



BMJ Open Quality Patient safety culture in South America: a cross-sectional study

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ABSTRACT

Background Every year, millions of patients suffer injuries or die due to unsafe and poor-quality healthcare. A culture of safety care is crucial to prevent risks, errors and harm that may result from medical assistance. Measurement of patient safety culture (PSC) identifies strengths and weaknesses, serving as a guide to improvement interventions; nevertheless, there is a lack of studies related to PSC in Latin America.

Aim To assess the PSC in South American hospitals.

Methods A multicentre international cross-sectional study was performed between July and September 2021 by the Latin American Alliance of Health Institutions, composed of four hospitals from Argentina, Brazil, Chile and Colombia. The Hospital Survey on Patient Safety Culture (HSOPSC V.1.0) was used. Participation was voluntary. Subgroup analyses were performed to assess the difference between leadership positions and professional categories.

Results A total of 5695 records were analysed: a 30.1% response rate (range 25%–55%). The highest percentage of positive responses was observed in items related to patient safety as the top priority (89.2%). Contrarily, the lowest percentage was observed in items regarding their mistakes/failures being recorded (23.8%). The strongest dimensions (average score $\geq 75\%$) were organisational learning, teamwork within units and management support for patient safety (82%, 79% and 78%, respectively). The dimensions ‘requiring improvement’ (average score $< 50\%$) were staffing and non-punitive responses to error (41% and 37%, respectively). All mean scores were higher in health workers with a leadership position except for the hospital handoff/transitions item. Significant differences were found by professional categories, mainly between physicians, nurses, and other professionals.

Conclusion Our findings lead to a better overview of PSC in Latin America, serving as a baseline and benchmarking to facilitate the recognition of weaknesses and to guide quality improvement strategies regionally and globally. Despite South American PSC not being well-exploited, local institutions revealed a strengthened culture of safety care.

BACKGROUND

Every year, millions of patients suffer injuries or die because of unsafe and poor-quality healthcare, mainly in low and middle-income settings.¹ Many medical practices and risks

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Measuring patient safety culture (PSC) enables the identification of strengths and areas for improvement, serving as a guide to further interventions and investments.
- ⇒ PSC has been well reported in developed countries but has not been explored enough in low and middle-income settings.

WHAT THIS STUDY ADDS

- ⇒ The PSC of four middle-income countries was assessed and analysed, bringing new insights into the PSC in South American healthcare institutions.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Better overview of PSC in Latin America serving as a baseline and benchmarking to facilitate the recognition of weaknesses and to guide quality improvement strategies regionally and globally.

associated with clinical care are emerging as significant challenges for patient safety. In this context, the search for a culture of safety care is crucial to delivering quality-essential health services to prevent risks, errors and harm that occur to patients while providing medical assistance.²

A mature health system considers the increasing complexity in care settings that make humans more prone to mistakes. In response, health institutions set values, expectations, practices and behaviours to define a proper environment to promote safety management. Patient safety culture (PSC) is focused on the aspects of organisational culture that relates to safety care, being defined as a pattern of individual and organisational behaviour based on shared beliefs and values that continuously seek to minimise patient damage that may result from the process of care delivery.^{2,3}

The measurement of PSC identifies strengths and areas for improvement, serving as a guide to developing appropriate

interventions and investments. Clinical and non-clinical staff observe different aspects of how the hospital works and have the potential to identify what is going well and what could be done better.⁴ PSC can be measured through questionnaires of hospital staff, qualitative evaluations (focus groups, interviews), ethnographic investigation or a combination of these, but surveys are still the most common way of measurement.^{4,5}

The Agency for Healthcare Research and Quality's (AHRQ) developed the Hospital Survey on Patient Safety Culture (HSOPSC) in 2004—V.1.0, with an updated version released in 2019 (V.2.0).⁶ The survey is used internationally and is designed to measure staff opinions regarding patient safety issues, medical errors and safety event reporting. Different organisations concerned with PSC use this assessment as a tool to identify opportunities for quality improvement interventions.^{7,8}

Despite international accreditation, a recent systematic review evidenced a lack of studies on PSC assessment in Latin American institutions.⁹ Thus, this study aimed to report the quality and PSC in South American hospitals to better overview regional PSC and establish a unified safety culture in developing countries.

METHODS

Context

The work of the WHO on patient safety began with the launch of the World Alliance for Patient Safety in 2004, facilitating improvements in the safety of healthcare and establishing the Global Patient Safety Challenges.¹⁰ WHO has also encouraged the creation of networking and collaborative initiatives, such as the Global Patient Safety Network and the Global Patient Safety Collaborative, to engage nations in the patient safety agenda.¹¹

This study is part of different actions carried out by the Latin American Alliance of Health Institutions (from the Spanish: *Alianza Latinoamericana de Instituciones de Salud—ALIS*), a coalition created in collaboration with the Institute for Healthcare Improvement for cooperation in quality, safety and management initiatives among Latin American hospitals.

Type of study

A multicentre international cross-sectional study was performed between July and September 2021. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement was followed as recommended (online supplemental table 1S).¹²

Participants

ALIS comprises four private referral hospitals in South America: (I) *Hospital Universitario Austral*—Argentina, (II) *Hospital Israelita Albert Einstein*—Brazil, (III) *Clínica Alemana de Santiago*—Chile and (IV) *Fundación Santa Fe de Bogotá*—Colombia. All the institutions are considered to be one of the best hospitals in their respective countries and among the best hospital in Latin America. All of them have accreditation and certification by the Joint

Commission International. Further information on the participating hospitals, including localisation, size (number of workers and beds) and medical education provisions, is found in online supplemental table 2S.

Measuring patients safety culture

The HSOPSC V.1.0 from the AHRQ, structured and validated in Spanish¹³ and Portuguese,¹⁴ was used to assess and measure the PSC in the participating institutions. HSOPSC uses the *Likert scale* to evaluate all dimensions of PSC. Additionally, one question is related to the patient's perception of safety, and another relates to the employee's behaviour in reporting incidents in the referred institution, totalling 42 items divided into 12 dimensions.

Percentages of positive responses to the HSOPSC items were calculated by adding the responses: I totally agree and agree (or always and most of the time) for each item, and then dividing by the total number of responses present, ignoring missing responses. For items with a negative statement (identified by R after the item number), negative responses are given by the alternatives: I totally disagree and I disagree (or never and rarely) for each item.

For each participant, the percentages of positive responses (scores) for each dimension were calculated by the sum of positive responses divided by the number of valid responses since more than half of the responses from the item that make up a dimension were present (three items for dimensions formed by four, and two items for dimensions formed by three). A dimension was considered strengthened when the percentage of positive responses was equal to or greater than 75%, and the dimensions with greater weakness were equal to or less than 50%.¹⁵ The range between these cut points is considered suitable but requires improvement.

The survey was made available online for the four institutions during the same period, and they were randomly numbered to keep institutional data anonymous. Healthcare professionals were invited to participate anonymously and voluntarily, without inducements or reprisal. HSOPSC was carried out using the *RedCap* system¹⁶ to respect the data protection laws applicable to each country. Forms filled out without any response or with insufficient information were excluded from the sample.

Subgroup analysis

Complementary analyses were performed to further assess insights in PSC, including the difference between the perceptions of health workers by: leadership positions, professional categories (ie, physician, nurse, others), teaching hospital, direct contact with the patient, hospital units, time spent in the hospital, time spent in the position, time in the professional category and hours per week.

Statistics

Observed data were described globally and by subgroups. For qualitative variables, absolute and relative frequencies

were used. Quantitative variables were contrasted by normal plot and examined by the *Shapiro-Wilk* test as recommended, and depending on sample distribution, observed means and SD or medians and quartiles were calculated. Minimum and maximum values were also reported.

To analyse the proportions of positive responses of the HSOPSC's dimensions, generalised linear models with negative binomial distribution and logarithmic link function were adjusted, contemplating the dependence between the responses of employees who work in the same institution. For the positive answers given to the items related to the perception of patient safety in the institution and the employee's behaviour with the notification of occurrences, we used generalised linear models with a binomial distribution.

The significance level was set to $\delta=5\%$. Model results were presented as estimated mean values, 95% CIs, and *p* values as appropriate. *P* values of multiple comparisons between categories were corrected using the sequential Bonferroni method. Statistical analysis was performed using SPSS V.21, USA.

RESULTS

The *RedCap* platform registered 5745 records of responses from professionals from the four participating institutions. The overall response rate was 30.1% and was distributed as follows: *Hospital Universitario Austral*, 30%; *Hospital Israelita Albert Einstein*, 26%; *Clínica Alemana de Santiago*, 25% and *Fundación Santa Fe de Bogotá*, 55%.

A total of 50 responses were excluded due to insufficient information: 46 completed only general information, without any response to the items referring to the area/unit of work in the hospital, used in the calculation of the percentages of positive responses by dimension; and four filled in only one or two answers referring to the area/unit of work in the hospital, but insufficient to calculate the percentage of positive answers for at least one dimension.

Characteristics of the survey participants (5695 validated records) are described in [table 1](#). The Brazilian institution recorded most of the data (36.9%), and most came from no-teaching hospitals (59.6%). Among the respondents, 81.2% had direct contact with patients, most of whom were from the nursing team (37.2%). Only 4.9% of the health workers hold a leadership position.

[Table 2](#) presents the distributions of positive answers for each item of the HSOPSC. The highest percentage of positive responses was observed in item F8: the actions of hospital management show that patient safety is a top priority, with 4999 (89.2%) respondents agreeing. Conversely, the lowest percentage of positive responses was observed in item A16R: professionals (regardless of the employment relationship) worry that mistakes they make are kept in their personnel file, with 1289 (23.8%) disagreeing with the statement.

Table 1 Characteristics of the survey participants (5695 validated records)

Characteristic	Frequency (%)
Institution	
<i>Hospital Universitario Austral—Argentina</i>	904 (15.9)
<i>Hospital Israelita Albert Einstein—Brazil</i>	2103 (36.9)
<i>Clínica Alemana de Santiago—Chile</i>	1290 (22.7)
<i>Fundación Santa Fe de Bogotá—Colombia</i>	1398 (24.5)
Teaching hospital	
No	3393 (59.6)
Yes	2302 (40.4)
Hospital unit	
Nursing	957 (16.8)
Radiology	617 (10.8)
Emergency room	337 (5.9)
Intensive care unit	614 (10.8)
Other	3170 (55.7)
Time in the hospital	
Until 1 year	828 (14.6)
1–5 years	1726 (30.4)
6–10 years	1191 (21.0)
11–15 years	832 (14.7)
16–20 years	466 (8.2)
Over 20 years	627 (11.1)
Total of responses	5670
Time in the position	
Until 1 year	1000 (17.6)
1–5 years	2010 (35.5)
6–10 years	1150 (20.3)
11–15 years	710 (12.5)
16–20 years	333 (5.9)
Over 20 years	466 (8.2)
Total of responses	5669
Hours per week	
<20 hour	225 (4.0)
20–39 hour	1714 (30.4)
40–59 hour	3355 (59.4)
60–79 hour	206 (3.6)
80–99 hour	54 (1.0)
≥100 hour	93 (1.6)
Total of responses	5647
Leadership position	
No	5417 (95.1)
Yes	278 (4.9)
Professional category	
Physician	1223 (21.5)

Continued

Table 1 Continued

Characteristic	Frequency (%)
Nurse	2120 (37.2)
Multi-professional team	835 (14.7)
Other	1517 (26.6)
Direct contact with the patient	
No	1064 (18.8)
Yes	4590 (81.2)
Total of responses	5654
Time in the professional category	
Until 1 year	370 (6.5)
1–5 years	1394 (24.6)
6–10 years	1217 (21.5)
11–15 years	966 (17.0)
16–20 years	678 (12.0)
Over 20 years	1041 (18.4%)
Total of responses	5666

Asymmetrical distributions were observed among dimension scores, with a concentration of higher values for most of the dimensions, emphasising teamwork within units, organisational learning and continuous improvement, management support for patient safety, and feedback and communication about errors. The worst performances were observed in the staffing and non-punitive response to error items (online supplemental graphic 1). [Table 3](#) summarises the performance in each dimension.

Estimated mean scores of professionals in leadership compared with non-leadership positions are described in [table 4](#). [Table 4](#) highlights that all mean scores were higher in health workers in leadership positions except for hospital handoffs and transitions.

Estimated mean differences between teaching institutions and health workers in direct contact with the patients are presented in online supplemental tables 3S and 4S, respectively.

Finally, [table 5](#) compares the observed scores among the dimensions' professional categories.

Further comparisons among hospital units, time in the hospital, time in the position, time in the professional category and hours per week is found in online supplemental tables 5S and 9S respectively.

DISCUSSION

Despite WHO efforts to engage nations to set clear safety goals and performance indicators as part of an ongoing process of improvement in the international patient safety agenda, there is still a rising concern about the level of harm among patients in developing countries due to the lack of accountability and the limited reports of safety. Considering the scarcity of research on this subject, especially in Latin American countries, the ALIS

Table 2 Positive answers for each item of the Hospital Survey on Patient Safety Culture

Hospital Survey on Patient Safety Culture Dimensions and items	Total of responses*	Positive responses (average% positive)†
Dimension 1 – teamwork within units		
A1	5668	4770 (84.2)
A3	5653	4660 (82.4)
A4	5662	4967 (87.7)
A11	5633	3643 (64.7)
Dimension 2 – expectations and actions promoting patient safety		
B1	5612	4308 (76.8)
B2	5606	4424 (78.9)
B3R	5578	2985 (53.5)
B4R	5578	4283 (76.8)
Dimension 3 – organisational learning – continuous improvement		
A6	5597	4870 (87.0)
A9	5577	4589 (82.3)
A13	5543	4388 (79.2)
Dimension 4 – management support for patient safety		
F1	5615	4885 (87.0)
F8	5606	4999 (89.2)
F9R	5587	3307 (59.2)
Dimension 5 – feedback and communication about errors		
C1	5537	4014 (72.5)
C3	5555	3899 (70.2)
C5	5566	4476 (80.4)
Dimension 6 – frequency of events reported		
D1	5436	3960 (72.8)
D2	5425	3804 (70.1)
D3	5399	4063 (75.3)
Dimension 7 – overall perceptions of patients' safety		
A10R	5408	2889 (53.4)
A15	5433	3030 (55.8)
A17R	5450	3743 (68.7)
A18	5464	4429 (81.1)
Dimension 8 – communication openness		
C2	5484	4240 (77.3)
C4	5481	2670 (48.7)
C6R	5486	2783 (50.7)
Dimension 9 – teamwork across units		
F2R	5499	2723 (49.5)
F4	5519	3631 (65.8)
F6R	5499	3586 (65.2)
F10	5506	4026 (73.1)
Dimension 10 – staffing		

Continued

Table 2 Continued

Hospital Survey on Patient Safety Culture Dimensions and items	Total of responses*	Positive responses (average% positive)†
A2	5543	2171 (39.2)
A5R	5433	2157 (39.7)
A7R	5324	2440 (45.8)
A14R	5453	2224 (40.8)
Dimension 11—handoffs and transitions		
F3R	5306	3139 (59.2)
F5R	5286	3293 (62.3)
F7R	5268	2984 (56.6)
F11R	5267	3466 (65.8)
Dimension 12—non-punitive response to error		
A8R	5441	2360 (43.4)
A12R	5427	2428 (44.7)
A16R	5412	1289 (23.8)
E1‡	5506	4521 (82.1)
G1§	5366	2184 (40.7)

Bold: Higher and lower scores. Item classification is available in the SOPS Hospital Survey Items and Composite (available from <https://www.ahrq.gov>).

