9) 4 (21.1)	5 (18.5) 8 (42.1)	3 (3.7) 4 (21.1)	9.656	0.047#
Hospital units do not coordinate well with each other	G1 (27) G2 (19)	1 (3.7) 2 (10.5)	8 (18.5) 5 (26.3)	7 (25.9) 4 (21.1)	9 (33.3) 7 (36.8)	5 (18.5) 1 (5.3)	2.760	0.599
Things "fall between the cracks" when transferring patients from one unit to another	G1 (27) G2 (19)	2 (7.7) 3 (15.8)	4 (15.4) 5 (26.3)	7 (26.9) 5 (26.3)	9 (34.6) 5 (26.3)	4 (15.4) 1 (5.3)	2.560	0.634
There is good cooperation among hospital units that need to work together	G1 (27) G2 (19)	3 (11.1) 1 (5.3)	8 (29.6) 3 (15.8)	6 (22.2) 5 (26.3)	9 (33.3) 8 (42.1)	1 (3.7) 2 (10.5)	2.438	0.656
Important patient care information is often lost during shift changes	G1 (27) G2 (19)	4 (14.8) 3 (15.8)	8 (29.6) 6 (31.6)	5 (18.5) 3 (15.8)	8 (29.6) 5 (26.3)	2 (7.4) 2 (10.5)	0.237	0.994
It is often unpleasant to work with staff from other hospital units	G1 (27) G2 (19)	3 (11.1) 8 (42.1)	5 (18.5) 8 (42.1)	7 (25.9) 1 (5.3)	10 (37)* 2 (10.5)*	2 (7.4) 0 (0.0)	13.825	0.008#
Problems often occur in the exchange of information across hospital units	G1 (27) G2 (19)	1 (3.7) 4 (21.1)	9 (33.3) 5 (26.3)	4 (14.8) 6 (36.1)	6 (22.2) 4 (21.1)	7 (25.9)* 0 (0.0)*	9.643	0.047#
The actions of hospital management show that patient safety is a top priority	G1 (27) G2 (19)	6 (22.2) 1 (5.3)	5 (18.5) 3 (15.8)	5 (18.5) 2 (10.5)	9 (33.3) 5 (26.3)	2 (7.4)* 8 (42.1)*	8.980	0.062
Hospital management seems interested in patient safety only after an adverse event happens	G1 (27) G2 (19)	3 (11.1) 1 (5.3)	6 (22.2) 6 (31.6)	4 (14.8) 5 (26.3)	9 (33.3) 4 (21.1)	5 (18.5) 3 (15.8)	2.210	0.697
Hospital units work well together to provide the best care for patients	G1 (27) G2 (19)	2 (7.4) 0 (0.0)	9 (33.3) 2 (10.5)	6 (22.2) 3 (15.8)	9 (33.3) 9 (33.3)	1 (3.7)* 5 (26.3)*	9.002	0.061
Shift changes are problematic for patients in this hospital	G1 (27) G2 (19)	6 (22.2) 8 (42.1)	9 (33.3) 5 (26.3)	8 (29.6)* 1 (5.3)*	2 (7.4) 4 (21.1)	2 (7.4) 1 (5.3)	6.684	0.154

G1: clinical-surgical ICU; G2: COVID-19 ICU. *Significant values through the adjusted residual post-hoc tests with $Z_{crit} = 1.96$. #$p < 0.05$ by Pearson χ^2 (2-sided).

Table 6

Comparison between the total score in the different sessions for the clinical-surgical ICU (G1) and COVID-19 ICU (G2)

	G1 ($n = 29$)	G2 ($n = 21$)	t ou U	p
Work area/unit	60 (56; 62)	59.5 (55; 64.25)	$U = 219.5$	0.585
Supervisor/manager	11 (9; 13)	10 (9; 12)	$U = 193.5$	0.155
Communications	19.07 3.84	20.47 3.82	$t = -1.221$	0.230
Frequency of events reported	8.30 3.85	9.89 3.45	$t = -1.475$	0.148
Patient safety grade	3 (2; 3)	2 (2; 3)	$U = 171.5$	0.045[#]
Hospital	32.5 (31; 35)	33 (29; 35)	$U = 221$	0.548
Event reports for participants	1.5 (1; 2)	1 (1; 2)	$U = 281$	0.772