*Total responses excluding missing responses.

†Total responses strongly agree and agree for items with a positive statement and strongly disagree and disagree for items with a negative statement, identified with an R next to the item number.

‡Positive responses: excellent and very good.

§Positiveonline supplemental file 1 responses: all alternatives, except none.

aimed to assess four South American healthcare institutions together to bring new insights into the local PSC. As a result, our findings allow a broader overview of the

regional safety culture and enhance the understanding of health workers' perceptions in the context of Latin American developing countries.

Benchmarking in Latin American settings

A recent systematic review by Camacho-Rodriguez *et al*,⁹ confirmed the global concern about the PSC in Latin America, revealing that only 30 studies, limited only to five countries (none from Central America), reported a PSC evaluation. Most of these studies are from Brazil (22 studies),^{17–38} and only three and one from Colombia^{39–41} and Argentina,⁴² respectively. However, no Chilean studies have assessed PSC. Another recent review by Prieto *et al*⁴³ in 2021 included 36 studies assessing PSC, reporting 24 additional studies from Brazil,^{44–67} of which 11 were master's degree theses or doctoral dissertations.^{44–46 49 54–59 63} Additionally, we found another Colombian study reporting PSC assessments.⁶⁸

Most of these studies were performed in single units, such as surgical services^{17 19 26 39 40 51 54 58} and intensive care units,^{20 31 36 37 53 55 67} or applied to a unique professional category, mainly nursing staff.^{20–23 26 34 35 48 52 53 55 58 63 65 66} Moreover, some studies have used HSOPSC for different purposes or have not shown areas of strength or critical areas.⁴³ Considering these limitations, the PSC assessment reported by these studies may represent microcultures rather than an institutional culture of safe care. Therefore, establishing a local benchmark in Latin America remains challenging.

Our initiative includes an assessment of Chilean participants for the first time, and it is also the first to evaluate four South American hospitals simultaneously. This collaboration allows us to explore the regional PSC in a unified way and facilitates further contrast with other groups of hospitals.

Table 3 Distribution of positive responses of Hospital Survey on Patient Safety Culture

Dimensions	Observed average (SD)	Q1	Median*	Q3	N	Estimated average (95% CI)
Teamwork within units	79.8 (±29.7)	75.0	100.0	100.0	5666	79.7 (78.2 to 81.2)
Expectations and actions promoting patient safety	71.5 (±31.3)	50.0	75.0	100.0	5602	69.6 (63.5 to 76.3)
Organisational learning—continuous improvement	82.9 (±30.6)	67.0	100.0	100.0	5593	81.8 (77.5 to 86.2)
Management support for patient safety	78.6 (±28.8)	67.0	100.0	100.0	5629	77.4 (73.6 to 81.5)
Feedback and communication about errors	74.4 (±35.9)	67.0	100.0	100.0	5579	73.6 (70.4 to 77.0)
Frequency of events reported	72.8 (±39.7)	33.0	100.0	100.0	5432	70.4 (61.8 to 80.2)
Overall perceptions of patients' safety	64.7 (±29.3)	50.0	75.0	100.0	5449	65.4 (59.7 to 71.7)
Communication openness	59.0 (±36.0)	33.0	67.0	100.0	5515	58.8 (56.6 to 61.0)
Teamwork across units	63.4 (±35.8)	25.0	75.0	100.0	5516	63.1 (59.8 to 66.6)
Staffing	41.3 (±33.2)	25.0	25.0	75.0	5438	40.2 (36.8 to 44.1)
Handoffs and transitions	61.0 (±40.5)	25.0	75.0	100.0	5270	60.3 (52.4 to 69.3)
Non-punitive response to error	37.3 (±39.1)	0.0	33.0	67.0	5445	37.5 (35.0 to 40.1)

*All minimum values were 0, and all maximum values were 100.

**Table 4** Estimated mean differences for the percentages of positive responses in the dimensions of the Hospital Survey on Patient Safety Culture between healthcare professionals holding a leadership position or those who are not

Dimensions	Leadership position		Contrasts	
	Yes	No	Yes–No (CI 95%)	P value
Teamwork within units	86.9 (82.0 to 92.1)	79.3 (78.0 to 80.6)	7.6 (3.2 to 12.0)	0.001
Expectations and actions promoting patient safety	76.7 (70.3 to 83.8)	69.2 (63.0 to 76.1)	7.5 (3.5 to 11.5)	<0.001
Organisational learning—continuous improvement	83.3 (80.6 to 86.1)	81.7 (77.3; 86.3)	1.6 (1.4 to 4.7)	0.292
Management support for patient safety	84.9 (79.7 to 90.4)	77.0 (73.0 to 81.3)	7.9 (3.1 to 12.6)	0.001
Feedback and communication about errors	75.8 (73.7 to 77.8)	73.5 (70.2 to 77.0)	2.3 (0.8 to 5.3)	0.142
Frequency of events reported	76.0 (63.0 to 91.6)	70.1 (61.7 to 79.6)	5.9 (0.3 to 11.5)	0.040
Overall perceptions of patients' safety	68.5 (62.2 to 75.4)	65.2 (59.6 to 71.5)	3.2 (0.5 to 7.0)	0.093
Communication openness	68.6 (62.3 to 75.6)	58.2 (55.7 to 60.9)	10.4 (2.4 to 18.4)	0.011
Teamwork across units	68.7 (66.4 to 71.1)	62.8 (59.1 to 66.7)	6.0 (0.0 to 11.9)	0.051
Staffing	47.7 (44.2 to 51.4)	39.8 (36.1 to 44.0)	7.8 (2.6 to 13.1)	0.003
Handoffs and transitions	59.5 (50.1 to 70.5)	60.3 (52.5 to 69.3)	0.9 (–4.7 to 3.0)	0.663
Non-punitive response to error	53.4 (48.1 to 59.2)	36.6 (33.8 to 39.6)	16.7 (9.2 to 24.3)	<0.001

Bold: significant p value.

Strengthened dimensions

The dimensions with higher scores in our sample were teamwork within units, organisational learning and continuous improvement, management support for patient safety, and feedback and communication about errors. None of the Brazilian, Colombian or Argentinian studies assessing PSC institutionally were performed during 2021. According to Prieto's review,⁴³ which included Brazilian pre-pandemic studies, teamwork within units, organisational learning and continuous improvement and management support for patient safety were also found to be strong areas.^{17 36 51 53 65 66} Expectations and actions promoting patient safety and frequency of reporting events were also reported as strong areas.^{33 36 60}

Notably, despite limitations related to PSC measurement in Latin American settings, the participating institutions of our sample have a high perception of safety culture, comparable to 630 American institutions reported by AHRQ in 2018.⁶⁹ The item related to actions of the hospital management shows that patient safety is a top priority, showed the highest positive answers in our sample (89.2%). No significant differences were found in the dimension of overall perception of safety when compared with AHRQ report (65.4% (CI 95% 59 to 71), and 66%, respectively). Contrasting to local settings, the review of Latin American studies showed only 48.8% of positive responses in this dimension,⁹ similar to a national report by the Brazilian Health Regulatory Agency—ANVISA (49.5%) performed in 301 hospitals during 2021.⁷⁰ It would be expected that workers in leaderships position report a more positive assessment of safety than clinicians because of their investment in the organisation's hierarchy and functions.^{71 72} However, no significant differences were found in this dimension in our sample (p value=0.093).

Another interesting aspect is the teamwork: (i) teamwork within units was lower than the reported scores by AHRQ⁶⁹ (79.7% (CI 95% 78 to 81) and 82%, respectively), but higher when compared with the Brazilian national report (73.2%),⁷⁰ and (ii) teamwork across units was higher than AHRQ and ANVISA records (63.1% (CI 95% 59 to 66), 62% and 58.6%, respectively).^{69 70} Differences were found between physicians and other professional categories for both teamwork dimensions, showing higher results in the medical team (p value <0.001 for all), which has also been reported in the previous Brazilian studies.¹⁹ Leadership positions also revealed higher values in both teamwork dimensions: 7.6 (CI 95% 3 to 12) and 6.0 (CI 95% 0 to 11) percentage points higher for teamwork within and across units' dimensions, respectively, when compared with health workers not-holding a leadership position. High scores on these dimensions indicate a ward where healthcare professionals support each other, treat each other with respect and work together as a team. Opposite to other studies,⁹ in our sample, the nursing team does not evidence higher values in teamwork. A recent systematic review by Vaismoradi *et al*⁷³ revealed that nurses working together within units directly impact care quality and patient safety in hospitals through their continuous quality improvement activities.

Dimensions 'requiring improvements'

The worst rated item was the concerns related to mistakes or failures being recorded in their files (23.8%), which is also the worst performing item in American hospitals, with a 39% average of positive responses.⁶⁹ The two dimensions with the lower performances were staffing (40.2% (CI 95% 36 to 44)) and non-punitive response to error (37.5% (CI 95% 35 to 40)), which are also below the AHRQ average (53% and 47%, respectively),⁶⁹ but similar

Table 5 Multiple comparisons between professional categories in the dimensions of the Hospital Survey on Patient Safety Culture

	Mean (95% CI)	P value	Mean (95% CI)	P value	Mean (95% CI)	P value
Contrasts	Teamwork within units		Expectations and actions promoting patient safety		Organisational learning – continuous improvement	
Physician—nurse	8.8 (6.3 to 11.3)	<0.001	4.5 (–2.4 to 11.3)	0.414	3.0 (–5.9 to –0.1)	0.039
Physician—multi-professional team	7.8 (0.7 to 14.8)	0.023	4.2 (–1.2 to 9.6)	0.236	0.6 (–4.5 to 5.7)	>0.999
Physician—others	5.8 (0.5 to 11.1)	0.024	3.7 (–0.9 to 8.3)	0.217	0.3 (–2.1 to 2.7)	>0.999
Nurse—multi-professional team	1.0 (–5.6 to 3.5)	>0.999	0.3 (–2.8 to 2.3)	>0.999	3.6 (0.6 to 6.6)	0.010
Nurse—others	3.0 (–8.5 to 2.5)	0.576	0.8 (–7.6 to 6.0)	>0.999	3.3 (–1.0 to 7.6)	0.226
Multi-professional team—others	2.0 (–10.1 to 6.2)	>0.999	0.5 (–6.5 to 5.5)	>0.999	0.3 (–5.9 to 5.3)	>0.999
	Management support for patient safety		Feedback and communication about errors		Frequency of events reported	
Physician—nurse	3.5 (–2.5 to 9.5)	0.641	10.6 (–15.2 to –6.0)	<0.001	9.7 (–14.2 to –5.3)	<0.001
Physician—multi-professional team	2.8 (–2.8 to 8.4)	0.687	4.1 (–9.7 to 1.6)	0.213	4.0 (–8.3 to 0.3)	0.082
Physician—others	0.3 (–1.4 to 0.9)	0.723	4.2 (–7.4 to –0.9)	0.006	8.6 (–16.2 to –1.1)	0.017
Nurse—multi-professional team	0.7 (–2.5 to 1.0)	0.723	6.5 (1.4 to 11.5)	0.006	5.8 (1.3 to 10.2)	0.005
Nurse—others	3.8 (–9.3 to 1.7)	0.405	6.4 (3.4 to 9.3)	<0.001	1.1 (–1.8 to 4.0)	0.453
Multi-professional team—others	3.1 (–8.7 to 2.6)	0.687	0.1 (–5.8 to 5.6)	0.975	4.7 (–11.6 to 2.3)	0.267
	Overall perceptions of patients' safety		Communication openness		Teamwork across units	
Physician—nurse	10.1 (0.0 to 20.1)	0.051	7.9 (–1.4 to 17.1)	0.137	11.5 (3.6 to 19.5)	0.001
Physician—multi-professional team	7.6 (1.8 to 13.5)	0.004	9.8 (0.4 to 19.3)	0.038	8.0 (–0.3 to 16.3)	0.065
Physician—others	7.4 (5.8 to 9.0)	<0.001	8.4 (0.8 to 16.0)	0.021	7.3 (4.8 to 9.8)	<0.001
Nurse—multi-professional team	2.4 (–8.3 to 3.5)	0.987	2.0 (–0.9 to 4.8)	0.289	3.6 (–8.2 to 1.1)	0.201
Nurse—others	2.7 (–10.7 to 5.3)	0.987	0.6 (–5.7 to 6.8)	>0.999	4.2 (–10.6 to 2.2)	0.275
Multi-professional team—others	0.3 (–3.9 to 3.3)	0.987	1.4 (–10.0 to 7.1)	>0.999	0.7 (–7.6 to 6.3)	0.854
	Staffing		Handoffs and transitions		Non-punitive response to error	
Physician—nurse	5.8 (–1.8 to 13.3)	0.200	1.7 (–6.7 to 10.2)	>0.999	6.7 (–5.3 to 18.7)	0.750
Physician—multi-professional team	10.8 (7.0 to 14.7)	<0.001	3.0 (0.7 to 5.2)	0.004	9.5 (1.1 to 18.0)	0.017
Physician—others	7.5 (5.2 to 9.8)	<0.001	9.2 (4.5 to 13.9)	<0.001	3.7 (–6.6 to 14.1)	0.831
Nurse—multi-professional team	5.1 (–0.4 to 10.5)	0.080	1.2 (–5.5 to 7.9)	>0.999	2.8 (–2.9 to 8.5)	0.750
Nurse—others	1.8 (–5.4 to 8.9)	0.632	7.4 (–2.4 to 17.3)	0.214	2.9 (–15.4 to 9.5)	0.831
Multi-professional team—others	3.3 (–7.9 to 1.2)	0.200	6.2 (1.7 to 10.8)	0.002	5.8 (–16.6 to 5.0)	0.750

Bold: significant p value.

to the Latin American PSC review (39% and 33%, respectively).⁷⁰ The non-punitive response to the error dimension has also been reported as the most critical dimension in other Brazilian reports⁴³ and international reviews.⁷⁴

Interestingly, these two dimensions plus communication openness represented the wider differences across healthcare workers in a leadership position, especially the punishment to error (variation of 16.7 percentage

point (95% CI 9 to 24], p value <0.001). This variation in the perception may be related to the distance between leaders and the front line, often perceived in current management models and leadership perception.^{75 76}

Compared with the American benchmark, our fair culture appears among 10% of the worst hospitals, evidencing that it is still an unaddressed issue in the Latin American context. The dimension of non-punitive response to error is a concern in our sample and one of the greatest challenges worldwide.^{74 77} A systematic review involving 21 countries showed a lack in applying fair culture algorithms, developing psychological safety and sharing lessons learnt.¹⁵ According to Reason,⁷⁸ 90% of errors are blameless, but we reinforce the challenge of promoting fair culture flows regardless of the type of event to improve quality, patients' outcomes and patients' experience, which all are directly associated with PSC.^{79 80}

Others findings

All mean scores were higher for health workers in leadership positions, except for hospital handoffs and transitions. Although leaders' support and leadership abilities are crucial in this dimension,^{81 82} this result may be explained by the fact that leaders usually work on a fixed schedule rather than rotating shifts in the participating institutions in our sample.

In contrast to other reports,^{9 74} we did not find differences between nurses and other healthcare professionals regarding punitive culture (p value >0.05 for all). Since women working in developing countries often experience gender inequality and discrimination, the punitive culture perceived by women nurses may result from hospitals being gendered organisations.^{83 84} Machismo culture, paternalistic leaders and medicalised systems may also contribute to these findings in Latin America.⁹ Establishing a non-punitive culture with open communication is essential to cultivate a robust incident reporting system and facilitating adverse event disclosure.⁸⁵ As no significant differences among professional categories were found in our sample, we may hypothesise that this is an addressed issue in the participating hospitals. However, further studies are necessary to confirm this speculation.

Additionally, in these two dimensions, nurse scores were higher when compared with other categories (P -value <0.05 for all), which may be justified because nurses are more engaged in improvement and care processes. In contrast, physicians and other professionals are more involved in clinical assistance issues than administrative routines. As PSC is the responsibility of all professionals involved in healthcare, engaging the medical team in matters of quality and patient safety is crucial to improve safety outcomes.⁸⁶ It is expected from organisations with a strong safety culture that their perception is common to all employees and that their values are applied in daily practice.^{78 77 88}

The COVID-19 pandemic's impact in the PSC

Notably, this study was conducted during the COVID-19 pandemic period, when there was a significant drop in the PSC survey scores worldwide between 2019 and 2021.⁸⁹ These findings raised a point of concern, evidencing how our healthcare systems are not resilient enough to confront significant challenges such a pandemic, being necessary numerous advancements and invest, especially in areas of risk management and contingency planning to achieve better safe care outcomes.⁹⁰ Recently, a crisis response strategy has been proposed to positively change the safety climate attitudes after the pandemic.⁹¹

Although staffing shortages are a known issue in Latin America⁹² the COVID-19 pandemic exacerbated it.⁹³ In this context, staffing issues—reported here as one of the worse scores (40.2% (CI 95% 36 to 44))—may also influence our results since the perception of patient safety has been related to the availability of appropriated staffing,⁹⁴ and it is essential for achieving more favourable PSC.⁹⁵ Here, the multidisciplinary team scored less positively in the work overload item, which may be justified by overwork during a pandemic. Pitfalls related to staffing, work pressure and overload affecting PSC have also been observed in other studies during the COVID-19 outbreak.^{96 97} Furthermore, infrastructure has been identified as a potential new PSC dimension.⁹⁷

Some regional studies assessing PSC were reported during the pandemic (all from Brazil). However, they also presented similar limitations, as previously mentioned, mainly related to their application in a single unit,^{98 99} comparing single units within the same institution.^{100 101}

Limitations

The current report is not exempt from limitations. Although a new version of the HSOPSC is available (V.2.0),⁶ to the best of our knowledge, there are no Latin American studies using a translated version. A validated HSOPSC in the Portuguese language is still under assessment,¹⁰² and, therefore, a unified measurement of South American countries, including Brazilian institutions, as reported here would not be possible. Moreover, larger and more detailed evidence of HSOPSC V.1.0 in a Latin American setting is recommended before migration to V.2.0.⁹

Since the healthcare workers of the participating institutions are voluntary submitters, are not a random sample, and only four institutions were included, these results may not be representative of all Latin American healthcare institutions. Additionally, the studied hospitals are recognised as the best in Latin America with international accreditation, which is strongly associated with PSC.¹⁰³ A broader vision, including non-accredited hospitals and institutions with lower resources, would be desirable to have a more reliable vision of local PSC.

We discussed some points regarding the lack of a Latin American PSC benchmark using the AHRQ report.⁶⁹ The American baseline would be more suitable for Western culture, while other reports, such as Europeans, Asians

and Africans, could bring other cultural divergences that may influence our comparison. Notwithstanding, the comparison with the AHRQ should be interpreted carefully, mainly because of the sample size (630 vs four hospitals) and application period (2018 vs 2021). In this context, a Brazilian report⁷⁰ conducted in the same year may be comparable to our sample. These limitations highlight the need for Latin American benchmarks.

A recent study found significant differences in perceptions of PSC by race and gender, showing that participants who identified as black/African American, Native Hawaiian, two or more races or 'other' had a worse perception on all dimension questions about safety culture and event reporting.¹⁰⁴ Thus, we reinforce the relevance of collecting data such as ethnicity and gender to analyse equity in the perception of participating professionals.

We characterised analyses through the formal position occupied by the professional, however, the analysis of local microcultures through the influence of informal leaders was not possible to evaluate through the survey used. Different perceptions of PSC may be found in similar units and under the same management, reinforcing the existence of local microcultures.¹⁰⁵ Further studies are necessary to address this subject in Latin American hospitals.

Prospective

ALIS is encouraged to continue monitoring PSC, expand the measures to other Latin American countries, drive collective actions to improve the areas with the greatest opportunity and also ensure the maintenance of their dimensions recognised as strong in the current survey applied.

CONCLUSION

The present study showed that Latin America has developed a strengthened culture of safety care. Nevertheless, there are still opportunities for improvement, especially in areas such as a fair culture and strengthening equity between different professional categories. Although the contexts of the participating countries are different, the dimensions understood are similar, demonstrating that it is possible to build joint actions to change this scenario.

Our results may help other local hospitals identify common PSC strengths and weaknesses, compare PSC perceptions with other regional hospitals and guide applied research to implement strategies focused on improving safety culture. Finally, our findings may inform health policies focused on advancing safety culture and guide international accreditation organisations in PSC assessments in Latin American hospitals.

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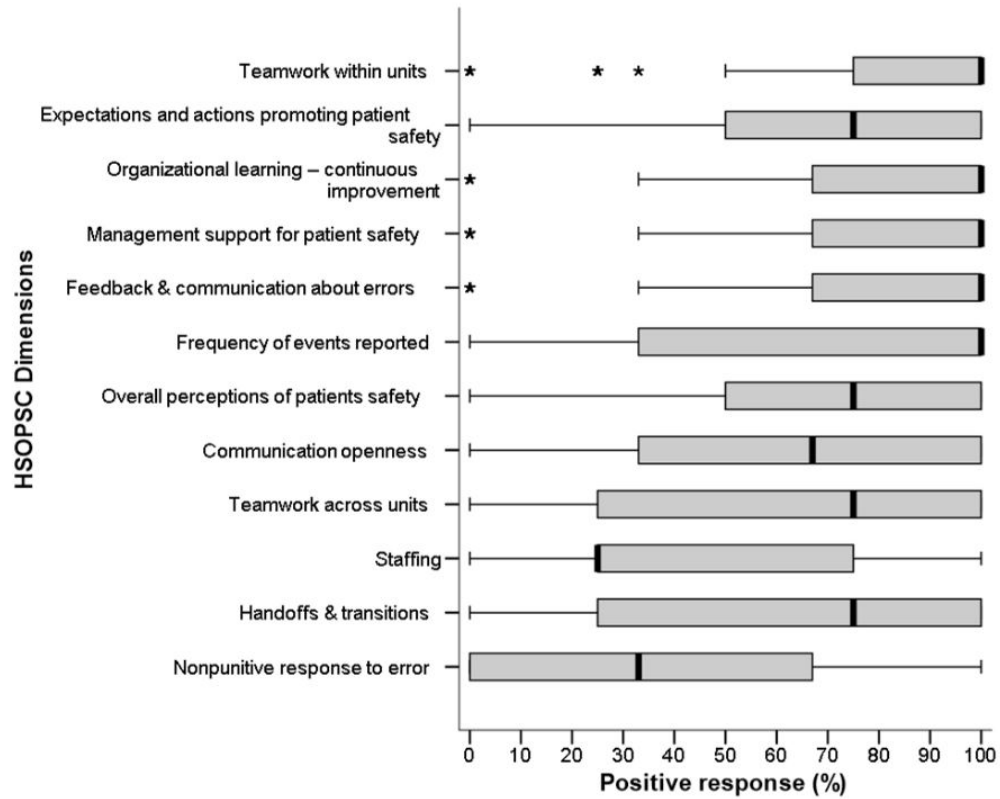
REFERENCES

- Kohn LT, Corrigan JM, Donaldson MS. Errors in health care: a leading cause of death and injury. In: *To err is human: building a safer health system*. Washington: National Academies Press, 2000.
- Sammer CE, Lykens K, Singh KP, *et al*. What is patient safety culture? A review of the literature. *J Nurs Scholarsh* 2010;42:156–65.
- Lee SE, Scott LD, Dahinten VS, *et al*. Safety culture, patient safety, and quality of care outcomes: a literature review. *West J Nurs Res* 2019;41:279–304.
- Trbovich PL, Griffin M. Measuring and improving patient safety culture: still a long way to go. *BMJ Qual Saf* 2016;25:209–11.
- Waterson P, Carman E-M, Manser T, *et al*. Hospital survey on patient safety culture (HSPSC): a systematic review of the psychometric properties of 62 International studies. *BMJ Open* 2019;9:e026896.
- Agency for Healthcare Research and Quality. Surveys on patient safety culture. 2019. Available: <https://www.ahrq.gov/sops/surveys/hospital/index.html> [Accessed 10 Jul 2023].
- Weaver SJ, Lubomski LH, Wilson RF, *et al*. Promoting a culture of safety as a patient safety strategy: a systematic review. *Ann Intern Med* 2013;158:369–74.
- Morello RT, Lowthian JA, Barker AL, *et al*. Strategies for improving patient safety culture in hospitals: a systematic review. *BMJ Qual Saf* 2013;22:11–8.
- Camacho-Rodríguez DE, Carrasquilla-Baza DA, Dominguez-Cancino KA, *et al*. Patient safety culture in Latin American hospitals: a systematic review with meta-analysis. *IJERPH* 2022;19:14380.