G1: clinical-surgical ICU; G2: COVID-19 ICU. [#]$p < 0.05$ by t-test or Mann–Whitney U test.

good G1: 9 (33.3), G2: 10 (52.6); Acceptable G1: 10 (37.0), G2: 5 (26.3); Poor G1: 5 (18.5), G2: 1 (5.3); Falling G1: 1 (3.7), G2: 0 (0.0); χ^2: 4.325; $p = 0.364$). However, in the comparison between the total score in the different sessions (Table 6), the score PSG was worse in G1 ($p = 0.045$).

Still, in the past 12 months, there was no statistical difference in the event reports for participants (No event reports G1: 14 (50), G2: 12 (57.1); 1 to 2 event reports G1: 10 (35.7), G2: 5 (23.8); 3 to 5 event reports G1: 2 (7.1), G2: 3 (14.3); 6 to 10 event reports G1: 2 (7.1), G2: 1 (4.8); χ^2: 1.382; $p = 0.710$).

Table 7 presents the correlation between the total score in the different sessions. The results indicate a moderate positive correlation, in which, for G2, the better the execution/performance in the supervisor manager with work area/unit session, and the better the execution/performance in hospital with frequency of events reported, the better the other session ($p = 0.026$ and $p = 0.022$, respectively). The highest PSG was related to worst communication (G1 and G2) and with the best performance against the frequency of events reported (G2) ($p < 0.05$).

4. Discussion

This study provides original information for understanding the level of PS associated with the COVID-19 pandemic in public hospitals of the Brazilian Eastern Amazon. The results suggest that the domains "Supervisor/Manager Expectations and Actions Promoting PS" and "Management Support to PS" may be a weak point for the clinical surgical ICU.

During the COVID-19 pandemic, despite an increase in patient volume and the complexity of their clinical conditions leading to a potential reduction in PS, there was an increase in patient safety incident reports (PSIRs) during the COVID-19 pandemic [21] due to greater management attention, as well as improved outcomes in some PSC areas, such as in the domains 'feedback and communication about errors', 'communication openness' and 'frequency of event reported' [11].

A study evaluating PSC before the pandemic and after the second wave showed that there were overall more positive ratings than in the national study conducted before the pandemic, in which the dimension "expectation of actions by management/supervision of the service" was considered a strength, with 85.29% positive responses [10].

Studies using different methods suggest that in normal contexts, the ability of management and supervision to connect with professionals to identify vulnerabilities in ICU is vulnerable [22–24], which may be associated with difficulties in relationships between professionals and managers due to reactive actions in the face of punitive events to correct irregularities [25,26].

Table 7
Correlation among the total score in the different sessions for the clinical-surgical ICU (G1) and COVID-19 ICU (G2)

	Groups	Supervisor/ manager	Communications	Frequency of events reported	Patient safety grade	Hospital	Event reports for participants
Work area/unit	G1	$S = -0.181$ $p = 0.367$	$S = 0.123$ $p = 0.541$	$S = -0.144$ $p = 0.475$	$S = -0.067$ $p = 0.739$	$S = 0.127$ $p = 0.536$	$S = 0.107$ $p = 0.604$
	G2	$S = 0.522$ $p = 0.026^{\#}$	$S = -0.127$ $p = 0.615$	$S = 0.167$ $p = 0.507$	$S = 0.016$ $p = 0.951$	$S = 0.009$ $p = 0.972$	$S = 0.043$ $p = 0.867$
Supervisor/manager	G1	-	$S = -0.094$ $p = 0.643$	$S = 0.031$ $p = 0.880$	$S = 0.354$ $p = 0.070$	$S = -0.012$ $p = 0.955$	$S = 0.035$ $p = 0.865$
	G2	-	$S = 0.008$ $p = 0.974$	$S = 0.051$ $p = 0.836$	$S = 0.192$ $p = 0.432$	$S = 0.364$ $p = 0.125$	$S = 0.038$ $p = 0.878$
Communications	G1	-	-	$P = 0.121$ $p = 0.549$	$S = -0.550$ $p = 0.003^{\#}$	$S = 0.112$ $p = 0.585$	$S = -0.322$ $p = 0.109$
	G2	-	-	$P = 0.381$ $p = 0.107$	$S = -0.574$ $p = 0.010^{\#}$	$S = 0.325$ $p = 0.175$	$S = 0.079$ $p = 0.748$
Frequency of events reported	G1	-	-	-	$S = -0.285$ $p = 0.150$	$S = 0.076$ $p = 0.713$	$S = 0.347$ $p = 0.082$
	G2	-	-	-	$S = -0.494$ $p = 0.031^{\#}$	$S = 0.521$ $p = 0.022^{\#}$	$S = -0.023$ $p = 0.926$
Patient safety grade	G1	-	-	-	-	$S = -0.037$ $p = 0.858$	$S = 0.280$ $p = 0.167$
	G2	-	-	-	-	$S = -0.276$ $p = 0.253$	$S = 0.030$ $p = 0.903$
Hospital	G1	-	-	-	-	-	$S = -0.051$ $p = 0.810$
	G2	-	-	-	-	-	$S = -0.063$ $p = 0.796$