- 10 World Health Organization. Patient safety. 2019. Available: <https://www.who.int/patientsafety/policies/global-health-priority/en/> [Accessed 10 Jul 2023].
- 11 World Health Assembly (WHA 72.6). Global action on patient safety. 2019. Available: http://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_R6-en.pdf?ua=1 [Accessed 10 Jul 2023].
- 12 von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol* 2008;61:344–9.
- 13 Agency for Healthcare Research and Quality. SOPS hospital survey 1.0. Available: https://www.ahrq.gov/sites/default/files/wysiwyg/sops/surveys/hospital/hospital_survey-spanish.pdf [Accessed 10 Jul 2023].
- 14 Andrade LEL, Melo LOM, Silva IG, et al. Adaptação E Validação do hospital survey on patient safety culture em Versão Brasileira Eletrônica. *Epidemiol Serv Saude* 2017;26:455–68.
- 15 Reis CT, Paiva SG, Sousa P. The patient safety culture: a systematic review by characteristics of hospital survey on patient safety culture dimensions. *Int J Qual Health Care* 2018;30:660–77.
- 16 Harris PA, Taylor R, Minor BL, et al. The Redcap consortium: building an international community of software platform partners. *J Biomed Inform* 2019;95:103208.
- 17 Abreu I de, Rocha RC, Avelino F. Cultura de Segurança do Paciente em Centro Cirúrgico: Visão DA Enfermagem. *Rev Gaúcha Enferm* 2019;40.
- 18 Andrade LEL, Lopes JM, Souza Filho MCM, et al. Cultura de Segurança do Paciente em Três Hospitais Brasileiros com Diferentes Tipos de Gestão. *Ciênc Saúde Coletiva* 2018;23:161–72.
- 19 Batista J, Almeida Cruz ED, Alpendre FT, et al. Diferencias Entre Los Profesionales de Enfermería Y Medicina Respecto a La Cultura de la Seguridad del Paciente Quirúrgico. *Enferm Glob* 2021;20:86–126.
- 20 Campelo CL, Nunes FDO, Silva LDC, et al. Cultura de Segurança do Paciente Entre Profissionais de Enfermagem no Ambiente DA Terapia Intensiva. *Rev Esc Enferm USP* 2021;55:1–8.
- 21 Costa DB da, Ramos D, Gabriel CS, et al. Cultura de Segurança do Paciente: Avaliação Pelos Profissionais de Enfermagem. *Texto Contexto - Enferm* 2018;27:e2670016.
- 22 Silva PL, Gouveia MT, Magalhães RB, et al. Cultura de Seguridad del Paciente en La Perspectiva del Equipo de Enfermería en una Maternidad Pública. *Enfermería Glob* 2020;19:427–62.
- 23 Silva SC, Moraes BX, Munhoz OL, et al. Cultura de Segurança do Paciente, Cuidados de Enfermagem Omitidos E Suas Razões NA Obstetrícia. *Rev Lat Am Enferm* 2021;29:e3461.
- 24 de Lima Garcia C, Bezerra IMP, Ramos JLS, et al. Association between culture of patient safety and burnout in pediatric hospitals. *PLoS ONE* 2019;14:e0218756.
- 25 Do Carmo JMA, Mendoza IYQ, Goveia VR, et al. Cultura de Segurança do Paciente em Unidades Hospitalares de Ginecologia E Obstetrícia: Estudo Transversal. *Rev Bras Enferm* 2020;73:e20190576.
- 26 Fagundes TE, Acosta AS, Gouveia PB, et al. Cultura de Segurança do Paciente em Centro Cirúrgico NA Perspectiva DA Equipe de Enfermagem. *J Nurs Health* 2021;11:e2111219510.
- 27 Fassarella CS, Camerini FG, Henrique D de M, et al. Evaluation of patient safety culture: comparative study in university hospitals. *Rev Esc Enferm USP* 2018;52:S0080-62342018000100457.
- 28 Galvão TF, Lopes MCC, Oliva CCC, et al. Cultura de Segurança do Paciente em um hospital Universitário. *Rev Lat Am Enferm* 2018;26:e3014.
- 29 Massaroli A, Carli Rodrigues ME, Kooke K, et al. Avaliação DA Cultura de Segurança do Paciente em um hospital do Sul do Brasil. *Cienc Y Enfermería* 2021;27:1–12.
- 30 Colares de Borba Netto F, Gadelha Severino F. Resultados DA Avaliação DA Cultura de Segurança em um hospital Público de Ensino do Ceará. *RBPS* 2016;29:334–41.
- 31 Notaro KAM, Corrêa A dos R, Tomazoni A, et al. Cultura de Segurança DA Equipe Multiprofissional em Unidades de Terapia Intensiva neonatal de Hospitais Públicos. *Rev Latino-Am Enfermagem* 2019;27.
- 32 Okuyama JHH, Galvão TF, Crozatti MTL, et al. Health professionals' perception of patient safety culture in a University hospital in São Paulo: A cross-sectional study applying the hospital survey on patient safety culture. *Sao Paulo Med J* 2019;137:216–22.
- 33 Pedroni VS, Gouveia HG, Vieira LB, et al. Cultura de Segurança do Paciente NA Área Materno-Infantil de hospital Universitário. *Rev Gauch Enferm* 2020;41:e20190171.
- 34 Ribeiro AC, Nogueira PC, Tronchin DMR, et al. Cultura de Segurança do Paciente: Percepção dos Enfermeiros em um Centro de Referência em Cardiopneumologia. *Texto E Contexto Enferm* 2019;28:e20180118.
- 35 Sanchis DZ, Haddad M, Giroto E, et al. Cultura de Segurança do Paciente: Percepção de Profissionais de Enfermagem em Instituições de Alta Complexidade. *Rev Bras Enferm* 2020;73:e20190174.
- 36 Santiago THR, Turrini RNT. Cultura E Clima Organizacional para Segurança do Paciente em Unidades de Terapia Intensiva. *Rev Esc Enferm USP* 2015;49:123–30.
- 37 Tomazoni A, Rocha PK, Souza S, et al. Cultura de Segurança do Paciente em Unidades de Terapia Intensiva neonatal: Perspectivas DA Equipe de Enfermagem E Médica. *Rev Lat Am Enferm* 2014;22:755–63.
- 38 Viana KE, Matsuda LM, Pereira ACS, et al. Cultura de Segurança do Paciente em Hospitais Públicos de Ensino: Estudo Comparativo. *Rev Enferm UERJ* 2020;28:e51949.
- 39 Salazar Maya AM, Restrepo Marín DM. Cultura de la Seguridad del Paciente en Seis Centros Quirúrgicos de Antioquia. *Rev Cuid* 2020;11.
- 40 Bravo Gómez MA, Pérez LB A, Becerra Moreno X, et al. Cultura de Seguridad en Profesionales del Quirófano en una Institución de Atención Materno Infantil. *Rev Cuba Enfermería* 2020;36:e3155.
- 41 Jaimes-Valencia ML, Alvarado-Alvarado AL, Mejía-Arciniegas CN, et al. Correlation between the degree of perception and culture on patient safety in a tertiary hospital between 2015-2019. *Rev Cuid* 2021;12:e1092.
- 42 Ramos F, Coca SM, Abeldaño RA. Percepción de la Cultura de Seguridad de Pacientes en Profesionales de una Institución Argentina. *Enfermería Universitaria* 2017;14:47–53.
- 43 Prieto MMN, Fonseca REP, Zem-Mascarenhas SH. Assessment of patient safety culture in Brazilian hospitals through HSOPSC: a scoping review. *Rev Bras Enferm* 2021;74:e20201315.
- 44 Andrade LEL. *Evolução da cultura de segurança em hospitais antes e após a implantação do programa nacional de segurança do paciente*. Dissertation, Natal: Universidade Federal do Rio Grande do Norte, 2016.
- 45 Cassago RM. *Avaliação da percepção da cultura de segurança do paciente com o questionário HSOPSC em um hospital público de São Paulo*. São Paulo: Instituto Sírio-Libanês de Ensino e Pesquisa do Hospital Sírio-Libanês, 2017.
- 46 Corona ARPD. *Avaliação da cultura de segurança do paciente em hospital público de ensino de Mato Grosso do Sul*. São Paulo: Universidade de São Paulo, 2017.
- 47 Cruz ED de A, Da Rocha DJM, Mauricio AB, et al. Cultura de Segurança Entre Profissionais de Saúde em hospital de Ensino. *Cogitare Enfermagem*. *Cogitare Enferm* 2018;23.
- 48 Fassarella CS, Silva LD, Camerini FG, et al. Cultura de Segurança dos Enfermeiros Entre os Serviços de um hospital Universitário. *Rev Bras Enferm* 2019;72:767–73.
- 49 Félix RS. *Cultura de segurança do paciente em uma maternidade na perspectiva de usuárias e equipe multiprofissional*. Santa Maria: Centro Universitário Franciscano, 2017.
- 50 Kawamoto AM, Oliveira JLC, Tonini NS, et al. Liderança E Cultura de Segurança do Paciente: Percepções de Profissionais em um hospital Universitário. *Rev Pesqui: Cuid Fundam* 2016;8:4387–98.
- 51 Lopez E da CMS, Cruz ED de A, Alpendre FT, et al. Cultura de Segurança do Paciente em Unidades Cirúrgicas de Hospitais de Ensino.REME. *REME* 2020;24.
- 52 Macedo TR, Rocha PK, Tomazoni A, et al. Cultura de Segurança do Paciente NA Perspectiva DA Equipe de Enfermagem de Emergências Pediátricas. *Rev Esc Enferm USP* 2016;50:756–62.
- 53 Mello JF de, Barbosa S de FF. Cultura de Segurança do Paciente em Terapia Intensiva: Recomendações DA Enfermagem. *Texto Contexto - Enferm* 2013;22:1124–33.
- 54 Moretão DIC. *A cultura de segurança do paciente em unidades cirúrgicas de um hospital de ensino da rede pública de Saúde*. Belo Horizonte: Universidade Federal de Minas Gerais, 2019.
- 55 Lima Neto AV. *Percepção da cultura de segurança do paciente pelos enfermeiros de unidades de terapia intensiva*. Natal: Universidade Federal do Rio Grande do Norte, 2017.
- 56 Nicácio MC. *Cultura de segurança da mulher no parto hospitalar: um estudo misto das percepções dos profissionais de enfermagem e médicos*. Rio de Janeiro: Universidade do Estado do Rio de Janeiro, 2019.
- 57 Pinheiro MP. *Segurança do paciente: diagnóstico e intervenções da educação permanente em um hospital universitário*. Rio de Janeiro: Universidade Federal do Estado do Rio de Janeiro, 2015.
- 58 Rocha RC. *Cultura de segurança do paciente em centro cirúrgico: perspectiva da equipe de enfermagem*. Teresina: Universidade Federal do Piauí, 2017.
- 59 Rodrigues WVD. *Avaliação da Cultura de Segurança do Paciente entre profissionais de saúde de um hospital público*. São Paulo: Instituto Sírio-Libanês de Ensino e Pesquisa do Hospital Sírio-Libanês, 2016.

- 60 Schuh LX, Krug SBF, Possuelo L. Cultura de Segurança do Paciente em Unidades de Urgência/Emergência. *Rev Pesqui* 2020;12:616–21.
- 61 Serrano A, Santos DF, Matos SS, *et al.* Avaliação DA Cultura de Segurança do Paciente em um hospital Filantrópico. *REME Rev Min Enferm* 2019;23:e-1183.
- 62 Silva A, Santa Rosa DO. Cultura de Segurança do Paciente em Organização Hospitalar. *Cogitare Enferm* 2016;21:1–10.
- 63 Silva MF. *Cultura de segurança da equipe de enfermagem no serviço de urgência e emergência*. Natal: Universidade Federal do Rio Grande do Norte, 2017.
- 64 Souza VS, Kawamoto AM, Oliveira JLC, *et al.* Errors and adverse events: the interface with health professionals' safety culture. *Rev Bras Enferm* 2019;72:498–505.
- 65 Tavares APM, Moura ECC, Avelino F, *et al.* Cultura de Segurança do Paciente NA Perspectiva DA Equipe de Enfermagem. *Rev Rene* 2018;19:e3152.
- 66 Tobias GC, Bezerra ANQ, Paranaguá TTB, *et al.* Cultura de Segurança em hospital de Ensino: Fortalezas E Fraquezas Percebidas Por Enfermeiros. *Rev Enferm UFPE* 2016;10:1063–70.
- 67 Tomazoni A, Rocha PK, Kusahara DM, *et al.* Avaliação DA Cultura de Segurança do Paciente em Terapia Intensiva neonatal. *Texto Contexto Enferm* 2015;24:161–9.
- 68 Arias-Botero JH, Segura-Cardona AM, Acosta Rodríguez F, *et al.* Patient safety climate in operating rooms at Colombian hospitals: differences by profession and type of contract. *Colomb J Anesthesiol* 2020;48:71–7.
- 69 Sorra J, Gray L, Streagle S, *et al.* AHRQ hospital survey on patient safety culture: user's guide. Available: <https://www.ahrq.gov/sops/quality-patient-safety/patientsafetyculture/hospital/index.html> [Accessed 10 Jul 2023].
- 70 Agência Nacional de Vigilância Sanitária (ANVISA). Avaliação Nacional DA Cultura de Segurança do Paciente em Hospitais. 2021. Available: <https://www.gov.br> [Accessed 10 Jul 2023].
- 71 Zwijnenberg NC, Hendriks M, Hoogervorst-Schilp J, *et al.* Healthcare professionals' views on feedback of a patient safety culture assessment. *BMC Health Serv Res* 2016;16:199.
- 72 Giménez-Júlvez T, Hernández-García I, Aibar-Remón C, *et al.* Cultura de la Seguridad del Paciente en Directivos Y Gestores de UN Servicio de Salud. *Gaceta Sanitaria* 2017;31:423–6.
- 73 Vaismoradi M, Tella S, A Logan P, *et al.* Nurses' adherence to patient safety principles: a systematic review. *Int J Environ Res Public Health* 2020;17:2028.
- 74 Okuyama JHH, Galvao TF, Silva MT. Healthcare professional's perception of patient safety measured by the hospital survey on patient safety culture: a systematic review and meta-analysis. *ScientificWorldJournal* 2018;2018:9156301.
- 75 Zaghini F, Fiorini J, Piredda M, *et al.* The relationship between nurse managers' leadership style and patients' perception of the quality of the care provided by nurses: cross sectional survey. *Int J Nurs Stud* 2020;101:103446.
- 76 López-Medina IM, Sánchez-García I, García-Fernández FP, *et al.* Nurses and ward managers' perceptions of leadership in the evidence-based practice: a qualitative study. *J Nurs Manag* 2022;30:135–43.
- 77 Liu C, Liu W, Wang Y, *et al.* Patient safety culture in China: a case study in an outpatient setting in Beijing. *BMJ Qual Saf* 2014;23:556–64.
- 78 Reason J. Human error: models and management. *BMJ* 2000;320:768–70.
- 79 Palmieri PA, Leyva-Moral JM, Camacho-Rodriguez DE, *et al.* Hospital survey on patient safety culture (HSOPSC): a multi-method approach for target-language instrument translation, adaptation, and validation to improve the equivalence of meaning for cross-cultural research. *BMC Nurs* 2020;19:23.
- 80 Singer SJ. Value of a value culture survey for improving healthcare quality. *BMJ Qual Saf* 2022;31:479–82.
- 81 Keebler JR, Lazzara E, Griggs A, *et al.* Holistic strategy for promoting effective Handoffs. *BMJ Lead* 2023;7:91–5.
- 82 Webster KLW, Keebler JR, Lazzara EH, *et al.* Handoffs and teamwork: a framework for care transition communication. *Jt Comm J Qual Patient Saf* 2022;48:343–53.
- 83 Elmontsri M, Almashrafi A, Banarsee R, *et al.* Status of patient safety culture in Arab countries: a systematic review. *BMJ Open* 2017;7:e013487.
- 84 Azami-Aghdash S, Ebadifard Azar F, Rezapour A, *et al.* Patient safety culture in hospitals of Iran: a systematic review and meta-analysis. *Med J Islam Repub Iran* 2015;29:251.
- 85 Wu AW, Boyle DJ, Wallace G, *et al.* Disclosure of adverse events in the United States and Canada: an update, and a proposed framework for improvement. *J Public Health Res* 2013;2:e32.
- 86 Ebrahimipour H, Hooshmand E, Varmaghani M, *et al.* The challenges of physicians' participation in hospital accreditation programs: a qualitative study in Iran. *BMC Health Serv Res* 2021;21:1171.
- 87 McFadden KL, Stock GN, Gowen CR. Leadership, safety climate, and continuous quality improvement: impact on process quality and patient safety. *J Nurs Adm* 2014;44:S27–37.
- 88 Singer S, Lin S, Falwell A, *et al.* Relationship of safety climate and safety performance in hospitals. *Health Serv Res* 2009;44(2 Pt 1):399–421.
- 89 Safety culture trends. 2022. Available: <https://info.pressganey.com/ebooks/safety-culture-trends> [Accessed 10 Jul 2023].
- 90 Fassarella CS. Organizational culture of safety during the COVID-19 pandemic. *Revista de Enfermagem Referência* 2021;5:e21ED5.
- 91 Wang SJ, Chang YC, Hu WY, *et al.* Improving patient safety culture during the COVID-19 pandemic in Taiwan. *Front Public Health* 2022;10:889870.
- 92 Pan American Health Organization (PAHO). Working for health: 2022-2030 action plan. Available: https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75_12-sp.pdf [Accessed 10 Jul 2023].
- 93 Chervoni-Knapp T. The staffing shortage pandemic. *J Radiol Nurs* 2022;41:74–5.
- 94 Azyabi A, Karwowski W, Davahli MR. Assessing patient safety culture in hospital settings. *Int J Environ Res Public Health* 2021;18:2466.
- 95 Granel-Giménez N, Palmieri PA, Watson-Badia CE, *et al.* Patient safety culture in European hospitals: a comparative mixed methods study. *Int J Environ Res Public Health* 2022;19:939.
- 96 Abu Assab M, Jaber D, Basheer H, *et al.* The COVID-19 pandemic and patient safety culture: a cross-sectional study among community pharmacies in Jordan. *Healthcare* 2022;10:1434.
- 97 Brborović O, Brborović H, Hrain L. The COVID-19 pandemic crisis and patient safety culture: a mixed-method study. *Int J Environ Res Public Health* 2022;19:2237.
- 98 Rodrigues TA, Amaral FMA, Hoffmann MA, *et al.* Factors associated with the safety culture of patients under dialysis in the context of the COVID-19 pandemic. *Rev Bras Enferm* 2023;76Suppl 1:e20220280.
- 99 Haas LE, Gaedke MÂ, Mendes Santos JA. Safety culture in high complexity services in the context of the COVID-19 pandemic. *Cogitare Enferm* 2022;27:1–14.
- 100 Dos Santos MLR, Tavares VB, da Costa NS, *et al.* Patient safety culture in a COVID-19 ICU compared to a clinical-surgical ICU in the Brazilian Eastern Amazon: a cross-sectional study. *Int J Risk Saf Med* 2023;34:5–19.
- 101 De Carvalho G, Pinheiro ALS. Comparison of patient safety culture between traditional and COVID-19 care units. *Research Society and Development* 2022;11:e66111536737.
- 102 Reis CT, Laguardia J, Bruno de Araújo Andreoli P, *et al.* Cross-cultural adaptation and validation of the hospital survey on patient safety culture 2.0 – Brazilian version. *BMC Health Serv Res* 2023;23:32.
- 103 Hussein M, Pavlova M, Ghalwash M, *et al.* The impact of hospital accreditation on the quality of healthcare: a systematic literature review. *BMC Health Serv Res* 2021;21:1057.
- 104 Kyung M, Collman N, Domeracki S, *et al.* Racial and ethnic differences in the perceptions of health, work environment and experiences of work-related symptoms among cleaning workers. *J Immigr Minor Health* 2022;24:1398–407.
- 105 Santiago THR, Turrini RNT. Organizational culture and climate for patient safety in intensive care units. *Rev Esc Enferm USP* 2015;49 Spec No:123–30.

SUPPLEMENTARY FIGURE

Supplementary Graphic 1S. Distribution of positive responses of Hospital Survey on Patient Safety Culture

SUPPLEMENTARY TABLES

Supplementary Table 1S. STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	2
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	2
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	2
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	2
Bias	9	Describe any efforts to address potential sources of bias	8,9
Study size	10	Explain how the study size was arrived at	2
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	2
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	2,3
		(b) Describe any methods used to examine subgroups and interactions	2,3
		(c) Explain how missing data were addressed	3
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3,4
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	3,4
		(b) Indicate number of participants with missing data for each variable of interest	4,5
Outcome data	15*	Report numbers of outcome events or summary measures	4,5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	3-5
		(b) Report category boundaries when continuous variables were categorized	3,4
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-7
Discussion			
Key results	18	Summarise key results with reference to study objectives	4,5
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	8,9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	4-8
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	9

*Give information separately for exposed and unexposed groups

Supplementary Table 2S. Characterization of the participating hospitals

Features	<i>Hospital Universitario Austral</i>	<i>Hospital Israelita Albert Einstein</i>	<i>Clínica Alemana de Santiago</i>	<i>Fundación Santa Fe de Bogotá</i>
Localization	Buenos Aires, Argentina	Sao Paulo, Brazil	Santiago, Chile	Bogotá, Colombia
Number of workers	3,070	8,230	5,188	2,578
Number of bed	230	701	438	393
Teaching Hospital	Yes	Yes	No	Yes

Supplementary Table 3S. Estimated means differences for the percentages of positive responses in the dimensions of the Hospital Survey on Patient Safety Culture between non-teaching institutions and teaching hospitals

Dimensions	Teaching hospital		Contrasts	
	No	Yes	No - Yes (CI 95%)	P-value
Teamwork within units	80.8 (79.5–82.0)	78.2 (77.9–78.5)	2.6 (1.3–3.9)	<0.001
Expectations and actions promoting patient safety	75.2 (69.2–81.6)	64.1 (61.3–67.0)	11.1 (4.2–17.9)	0.002
Organizational learning – Continuous improvement	82.2 (75.5–89.5)	81.3 (76.4–86.5)	0.9 (-7.7–9.6)	0.830
Management support for Patient safety	79.8 (75.8–84.0)	75.0 (70.3–80.0)	4.8 (-1.5–11.2)	0.137
Feedback & communication about errors	74.9 (72.7–77.2)	72.3 (66.8–78.3)	2.5 (-3.6–8.7)	0.415
Frequency of events reported	77.7 (74.7–80.7)	63.1 (52.9–75.3)	14.5 (3.0–26.1)	0.014
Overall perceptions of patients safety	64.0 (55.6–73.7)	66.8 (60.0–74.5)	-2.9 (-14.4–8.7)	0.629
Communication openness	58.0 (54.2–62.0)	59.6 (58.8–60.3)	-1.6 (-5.5–2.4)	0.437
Teamwork across units	62.3 (61.4–63.1)	64.0 (57.7–71.0)	-1.7 (-8.5–5.0)	0.612
Staffing	42.9 (39.6–46.5)	37.6 (34.0–41.5)	5.3 (0.2–10.4)	0.041
Handoffs & transitions	65.5 (58.1–73.7)	55.0 (45.0–67.2)	10.4 (-3.0–23.9)	0.129
Non-punitive response to error	35.4 (33.4–37.5)	39.9 (39.8–40.1)	-4.5 (-6.6–2.5)	<0.001

Legend. CI: Confidential interval 95%

Supplementary Table 4S. Estimated means differences for the percentages of positive responses in the dimensions of the Hospital Survey on Patient Safety Culture between healthcare professional without direct contact with the patients and those who are in direct contact

Dimensions	Direct contact with the patient		Contrasts	
	No	Yes	No - Yes (CI 95%)	P-value
Teamwork within units	80.2 (77.3–83.2)	79.6 (77.6–81.5)	0.6 (-3.5–4.8)	0.768
Expectations and actions promoting patient safety	72.2 (69.1–75.4)	69.0 (62.3–76.5)	3.2 (-1.0–7.3)	0.133
Organizational learning – Continuous improvement	81.9 (77.8–86.1)	81.8 (77.3–86.6)	0.1 (-3.6–3.8)	0.971
Management support for Patient safety	81.4 (78.3–84.5)	76.5 (72.4–81.0)	4.8 (1.6–8.1)	0.003
Feedback & communication about errors	74.5 (71.3–77.8)	73.5 (70.1–77.1)	1.0 (-1.7–3.7)	0.478
Frequency of events reported	72.7 (65.4–80.8)	69.9 (61.0–80.0)	2.8 (-1.0–6.6)	0.143
Overall perceptions of patients safety	66.9 (59.6–75.1)	65.2 (59.7–71.1)	1.7 (-1.6–5.1)	0.317
Communication openness	60.4 (57.4–63.6)	58.4 (56.2–60.8)	2.0 (-1.3–5.3)	0.232
Teamwork across units	65.1 (59.8–70.9)	62.6 (59.3–66.1)	2.5 (-1.8–6.8)	0.256
Staffing	37.4 (34.4–40.6)	40.9 (36.5–46.0)	-3.6 (-10.2–3.0)	0.287
Handoffs & transitions	53.0 (46.6–60.4)	61.7 (53.3–71.4)	-8.7 (-14.1–-3.2)	0.002
Non-punitive response to error	41.8 (36.1–48.4)	36.6 (33.8–39.6)	5.2 (-1.5–11.9)	0.128

Legend. CI: Confidential interval 95%

Supplementary Table 5S. Multiple comparisons among hospital units in the dimensions of the Hospital Survey on Patient Safety Culture

Contrasts	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value
	Teamwork within units		Expectations and actions promoting patient safety		Organizational learning – Continuous improvement	
Nursing wards – Radiology	-1.8 (-6.3; 2.7)	>0.999	0.5 (-3.5; 4.5)	>0.999	2.6 (-1.5; 6.7)	0.678
Nursing wards – Emergency room	-0.7 (-5.0; 3.7)	>0.999	3.4 (-3.7; 10.4)	>0.999	4.6 (-4.2; 13.4)	>0.999
Nursing wards – ICU	-1.6 (-5.9; 2.7)	>0.999	-0.6 (-6.1; 4.9)	>0.999	2.3 (-2.9; 7.6)	>0.999
Nursing wards – Other	-1.9 (-6.9; 3.0)	>0.999	-1.4 (-5.7; 3.0)	>0.999	2.5 (-1.0; 6.0)	0.432
Radiology – Emergency room	1.1 (-3.0; 5.2)	>0.999	2.8 (-4.0; 9.6)	>0.999	2.0 (-3.6; 7.6)	>0.999
Radiology – ICU	0.2 (-3.9; 4.3)	>0.999	-1.1 (-7.3; 5.1)	>0.999	-0.3 (-5.6; 5.0)	>0.999
Radiology – Other	-0.1 (-2.8; 2.6)	>0.999	-1.9 (-6.7; 2.9)	>0.999	-0.1 (-3.2; 3.0)	>0.999
Emergency room – ICU	-0.9 (-7.6; 5.8)	>0.999	-4.0 (-14.8; 6.9)	>0.999	-2.3 (-12.9; 8.4)	>0.999
Emergency room – Other	-1.2 (-4.4; 1.9)	>0.999	-4.7 (-7.5; -1.9)	<0.001	-2.1 (-7.3; 3.1)	>0.999
ICU – Other	-0.3 (-6.9; 6.2)	>0.999	-0.8 (-9.3; 7.7)	>0.999	0.2 (-6.2; 6.6)	>0.999
	Management support for Patient safety		Feedback & communication about errors		Frequency of events reported	
Nursing wards – Radiology	-2.5 (-6.3; 1.4)	0.496	8.6 (0.0; 17.2)	0.052	6.8 (-0.6; 14.2)	0.099
Nursing wards – Emergency room	4.2 (-3.3; 11.6)	0.659	6.7 (-8.6; 22.0)	>0.999	7.3 (-6.8; 21.3)	>0.999
Nursing wards – ICU	1.6 (-2.2; 5.5)	0.954	2.2 (-5.6; 10.1)	>0.999	7.1 (-0.5; 14.7)	0.083
Nursing wards – Other	-2.9 (-7.2; 1.5)	0.496	5.3 (-1.6; 12.1)	0.269	4.3 (0.7; 7.9)	0.009
Radiology – Emergency room	6.6 (-1.0; 14.3)	0.139	-1.9 (-11.6; 7.8)	>0.999	0.5 (-7.5; 8.5)	>0.999
Radiology – ICU	4.1 (0.5; 7.7)	0.014	-6.4 (-14.6; 1.8)	0.269	0.3 (-8.3; 9.0)	>0.999
Radiology – Other	-0.4 (-2.1; 1.4)	0.961	-3.3 (-6.2; -0.5)	0.010	-2.5 (-8.0; 2.9)	>0.999
Emergency room – ICU	-2.6 (-10.7; 5.6)	0.961	-4.5 (-19.2; 10.2)	>0.999	-0.1 (-15.0; 14.8)	>0.999
Emergency room – Other	-7.0 (-13.0; -1.0)	0.010	-1.4 (-11.1; 8.2)	>0.999	-3.0 (-13.7; 7.7)	>0.999
ICU – Other	-4.5 (-10.0; 1.1)	0.207	3.0 (-5.2; 11.3)	>0.999	-2.9 (-11.2; 5.5)	>0.999
	Overall perceptions of patients safety		Communication openness		Teamwork across units	
Nursing wards – Radiology	-5.8 (-12.2; 0.5)	0.097	0.1 (-3.1; 3.3)	>0.999	-3.6 (-8.3; 1.2)	0.285
Nursing wards – Emergency room	-0.8 (-5.1; 3.6)	>0.999	-2.4 (-6.5; 1.8)	0.936	1.8 (-2.6; 6.1)	>0.999
Nursing wards – ICU	1.9 (-2.7; 6.5)	>0.999	3.0 (-4.3; 10.3)	>0.999	-4.1 (-8.2; 0.1)	0.060
Nursing wards – Other	-2.3 (-7.7; 3.0)	>0.999	1.9 (-1.1; 4.9)	0.780	-2.8 (-7.8; 2.2)	0.750
Radiology – Emergency room	5.0 (-1.0; 11.0)	0.161	-2.4 (-9.0; 4.1)	>0.999	5.3 (1.8; 8.9)	<0.001
Radiology – ICU	7.7 (1.8; 13.6)	0.003	2.9 (-2.7; 8.6)	>0.999	-0.5 (-1.9; 1.0)	>0.999
Radiology – Other	3.5 (0.7; 6.3)	0.005	1.8 (-3.9; 7.5)	>0.999	0.8 (-2.2; 3.7)	>0.999
Emergency room – ICU	2.7 (2.1; 3.2)	<0.001	5.4 (-5.9; 16.7)	>0.999	-5.8 (-7.7; -4.0)	<0.001
Emergency room – Other	-1.5 (-6.6; 3.5)	>0.999	4.2 (2.2; 6.2)	<0.001	-4.6 (-10.6; 1.4)	0.285
ICU – Other	-4.2 (-9.5; 1.1)	0.205	-1.1 (-9.3; 7.0)	>0.999	1.2 (-2.5; 5.0)	>0.999
	Staffing		Handoffs & Transitions		Non-punitive response to error	
Nursing wards – Radiology	-6.4 (-9.2; -3.6)	<0.001	-2.8 (-7.1; 1.5)	0.486	1.7 (-1.7; 5.1)	>0.999
Nursing wards – Emergency room	-1.9 (-11.1; 7.2)	>0.999	-5.1 (-12.6; 2.5)	0.462	-2.0 (-9.6; 5.7)	>0.999
Nursing wards – ICU	2.2 (-1.5; 5.8)	0.724	-0.4 (-6.0; 5.2)	>0.999	1.6 (-3.9; 7.2)	>0.999
Nursing wards – Other	-1.4 (-5.2; 2.4)	>0.999	5.1 (-2.1; 12.3)	0.390	-0.4 (-7.7; 6.9)	>0.999
Radiology – Emergency room	4.5 (-7.4; 16.3)	>0.999	-2.3 (-10.0; 5.4)	>0.999	-3.7 (-10.0; 2.7)	0.981
Radiology – ICU	8.6 (4.8; 12.3)	<0.001	2.3 (-1.9; 6.6)	0.650	-0.1 (-5.2; 5.1)	>0.999
Radiology – Other	5.0 (0.7; 9.3)	0.012	7.9 (2.7; 13.0)	<0.001	-2.1 (-7.9; 3.6)	>0.999
Emergency room – ICU	4.1 (-8.4; 16.6)	>0.999	4.6 (-7.5; 16.8)	>0.999	3.6 (-5.6; 12.7)	>0.999
Emergency room – Other	0.5 (-10.8; 11.9)	>0.999	10.2 (-2.8; 23.2)	0.259	1.5 (0.3; 2.8)	0.006
ICU – Other	-3.5 (-4.2; -2.9)	<0.001	5.5 (0.8; 10.3)	0.010	-2.1 (-11.0; 6.9)	>0.999