G1: Clinical-surgical ICU; G2: COVID-19 ICU. $^{\#}p < 0.05$ by correlation (r) of Pearson (P) or Spearman (S).

A systematic review with meta-analysis [27] that included 59 studies found that dimensions of management support for PS, supervisor/manager expectations and actions to promote PS, and overall perceptions of PS remained neutral in most general ICUs. In our study, the first area remained as a potential weakness compared with COVID-19 ICU.

In our study, it was also observed that a higher level of PSG was associated with poorer communication, although PSG was reflected in the improvement of error reporting for the clinical surgical ICU. It is well known that lack of communication leads to underreporting of events and thus underreporting of errors, which may hinder the establishment and implementation of error prevention strategies [11].

This could also be related to the positive assessment of the dimension supervisor/manager expectations and actions to promote the patient's safety by COVID-19 ICU professionals, who were also more aware of PS problems in this unit, and therefore more proactive in doing something to improve PS. This suggests

that the team feels supported in their work environment and is more willing to participate in teamwork for the benefit of PS [28], as positive responses may be due to professionals feeling an active part of the safety culture [29], due to mature management that creates an atmosphere of awareness and improvement, rather than just taking action after incidents occur [30].

Thus, the results of this study suggest that the implementation of safety culture strategies needs to be improved in many ways by facility leadership and the management of the institution, especially in non-specialized ICUs.

As a limitation of this study, we have the number of participants. However, our sample included the entire population of services interested in participating in this study, and there was no difference in the professional class between the groups. The study demonstrated external validity when considering the use of statistical power analyses. However, we address the need for further research on this topic.

It is important to remember that in Brazil, due to the high demand for hospitalizations and the characteristics of COVID-19, there was a need to implement specific ICUs for infected patients and to hire emergency specialists to act in the face of the pandemic, which can be illustrated in our sample in relation to the COVID-19 ICU professionals who had recently joined the hospital on a temporary contract, as opposed to the clinical-surgical ICU, which may have influenced the most positive evaluations in this group [31].

Therefore, studies at PS are useful to guide decision making and intervention management, where interventions should be directed toward goals to minimize risks and change the current situation of adverse events, thus modifying the practice of care. Especially at this time when the COVID-19 pandemic has received more attention than other diseases. Therefore, it is necessary that other services not related to COVID-19 continue to receive quality attention.

5. Conclusion

Our study revealed a moderate positive correlation between supervisor/manager and work area/unit session and between hospital and frequency of reported events. The highest PS grade was related to poorer communication and to better performance in the frequency of reported events only for the COVID-19 ICU. In addition, although there was no difference between groups in overall PSC, the domains "Supervisor/Manager Expectations and Actions Promoting PS" and "Management Support for PS" could be key points for PSC for the general ICU. This study highlights the need to balance attention between the different ICUs in times of crisis at PS, especially in terms of expectations and actions to promote PS by supervisors/managers to prevent the weakness of PS. Nevertheless, further studies should be conducted to support these findings.

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Conflict of interest

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