Legend. CI: Confidential interval 95%; ICU: Intensive care Unit

Supplementary Table 6S. Multiple comparisons among time-period in the hospital in the dimensions of the Hospital Survey on Patient Safety Culture

Contrasts	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value
	Teamwork within units		Expectations and actions promoting patient safety		Organizational learning – Continuous improvement	
Until 1 year – 1 to 5 years	6.8 (6.1; 7.4)	<0.001	6.0 (3.7; 8.3)	<0.001	4.3 (0.8; 7.8)	0.006
Until 1 year – 6 to 10 years	7.9 (4.2; 11.5)	<0.001	8.3 (3.7; 12.9)	<0.001	7.5 (2.6; 12.4)	<0.001
Until 1 year – 11 to 15 years	7.0 (4.5; 9.4)	<0.001	6.5 (1.9; 11.1)	0.001	6.6 (0.5; 12.6)	0.022
Until 1 year – 16 to 20 years	4.9 (2.7; 7.1)	<0.001	4.1 (1.6; 6.6)	<0.001	6.9 (0.1; 13.7)	0.044
Until 1 year – more than 20 years	2.2 (0.7; 3.8)	0.001	2.2 (-0.5; 5.0)	0.193	-0.5 (-6.4; 5.4)	>0.999
1 to 5 years – 6 to 10 years	1.1 (-2.0; 4.1)	>0.999	2.3 (-0.5; 5.2)	0.193	3.2 (0.0; 6.5)	0.044
1 to 5 years – 11 to 15 years	0.2 (-1.7; 2.1)	>0.999	0.5 (-1.5; 2.5)	0.636	2.3 (-1.5; 6.0)	0.610
1 to 5 years – 16 to 20 years	-1.9 (-4.1; 0.3)	0.124	-1.9 (-4.9; 1.1)	0.454	2.6 (-1.6; 6.9)	0.610
1 to 5 years – more than 20 years	-4.6 (-6.1; -3.1)	<0.001	-3.8 (-6.6; -1.0)	0.002	-4.8 (-9.5; -0.1)	0.044
6 to 10 years – 11 to 15 years	-0.9 (-3.6; 1.8)	>0.999	-1.8 (-3.1; -0.6)	<0.001	-1.0 (-3.9; 2.0)	>0.999
6 to 10 years – 16 to 20 years	-3.0 (-6.4; 0.4)	0.124	-4.2 (-9.6; 1.1)	0.208	-0.6 (-2.8; 1.5)	>0.999
6 to 10 years – more than 20 years	-5.6 (-9.9; -1.4)	0.002	-6.1 (-9.2; -3.0)	<0.001	-8.0 (-14.6; -1.4)	0.006
11 to 15 years – 16 to 20 years	-2.1 (-2.6; -1.5)	<0.001	-2.4 (-6.9; 2.1)	0.508	0.3 (-1.5; 2.2)	>0.999
11 to 15 years – more than 20 years	-4.7 (-8.6; -0.9)	0.006	-4.3 (-7.2; -1.3)	<0.001	-7.1 (-13.4; -0.7)	0.017
16 to 20 years – more than 20 years	-2.7 (-6.0; 0.6)	0.174	-1.9 (-5.1; 1.4)	0.508	-7.4 (-13.3; -1.5)	0.003
	Management support for Patient safety		Feedback & communication about errors		Frequency of events reported	
Until 1 year – 1 to 5 years	3.6 (1.2; 5.9)	<0.001	10.7 (8.3; 13.1)	<0.001	6.6 (5.8; 7.5)	<0.001
Until 1 year – 6 to 10 years	7.9 (2.7; 13.2)	<0.001	14.4 (8.7; 20.1)	<0.001	7.1 (5.4; 8.8)	<0.001
Until 1 year – 11 to 15 years	3.6 (-2.4; 9.5)	0.533	15.3 (8.7; 21.9)	<0.001	9.0 (4.7; 13.3)	<0.001
Until 1 year – 16 to 20 years	5.7 (1.6; 9.9)	0.001	16.5 (10.0; 23.0)	<0.001	8.0 (1.1; 14.9)	0.011
Until 1 year – more than 20 years	-3.0 (-8.2; 2.2)	0.533	10.0 (1.7; 18.2)	0.007	4.8 (-1.7; 11.2)	0.398
1 to 5 years – 6 to 10 years	4.4 (0.5; 8.3)	0.019	3.7 (-0.5; 7.8)	0.118	0.5 (-1.0; 1.9)	>0.999
1 to 5 years – 11 to 15 years	0.0 (-3.8; 3.7)	0.998	4.5 (-0.1; 9.1)	0.055	2.4 (-1.6; 6.4)	0.801
1 to 5 years – 16 to 20 years	2.2 (-1.3; 5.7)	0.533	5.8 (1.7; 9.9)	0.001	1.3 (-3.5; 6.2)	>0.999
1 to 5 years – more than 20 years	-6.6 (-11.1; -2.1)	<0.001	-0.7 (-5.3; 3.8)	>0.999	-1.9 (-7.1; 3.4)	>0.999
6 to 10 years – 11 to 15 years	-4.4 (-6.3; -2.4)	<0.001	0.9 (-1.9; 3.7)	>0.999	1.9 (-1.2; 5.0)	0.757
6 to 10 years – 16 to 20 years	-2.2 (-4.0; -0.4)	0.006	2.1 (-2.3; 6.5)	0.918	0.9 (-4.0; 5.8)	>0.999
6 to 10 years – more than 20 years	-11.0 (-12.9; -9.0)	<0.001	-4.4 (-9.8; 0.9)	0.169	-2.3 (-8.3; 3.6)	>0.999
11 to 15 years – 16 to 20 years	2.2 (-1.3; 5.6)	0.533	1.2 (-2.0; 4.5)	>0.999	-1.0 (-5.1; 3.0)	>0.999
11 to 15 years – more than 20 years	-6.6 (-7.6; -5.5)	<0.001	-5.3 (-10.5; 0.0)	0.046	-4.3 (-10.3; 1.8)	0.467
16 to 20 years – more than 20 years	-8.8 (-12.5; -5.0)	<0.001	-6.5 (-9.1; -4.0)	<0.001	-3.2 (-9.3; 2.9)	>0.999
	Overall perceptions of patients safety		Communication openness		Teamwork across units	
Until 1 year – 1 to 5 years	4.5 (3.1; 5.9)	<0.001	6.6 (3.0; 10.2)	<0.001	8.6 (5.5; 11.7)	<0.001
Until 1 year – 6 to 10 years	7.9 (3.1; 12.8)	<0.001	8.7 (6.1; 11.2)	<0.001	12.1 (5.3; 18.9)	<0.001
Until 1 year – 11 to 15 years	4.2 (-0.9; 9.3)	0.175	6.0 (0.1; 11.9)	0.046	9.6 (1.7; 17.5)	0.007
Until 1 year – 16 to 20 years	7.9 (2.7; 13.0)	<0.001	3.4 (-1.5; 8.4)	0.371	10.6 (3.0; 18.1)	0.001
Until 1 year – more than 20 years	0.8 (-5.3; 6.8)	>0.999	0.9 (-5.7; 7.5)	>0.999	4.4 (-3.4; 12.2)	0.630
1 to 5 years – 6 to 10 years	3.4 (-0.1; 6.9)	0.059	2.1 (0.4; 3.7)	0.004	3.5 (-0.9; 8.0)	0.222
1 to 5 years – 11 to 15 years	-0.3 (-3.7; 3.1)	>0.999	-0.7 (-3.5; 2.2)	>0.999	1.0 (-3.2; 5.2)	0.642
1 to 5 years – 16 to 20 years	3.4 (-0.3; 7.1)	0.103	-3.2 (-6.0; -0.3)	0.017	2.0 (-2.3; 6.3)	0.630
1 to 5 years – more than 20 years	-3.7 (-9.1; 1.7)	0.353	-5.7 (-11.5; 0.1)	0.057	-4.2 (-9.8; 1.5)	0.280
6 to 10 years – 11 to 15 years	-3.7 (-5.8; -1.6)	<0.001	-2.7 (-7.0; 1.6)	0.464	-2.5 (-4.0; -1.1)	<0.001
6 to 10 years – 16 to 20 years	0.0 (-2.1; 2.0)	>0.999	-5.2 (-9.6; -0.8)	0.008	-1.5 (-3.3; 0.2)	0.133
6 to 10 years – more than 20 years	-7.1 (-11.0; -3.3)	<0.001	-7.7 (-14.8; -0.7)	0.021	-7.7 (-11.3; -4.1)	<0.001
11 to 15 years – 16 to 20 years	3.7 (-0.4; 7.7)	0.103	-2.5 (-4.8; -0.2)	0.021	1.0 (-0.8; 2.8)	0.630
11 to 15 years – more than 20 years	-3.4 (-6.8; 0.1)	0.040	-5.0 (-8.5; -1.6)	<0.001	-5.2 (-8.4; -1.9)	<0.001
16 to 20 years – more than 20 years	-7.1 (-10.6; -3.5)	<0.001	-2.5 (-7.2; 2.2)	0.594	-6.2 (-8.1; -4.2)	<0.001

	Staffing		Handoffs & Transitions		Non-punitive response to error	
Until 1 year – 1 to 5 years	1.1 (-3.5; 5.7)	>0.999	4.5 (1.1; 7.8)	0.001	0.7 (-2.5; 4.0)	>0.999
Until 1 year – 6 to 10 years	3.1 (-3.8; 10.0)	>0.999	8.9 (3.5; 14.3)	<0.001	3.1 (-1.4; 7.5)	0.463
Until 1 year – 11 to 15 years	-0.2 (-7.1; 6.8)	>0.999	5.6 (-2.3; 13.5)	0.412	-4.4 (-8.8; 0.0)	0.052
Until 1 year – 16 to 20 years	-2.8 (-9.7; 4.2)	>0.999	6.3 (-2.2; 14.7)	0.393	-6.6 (-17.9; 4.6)	0.719
Until 1 year – more than 20 years	-7.5 (-17.2; 2.2)	0.279	2.7 (-4.8; 10.2)	>0.999	-5.6 (-16.9; 5.8)	>0.999
1 to 5 years – 6 to 10 years	2.0 (-3.3; 7.2)	>0.999	4.4 (2.3; 6.6)	<0.001	2.3 (-1.4; 6.0)	0.636
1 to 5 years – 11 to 15 years	-1.3 (-7.1; 4.5)	>0.999	1.1 (-3.9; 6.2)	>0.999	-5.1 (-5.8; -4.5)	<0.001
1 to 5 years – 16 to 20 years	-3.8 (-8.0; 0.3)	0.085	1.8 (-3.4; 7.0)	>0.999	-7.4 (-15.8; 1.0)	0.142
1 to 5 years – more than 20 years	-8.6 (-15.4; -1.7)	0.004	-1.8 (-7.0; 3.4)	>0.999	-6.3 (-14.4; 1.8)	0.276
6 to 10 years – 11 to 15 years	-3.2 (-5.9; -0.5)	0.007	-3.3 (-9.4; 2.9)	>0.999	-7.5 (-11.2; -3.8)	<0.001
6 to 10 years – 16 to 20 years	-5.8 (-9.8; -1.8)	<0.001	-2.6 (-7.6; 2.3)	>0.999	-9.7 (-18.7; -0.7)	0.023
6 to 10 years – more than 20 years	-10.5 (-14.0; -7.1)	<0.001	-6.2 (-11.5; -0.8)	0.011	-8.6 (-18.8; 1.6)	0.177
11 to 15 years – 16 to 20 years	-2.6 (-6.7; 1.6)	0.684	0.6 (-2.8; 4.1)	>0.999	-2.2 (-8.7; 4.3)	>0.999
11 to 15 years – more than 20 years	-7.3 (-9.1; -5.5)	<0.001	-2.9 (-6.9; 1.1)	0.393	-1.2 (-7.3; 5.0)	>0.999
16 to 20 years – more than 20 years	-4.7 (-7.8; -1.6)	<0.001	-3.5 (-8.3; 1.2)	0.393	1.1 (-2.8; 4.9)	>0.999

Legend. CI: Confidential interval 95%

Supplementary Table 7S. Multiple comparisons among time-period at the position in the dimensions of the Hospital Survey on Patient Safety Culture

Contrasts	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value
	Teamwork within units		Expectations and actions promoting patient safety		Organizational learning – Continuous improvement	
Until 1 year – 1 to 5 years	4.8 (2.9; 6.8)	<0.001	4.5 (2.4; 6.7)	<0.001	3.7 (0.6; 6.8)	0.008
Until 1 year – 6 to 10 years	6.9 (4.1; 9.7)	<0.001	8.0 (2.0; 14.0)	0.002	8.1 (3.6; 12.6)	<0.001
Until 1 year – 11 to 15 years	5.4 (1.4; 9.4)	0.002	7.0 (6.6; 7.3)	<0.001	6.6 (0.2; 13.0)	0.041
Until 1 year – 16 to 20 years	4.1 (2.5; 5.7)	<0.001	6.3 (2.5; 10.1)	<0.001	7.7 (3.6; 11.8)	<0.001
Until 1 year – more than 20 years	-0.7 (-2.9; 1.6)	>0.999	1.3 (0.3; 2.2)	0.002	-1.5 (-6.4; 3.3)	>0.999
1 to 5 years – 6 to 10 years	2.1 (-0.7; 4.9)	0.294	3.5 (-1.3; 8.3)	0.301	4.4 (1.5; 7.2)	<0.001
1 to 5 years – 11 to 15 years	0.6 (-1.4; 2.5)	>0.999	2.4 (0.6; 4.3)	0.002	2.9 (-1.3; 7.0)	0.370
1 to 5 years – 16 to 20 years	-0.7 (-2.7; 1.3)	>0.999	1.8 (-2.0; 5.6)	0.972	4.0 (1.3; 6.7)	0.001
1 to 5 years – more than 20 years	-5.5 (-9.3; -1.6)	0.001	-3.3 (-4.5; -2.1)	<0.001	-5.3 (-8.5; -2.1)	<0.001
6 to 10 years – 11 to 15 years	-1.5 (-5.4; 2.4)	>0.999	-1.1 (-5.6; 3.5)	>0.999	-1.5 (-6.3; 3.3)	>0.999
6 to 10 years – 16 to 20 years	-2.8 (-5.1; -0.4)	0.012	-1.7 (-5.8; 2.4)	0.986	-0.4 (-2.2; 1.5)	>0.999
6 to 10 years – more than 20 years	-7.5 (-11.4; -3.7)	<0.001	-6.7 (-12.1; -1.4)	0.005	-9.6 (-15.4; -3.9)	<0.001
11 to 15 years – 16 to 20 years	-1.2 (-5.1; 2.7)	>0.999	-0.6 (-3.5; 2.3)	>0.999	1.1 (-4.2; 6.5)	>0.999
11 to 15 years – more than 20 years	-6.0 (-12.0; 0.0)	0.050	-5.7 (-6.5; -4.9)	<0.001	-8.1 (-13.0; -3.2)	<0.001
16 to 20 years – more than 20 years	-4.8 (-6.5; -3.1)	<0.001	-5.1 (-8.8; -1.3)	0.002	-9.2 (-14.2; -4.3)	<0.001
	Management support for Patient safety		Feedback & communication about errors		Frequency of events reported	
Until 1 year – 1 to 5 years	2.0 (-0.9; 4.9)	0.352	9.2 (7.3; 11.1)	<0.001	5.4 (2.0; 8.8)	<0.001
Until 1 year – 6 to 10 years	6.9 (-0.2; 14.0)	0.063	14.1 (10.0; 18.2)	<0.001	8.4 (4.9; 11.9)	<0.001
Until 1 year – 11 to 15 years	3.8 (0.2; 7.3)	0.028	14.1 (4.8; 23.4)	<0.001	6.6 (1.8; 11.3)	0.001
Until 1 year – 16 to 20 years	4.1 (-2.3; 10.6)	0.436	16.8 (11.3; 22.4)	<0.001	10.5 (3.9; 17.1)	<0.001
Until 1 year – more than 20 years	-2.9 (-8.8; 3.0)	0.706	8.9 (1.8; 16.0)	0.005	5.8 (-4.2; 15.8)	0.819
1 to 5 years – 6 to 10 years	4.9 (0.3; 9.5)	0.028	4.9 (1.1; 8.7)	0.003	3.0 (0.4; 5.6)	0.011
1 to 5 years – 11 to 15 years	1.7 (0.1; 3.4)	0.028	4.9 (-1.8; 11.7)	0.305	1.2 (-1.3; 3.6)	>0.999
1 to 5 years – 16 to 20 years	2.1 (-2.2; 6.5)	0.706	7.6 (2.5; 12.8)	<0.001	5.1 (-2.8; 12.9)	0.669
1 to 5 years – more than 20 years	-5.0 (-10.0; 0.1)	0.063	-0.3 (-4.5; 3.9)	>0.999	0.4 (-5.7; 6.5)	>0.999
6 to 10 years – 11 to 15 years	-3.2 (-6.8; 0.5)	0.143	0.0 (-5.8; 5.9)	>0.999	-1.8 (-4.1; 0.4)	0.203
6 to 10 years – 16 to 20 years	-2.8 (-6.4; 0.8)	0.254	2.7 (-1.4; 6.9)	0.409	2.1 (-3.1; 7.2)	>0.999
6 to 10 years – more than 20 years	-9.9 (-12.4; -7.4)	<0.001	-5.2 (-11.7; 1.4)	0.231	-2.6 (-10.0; 4.8)	>0.999
11 to 15 years – 16 to 20 years	0.4 (-3.2; 4.0)	0.834	2.7 (-4.6; 10.0)	>0.999	3.9 (-2.4; 10.2)	0.738
11 to 15 years – more than 20 years	-6.7 (-10.7; -2.7)	<0.001	-5.2 (-8.7; -1.7)	<0.001	-0.7 (-5.8; 4.3)	>0.999
16 to 20 years – more than 20 years	2.0 (-0.9; 4.9)	0.352	9.2 (7.3; 11.1)	<0.001	5.4 (2.0; 8.8)	<0.001
	Overall perceptions of patients safety		Communication openness		Teamwork across units	
Until 1 year – 1 to 5 years	4.9 (3.8; 6.1)	<0.001	5.2 (0.9; 9.5)	0.006	7.2 (4.1; 10.2)	<0.001
Until 1 year – 6 to 10 years	8.2 (2.6; 13.7)	<0.001	8.5 (5.1; 11.9)	<0.001	10.6 (0.2; 20.9)	0.042
Until 1 year – 11 to 15 years	5.0 (1.5; 8.4)	0.001	4.5 (-4.6; 13.6)	>0.999	8.4 (1.4; 15.5)	0.007
Until 1 year – 16 to 20 years	6.9 (0.5; 13.3)	0.025	3.8 (-5.1; 12.8)	>0.999	9.2 (-2.7; 21.1)	0.276
Until 1 year – more than 20 years	-1.5 (-6.6; 3.6)	>0.999	-0.4 (-6.2; 5.5)	>0.999	1.4 (-5.1; 7.9)	>0.999
1 to 5 years – 6 to 10 years	3.2 (-1.2; 7.7)	0.341	3.3 (-1.0; 7.6)	0.308	3.4 (-4.0; 10.8)	>0.999
1 to 5 years – 11 to 15 years	0.0 (-2.1; 2.2)	>0.999	-0.7 (-4.8; 3.5)	>0.999	1.3 (-2.2; 4.7)	>0.999
1 to 5 years – 16 to 20 years	2.0 (-3.2; 7.2)	>0.999	-1.4 (-7.6; 4.9)	>0.999	2.0 (-5.8; 9.9)	>0.999
1 to 5 years – more than 20 years	-6.4 (-12.1; -0.8)	0.015	-5.6 (-10.2; -0.9)	0.008	-5.8 (-13.1; 1.5)	0.267
6 to 10 years – 11 to 15 years	-3.2 (-5.7; -0.7)	0.004	-4.0 (-12.7; 4.7)	>0.999	-2.1 (-7.1; 2.8)	>0.999
6 to 10 years – 16 to 20 years	-1.3 (-4.6; 2.0)	>0.999	-4.7 (-11.9; 2.6)	0.680	-1.4 (-6.0; 3.3)	>0.999
6 to 10 years – more than 20 years	-9.7 (-11.9; -7.5)	<0.001	-8.9 (-16.4; -1.4)	0.008	-9.2 (-16.8; -1.5)	0.007
11 to 15 years – 16 to 20 years	1.9 (-3.1; 6.9)	>0.999	-0.7 (-8.3; 6.9)	>0.999	0.8 (-6.1; 7.6)	>0.999
11 to 15 years – more than 20 years	-6.5 (-10.8; -2.1)	<0.001	-4.9 (-9.6; -0.2)	0.037	-7.0 (-16.0; 1.9)	0.267
16 to 20 years – more than 20 years	-8.4 (-10.6; -6.2)	<0.001	-4.2 (-10.9; 2.5)	0.686	-7.8 (-13.0; -2.6)	<0.001

	Staffing		Handoffs & Transitions		Non-punitive response to error	
Until 1 year – 1 to 5 years	-0.5 (-3.5; 2.5)	>0.999	5.5 (3.8; 7.2)	<0.001	0.8 (-3.6; 5.2)	>0.999
Until 1 year – 6 to 10 years	1.4 (-5.0; 7.8)	>0.999	9.8 (6.1; 13.5)	<0.001	2.9 (-2.2; 7.9)	>0.999
Until 1 year – 11 to 15 years	-0.8 (-6.7; 5.2)	>0.999	5.5 (-0.8; 11.7)	0.138	-4.6 (-12.6; 3.5)	>0.999
Until 1 year – 16 to 20 years	-2.4 (-10.6; 5.7)	>0.999	5.7 (-0.3; 11.7)	0.079	-1.7 (-13.3; 9.9)	>0.999
Until 1 year – more than 20 years	-8.1 (-19.9; 3.7)	0.510	3.6 (-3.1; 10.4)	>0.999	-4.8 (-14.0; 4.4)	>0.999
1 to 5 years – 6 to 10 years	1.9 (-3.9; 7.8)	>0.999	4.3 (1.8; 6.8)	<0.001	2.1 (-2.8; 6.9)	>0.999
1 to 5 years – 11 to 15 years	-0.3 (-4.0; 3.5)	>0.999	0.0 (-3.8; 3.8)	>0.999	-5.4 (-9.5; -1.2)	0.002
1 to 5 years – 16 to 20 years	-1.9 (-7.5; 3.6)	>0.999	0.2 (-3.0; 3.5)	>0.999	-2.5 (-11.2; 6.2)	>0.999
1 to 5 years – more than 20 years	-7.6 (-16.6; 1.4)	0.182	-1.8 (-7.0; 3.3)	>0.999	-5.6 (-12.7; 1.5)	0.299
6 to 10 years – 11 to 15 years	-2.2 (-4.6; 0.2)	0.105	-4.3 (-9.5; 0.9)	0.192	-7.4 (-14.5; -0.4)	0.029
6 to 10 years – 16 to 20 years	-3.9 (-8.0; 0.3)	0.101	-4.1 (-7.6; -0.6)	0.010	-4.6 (-14.9; 5.8)	>0.999
6 to 10 years – more than 20 years	-9.5 (-17.2; -1.9)	0.004	-6.2 (-10.4; -1.9)	<0.001	-7.6 (-17.3; 2.1)	0.297
11 to 15 years – 16 to 20 years	-1.7 (-4.1; 0.8)	0.530	0.2 (-4.3; 4.7)	>0.999	2.9 (-5.7; 11.4)	>0.999
11 to 15 years – more than 20 years	-7.3 (-15.3; 0.7)	0.104	-1.9 (-6.9; 3.1)	>0.999	-0.2 (-2.9; 2.5)	>0.999
16 to 20 years – more than 20 years	-5.7 (-12.6; 1.2)	0.207	-2.1 (-7.4; 3.2)	>0.999	-3.1 (-13.8; 7.7)	>0.999

Legend. CI: Confidential interval 95%

Supplementary Table 8S. Multiple comparisons among time-period at the professional category in the dimensions of the Hospital Survey on Patient Safety Culture

Contrasts	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value
	Teamwork within units		Expectations and actions promoting patient safety		Organizational learning – Continuous improvement	
Until 1 year – 1 to 5 years	4.9 (-0.3; 10.0)	0.079	3.1 (-2.1; 8.4)	0.537	1.7 (-1.0; 4.4)	0.674
Until 1 year – 6 to 10 years	6.8 (1.3; 12.3)	0.005	4.4 (-1.2; 9.9)	0.255	3.8 (-2.0; 9.5)	0.651
Until 1 year – 11 to 15 years	8.0 (2.2; 13.9)	0.001	6.5 (-1.4; 14.5)	0.213	4.0 (-1.8; 9.8)	0.553
Until 1 year – 16 to 20 years	5.0 (-0.3; 10.2)	0.079	2.2 (-3.6; 8.1)	0.899	4.8 (-2.1; 11.6)	0.553
Until 1 year – more than 20 years	1.4 (-1.8; 4.5)	0.728	-1.5 (-5.0; 2.0)	0.899	-1.1 (-4.3; 2.2)	>0.999
1 to 5 years – 6 to 10 years	1.9 (-1.2; 5.1)	0.568	1.2 (-0.4; 2.9)	0.308	2.0 (-2.3; 6.4)	>0.999
1 to 5 years – 11 to 15 years	3.1 (1.2; 5.1)	<0.001	3.4 (-1.0; 7.8)	0.281	2.3 (-1.7; 6.2)	0.753
1 to 5 years – 16 to 20 years	0.1 (-2.1; 2.3)	0.930	-0.9 (-5.0; 3.1)	0.899	3.0 (-2.0; 8.1)	0.732
1 to 5 years – more than 20 years	-3.5 (-5.9; -1.1)	<0.001	-4.7 (-8.8; -0.5)	0.017	-2.8 (-7.1; 1.5)	0.651
6 to 10 years – 11 to 15 years	1.2 (-0.9; 3.3)	0.595	2.2 (-0.8; 5.1)	0.308	0.2 (-0.7; 1.2)	>0.999
6 to 10 years – 16 to 20 years	-1.8 (-5.6; 1.9)	0.728	-2.2 (-5.6; 1.3)	0.517	1.0 (-1.4; 3.4)	>0.999
6 to 10 years – more than 20 years	-5.4 (-7.9; -3.0)	<0.001	-5.9 (-8.8; -3.0)	<0.001	-4.8 (-8.1; -1.5)	<0.001
11 to 15 years – 16 to 20 years	-3.0 (-5.7; -0.4)	0.012	-4.3 (-6.6; -2.0)	<0.001	0.7 (-0.9; 2.4)	>0.999
11 to 15 years – more than 20 years	-6.6 (-9.5; -3.8)	<0.001	-8.1 (-12.3; -3.9)	<0.001	-5.1 (-9.1; -1.0)	0.003
16 to 20 years – more than 20 years	-3.6 (-7.6; 0.4)	0.098	-3.8 (-6.9; -0.6)	0.007	-5.8 (-11.6; -0.1)	0.043
	Management support for Patient safety		Feedback & communication about errors		Frequency of events reported	
Until 1 year – 1 to 5 years	3.1 (-0.1; 6.3)	0.071	5.7 (1.6; 9.8)	0.001	3.0 (-2.7; 8.6)	>0.999
Until 1 year – 6 to 10 years	4.6 (-1.5; 10.7)	0.349	10.6 (7.1; 14.1)	<0.001	6.1 (-0.2; 12.3)	0.067
Until 1 year – 11 to 15 years	4.1 (-2.7; 10.8)	0.856	11.0 (6.8; 15.3)	<0.001	3.4 (-2.2; 9.0)	0.836
Until 1 year – 16 to 20 years	4.1 (-2.8; 11.0)	0.856	10.9 (8.8; 12.9)	<0.001	4.6 (-2.0; 11.2)	0.521
Until 1 year – more than 20 years	-2.1 (-9.7; 5.4)	>0.999	9.7 (5.9; 13.5)	<0.001	4.0 (-1.3; 9.3)	0.378
1 to 5 years – 6 to 10 years	1.5 (-1.4; 4.4)	>0.999	4.9 (2.7; 7.1)	<0.001	3.1 (2.1; 4.1)	<0.001
1 to 5 years – 11 to 15 years	1.0 (-2.4; 4.3)	>0.999	5.3 (2.4; 8.2)	<0.001	0.4 (-0.7; 1.6)	>0.999
1 to 5 years – 16 to 20 years	1.0 (-2.3; 4.2)	>0.999	5.2 (0.8; 9.6)	0.011	1.7 (-1.9; 5.3)	>0.999
1 to 5 years – more than 20 years	-5.2 (-12.2; 1.7)	0.349	4.0 (-2.1; 10.1)	0.559	1.0 (-1.7; 3.7)	>0.999
6 to 10 years – 11 to 15 years	-0.6 (-2.4; 1.2)	>0.999	0.4 (-1.7; 2.6)	>0.999	-2.7 (-4.4; -0.9)	<0.001
6 to 10 years – 16 to 20 years	-0.5 (-2.8; 1.7)	>0.999	0.3 (-2.9; 3.5)	>0.999	-1.4 (-5.0; 2.1)	>0.999
6 to 10 years – more than 20 years	-6.8 (-13.1; -0.4)	0.028	-0.9 (-4.4; 2.6)	>0.999	-2.1 (-5.1; 0.9)	0.521
11 to 15 years – 16 to 20 years	0.0 (-2.8; 2.9)	>0.999	-0.2 (-3.0; 2.7)	>0.999	1.2 (-1.2; 3.7)	>0.999
11 to 15 years – more than 20 years	-6.2 (-12.6; 0.2)	0.063	-1.3 (-6.2; 3.5)	>0.999	0.6 (-2.6; 3.7)	>0.999
16 to 20 years – more than 20 years	-6.2 (-10.0; -2.4)	<0.001	-1.2 (-6.2; 3.9)	>0.999	-0.7 (-5.5; 4.1)	>0.999
	Overall perceptions of patients safety		Communication openness		Teamwork across units	
Until 1 year – 1 to 5 years	4.0 (0.4; 7.6)	0.019	1.9 (-0.7; 4.5)	0.378	7.8 (4.6; 10.9)	<0.001
Until 1 year – 6 to 10 years	5.9 (0.6; 11.3)	0.019	4.0 (2.3; 5.8)	<0.001	11.0 (7.2; 14.8)	<0.001
Until 1 year – 11 to 15 years	5.0 (0.5; 9.5)	0.016	3.1 (0.2; 6.1)	0.028	8.5 (2.7; 14.3)	<0.001
Until 1 year – 16 to 20 years	3.1 (-2.5; 8.6)	0.662	0.4 (-2.9; 3.7)	>0.999	8.9 (6.3; 11.5)	<0.001
Until 1 year – more than 20 years	-1.5 (-7.5; 4.4)	>0.999	-3.1 (-9.0; 2.9)	0.802	3.9 (-2.5; 10.3)	0.722
1 to 5 years – 6 to 10 years	2.0 (-1.4; 5.3)	0.636	2.1 (-0.9; 5.2)	0.467	3.2 (1.7; 4.7)	<0.001
1 to 5 years – 11 to 15 years	1.0 (-2.0; 4.0)	>0.999	1.2 (-1.9; 4.3)	>0.999	0.7 (-3.7; 5.1)	>0.999
1 to 5 years – 16 to 20 years	-0.9 (-5.1; 3.3)	>0.999	-1.5 (-6.6; 3.5)	>0.999	1.1 (-2.3; 4.6)	>0.999
1 to 5 years – more than 20 years	-5.5 (-13.4; 2.4)	0.403	-5.0 (-13.2; 3.3)	0.665	-3.9 (-11.8; 4.0)	>0.999
6 to 10 years – 11 to 15 years	-1.0 (-2.2; 0.3)	0.256	-0.9 (-2.2; 0.3)	0.378	-2.5 (-7.9; 3.0)	>0.999
6 to 10 years – 16 to 20 years	-2.9 (-5.1; -0.6)	0.003	-3.6 (-8.4; 1.1)	0.329	-2.1 (-6.0; 1.9)	>0.999
6 to 10 years – more than 20 years	-7.5 (-13.5; -1.5)	0.004	-7.1 (-13.0; -1.2)	0.007	-7.1 (-15.8; 1.6)	0.202
11 to 15 years – 16 to 20 years	-1.9 (-3.9; 0.1)	0.066	-2.7 (-7.3; 1.9)	0.665	0.4 (-2.9; 3.7)	>0.999
11 to 15 years – more than 20 years	-6.5 (-11.7; -1.3)	0.004	-6.2 (-11.9; -0.5)	0.022	-4.6 (-9.2; 0.0)	0.047
16 to 20 years – more than 20 years	-4.6 (-8.4; -0.8)	0.007	-3.5 (-8.6; 1.6)	0.470	-5.0 (-10.1; 0.0)	0.049

	Staffing		Handoffs & Transitions		Non-punitive response to error	
Until 1 year – 1 to 5 years	0.7 (-1.3; 2.7)	0.899	1.1 (-3.4; 5.5)	>0.999	1.2 (-2.9; 5.4)	>0.999
Until 1 year – 6 to 10 years	-1.4 (-3.8; 1.0)	0.606	2.6 (0.6; 4.6)	0.003	1.0 (-3.2; 5.2)	>0.999
Until 1 year – 11 to 15 years	-2.5 (-5.8; 0.8)	0.286	-0.2 (-3.1; 2.6)	>0.999	-4.2 (-7.6; -0.7)	0.006
Until 1 year – 16 to 20 years	-2.9 (-4.3; -1.6)	<0.001	2.5 (-0.6; 5.5)	0.251	-3.5 (-13.9; 7.0)	>0.999
Until 1 year – more than 20 years	-9.8 (-15.5; -4.1)	<0.001	-2.8 (-9.5; 3.8)	>0.999	-6.6 (-17.2; 4.1)	0.725
1 to 5 years – 6 to 10 years	-2.1 (-4.5; 0.4)	0.156	1.5 (-2.1; 5.2)	>0.999	-0.2 (-2.2; 1.7)	>0.999
1 to 5 years – 11 to 15 years	-3.1 (-7.2; 0.9)	0.266	-1.3 (-4.1; 1.5)	>0.999	-5.4 (-10.1; -0.8)	0.010
1 to 5 years – 16 to 20 years	-3.6 (-6.6; -0.6)	0.007	1.4 (-1.4; 4.2)	>0.999	-4.7 (-12.4; 2.9)	0.725
1 to 5 years – more than 20 years	-10.5 (-17.3; -3.6)	0.001	-3.9 (-8.9; 1.1)	0.281	-7.8 (-16.5; 0.9)	0.120
6 to 10 years – 11 to 15 years	-1.1 (-2.8; 0.7)	0.606	-2.9 (-5.0; -0.7)	0.001	-5.2 (-8.4; -2.0)	<0.001
6 to 10 years – 16 to 20 years	-1.5 (-4.6; 1.5)	0.672	-0.1 (-1.2; 0.9)	>0.999	-4.5 (-11.1; 2.1)	0.542
6 to 10 years – more than 20 years	-8.4 (-13.6; -3.2)	<0.001	-5.4 (-11.8; 0.9)	0.162	-7.6 (-14.2; -1.0)	0.011
11 to 15 years – 16 to 20 years	-0.5 (-3.5; 2.5)	0.899	2.7 (1.1; 4.3)	<0.001	0.7 (-5.6; 7.0)	>0.999
11 to 15 years – more than 20 years	-7.3 (-10.9; -3.7)	<0.001	-2.6 (-7.6; 2.5)	>0.999	-2.4 (-8.9; 4.1)	>0.999
16 to 20 years – more than 20 years	-6.9 (-12.3; -1.4)	0.004	-5.3 (-11.4; 0.8)	0.162	-3.1 (-6.7; 0.5)	0.147

Legend. CI: Confidential interval 95%

Supplementary Table 9S. Multiple comparisons among hours per week in the dimensions of the Hospital Survey on Patient Safety Culture

Contrasts	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value	Mean (CI 95%)	P-value
	Teamwork within units		Expectations and actions promoting patient safety		Organizational learning – Continuous improvement	
< 20h – 20-39h	4.0 (0.5; 7.5)	0.013	4.2 (-2.5; 10.9)	0.399	-0.5 (-6.6; 5.7)	>0.999
< 20h – 40-59h	7.0 (1.1; 12.9)	0.009	5.2 (-1.4; 11.7)	0.256	-2.1 (-9.0; 4.9)	>0.999
< 20h – 60-79h	7.4 (-2.4; 17.2)	0.301	9.4 (-0.7; 19.6)	0.090	-0.7 (-11.5; 10.1)	>0.999
< 20h – ≥ 80h	5.7 (3.7; 7.7)	<0.001	3.0 (-0.4; 6.4)	0.120	-5.3 (-13.1; 2.5)	0.551
20-39h – 40-59h	3.0 (-2.0; 7.9)	0.672	0.9 (-1.3; 3.1)	0.687	-1.6 (-5.0; 1.8)	>0.999
20-39h – 60-79h	3.4 (-5.6; 12.3)	>0.999	5.2 (-2.4; 12.9)	0.399	-0.3 (-6.7; 6.1)	>0.999
20-39h – ≥ 80h	1.7 (-2.9; 6.3)	>0.999	-1.2 (-4.6; 2.2)	0.687	-4.8 (-10.4; 0.7)	0.145
40-59h – 60-79h	0.4 (-3.0; 3.8)	>0.999	4.3 (-1.4; 10.0)	0.283	1.3 (-3.8; 6.5)	>0.999
40-59h – ≥ 80h	-1.3 (-6.3; 3.8)	>0.999	-2.2 (-5.4; 1.1)	0.399	-3.2 (-10.6; 4.2)	>0.999
60-79h – ≥ 80h	-1.7 (-9.5; 6.2)	>0.999	-6.4 (-14.6; 1.8)	0.256	-4.6 (-16.7; 7.6)	>0.999
	Management support for Patient safety		Feedback & communication about errors		Frequency of events reported	
< 20h – 20-39h	3.1 (-2.7; 9.0)	>0.999	1.3 (-2.5; 5.0)	>0.999	3.4 (-5.8; 12.6)	>0.999
< 20h – 40-59h	2.9 (-2.2; 8.0)	>0.999	-1.5 (-3.9; 0.9)	0.858	1.4 (-2.5; 5.3)	>0.999
< 20h – 60-79h	5.9 (-6.2; 18.1)	>0.999	3.0 (-6.5; 12.6)	>0.999	6.5 (-2.8; 15.8)	0.477
< 20h – ≥ 80h	3.5 (0.2; 6.8)	0.027	2.7 (-3.1; 8.5)	>0.999	2.4 (-7.7; 12.5)	>0.999
20-39h – 40-59h	-0.2 (-3.3; 2.9)	>0.999	-2.8 (-8.3; 2.8)	>0.999	-2.0 (-7.3; 3.3)	>0.999
20-39h – 60-79h	2.8 (-6.1; 11.8)	>0.999	1.7 (-7.4; 10.8)	>0.999	3.1 (-1.4; 7.6)	0.477
20-39h – ≥ 80h	0.4 (-2.2; 2.9)	>0.999	1.5 (-4.3; 7.2)	>0.999	-1.0 (-9.4; 7.5)	>0.999
40-59h – 60-79h	3.0 (-4.4; 10.4)	>0.999	4.5 (-4.6; 13.6)	>0.999	5.1 (-0.8; 11.0)	0.160
40-59h – ≥ 80h	0.6 (-1.3; 2.5)	>0.999	4.2 (-4.5; 12.9)	>0.999	1.0 (-7.3; 9.4)	>0.999
60-79h – ≥ 80h	-2.5 (-11.0; 6.1)	>0.999	-0.3 (-13.1; 12.5)	>0.999	-4.1 (-16.2; 8.1)	>0.999
	Overall perceptions of patients safety		Communication openness		Teamwork across units	
< 20h – 20-39h	12.3 (3.3; 21.3)	0.002	12.8 (3.4; 22.3)	0.002	9.2 (-2.5; 20.9)	0.237
< 20h – 40-59h	13.2 (4.1; 22.3)	0.001	12.9 (3.3; 22.4)	0.002	12.5 (5.2; 19.7)	<0.001
< 20h – 60-79h	14.7 (4.0; 25.5)	0.001	16.4 (8.0; 24.9)	<0.001	10.6 (-0.9; 22.2)	0.092
< 20h – ≥ 80h	10.0 (5.8; 14.1)	<0.001	9.7 (8.0; 11.4)	<0.001	11.3 (4.8; 17.8)	<0.001
20-39h – 40-59h	0.9 (-3.2; 5.1)	0.786	0.0 (-3.1; 3.2)	>0.999	3.3 (-4.2; 10.7)	>0.999
20-39h – 60-79h	2.4 (-3.2; 8.1)	0.786	3.6 (-0.9; 8.1)	0.176	1.4 (-6.9; 9.8)	>0.999
20-39h – ≥ 80h	-2.3 (-7.3; 2.6)	0.786	-3.1 (-11.2; 5.0)	>0.999	2.1 (-8.4; 12.6)	>0.999
40-59h – 60-79h	1.5 (-0.5; 3.5)	0.295	3.6 (2.2; 5.0)	<0.001	-1.8 (-6.6; 3.0)	>0.999
40-59h – ≥ 80h	-3.3 (-9.6; 3.0)	0.786	-3.2 (-11.7; 5.3)	>0.999	-1.1 (-10.2; 7.9)	>0.999
60-79h – ≥ 80h	-4.8 (-13.1; 3.5)	0.697	-6.8 (-15.0; 1.5)	0.176	0.7 (-11.8; 13.2)	>0.999
	Staffing		Handoffs & Transitions		Non-punitive response to error	
< 20h – 20-39h	8.1 (0.3; 15.8)	0.037	3.6 (-7.1; 14.2)	>0.999	12.8 (-3.7; 29.3)	0.261
< 20h – 40-59h	13.1 (4.5; 21.6)	<0.001	7.3 (-5.2; 19.7)	0.956	11.3 (-6.6; 29.2)	0.578
< 20h – 60-79h	15.7 (5.1; 26.4)	<0.001	8.7 (-11.7; 29.1)	>0.999	8.7 (-9.6; 27.0)	>0.999
< 20h – ≥ 80h	13.4 (8.0; 18.8)	<0.001	5.1 (-6.6; 16.8)	>0.999	9.1 (-2.3; 20.6)	0.230
20-39h – 40-59h	5.0 (0.8; 9.1)	0.009	3.7 (-2.5; 10.0)	0.956	-1.5 (-5.5; 2.5)	>0.999
20-39h – 60-79h	7.7 (-0.1; 15.4)	0.055	5.2 (-6.0; 16.3)	>0.999	-4.1 (-8.7; 0.6)	0.140
20-39h – ≥ 80h	5.3 (1.2; 9.5)	0.004	1.5 (-6.9; 10.0)	>0.999	-3.7 (-11.3; 4.0)	>0.999
40-59h – 60-79h	2.7 (-1.5; 6.9)	0.385	1.4 (-6.8; 9.7)	>0.999	-2.6 (-4.5; -0.6)	0.002
40-59h – ≥ 80h	0.3 (-2.0; 2.7)	0.770	-2.2 (-7.3; 2.9)	>0.999	-2.1 (-8.8; 4.5)	>0.999
60-79h – ≥ 80h	-2.3 (-7.6; 3.0)	0.651	-3.6 (-14.4; 7.2)	>0.999	0.4 (-6.6; 7.4)	>0.999

Legend. CI: Confidential interval 95%