OPEN

Psychometric Properties of the Latin American Spanish Version of the Hospital Survey on Patient Safety Culture Questionnaire in the Surgical Setting

Jose Andres Calvache, MD, MSc,† Edison Benavides, MD,† Sebastian Echeverry, MD,† Francisco Agredo, MD,† Robert Jan Stolker, MD, PhD,* and Markus Klimek, MD, PhD, DEAA, EDIC**

Objective: The Hospital Survey on Patient Safety Culture (HSPSC) was designed to assess staff views on patient safety and has been translated and validated into several languages and settings. This study developed a Latin American Spanish version of the HSPSC for use in perioperative settings and examines its psychometric properties.

Methods: After translation and adjustments, a web-based questionnaire was administered to all health care personnel at operating room in a public university-affiliated hospital in Popayán, Colombia. Descriptive statistics, internal reliability, confirmatory and exploratory factor analysis, and intercorrelations among survey composites were calculated.

Results: Confirmatory factor analysis showed inadequate model fit for the original 12-factor structure of the HSPSC. Rather, a 9-factor, 36-item instrument showed acceptable factor loadings, internal consistency, and psychometric properties. Five factors were formed with minor changes. Adjusted factors emerged, like "staffing and work pressure" and "supervisor/manager expectations and actions promoting patient safety," "organizational learning—continuous improvement," and "hospital management support for safety," as well as "repeated errors and perception of safety." Internal consistency for each remaining composite met or exceeded a Cronbach α value of 0.60.

Conclusions: Psychometric analyses provided overall support for 9 of the 12 initial factors of patient safety culture. Our findings suggest that more validation studies need to be conducted before applying safety dimensions from the original HSPSC to perioperative settings only. By providing this initial tool, we hope to stimulate further studies and the patient safety research agenda in this part of the world.

Key Words: safety management, organizational culture, patient safety

(*J Patient Saf* 2021;17: e1806–e1813)

The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and behavioral patterns that determine the commitment to the style and proficiency of an organization's health and safety management.[1] Patient safety is an essential component of healthcare quality; however, even with continuous alertness, health care providers face many challenges in today's healthcare environment in trying to keep patient management in a safe way. Studying patient safety–related topics can provide feedback to the healthcare systems with the possibility of implementing improvement measures based on the identification of specific problems at different areas.[2]

The climate of patient safety can be measured as a surrogate and analyzed at different levels of the healthcare system. Culture assessments can be used to identify areas for improvement, get a baseline, and raise awareness about patient safety; secondly, to evaluate patient safety interventions or programs and track change over time; thirdly, to conduct internal and external benchmarking; and finally, to fulfill directives or regulatory requirements, such as accreditation standards.[1,3] Interest in safety culture measurement in healthcare organizations has grown in parallel with the increased focus on improving patient safety. To transform culture, it is important to first measure and analyze it. Culture assessment tools create awareness and provide an understanding to develop an action plan to improve patient safety, more importantly in countries with limited resources.[4]

A study involving 58 hospitals from five Latin American countries found an estimated prevalence of adverse events in 10.5% of the cases. Six percent of these events were associated with the patient's death and more than 28% caused disability. Almost 60% of the total group of adverse events was judged to be "avoidable." In that sense, working on prevention and encouraging a strong patient safety culture are fundamental to promote and support quality of care among health professionals.[5]

Considering the inherent risks due to the logistic challenges and invasiveness of the procedures performed, operating rooms (ORs) are particularly challenging for patient safety. Unsafe surgery causes 7 million of complications, resulting in 1 million of deaths globally each year.[6] Several campaigns and interventions to improve patient safety in surgery have been introduced, including additional checks to confirm procedures, perioperative checklists, communication strategies, and new policies to govern the OR.[6–8] Nevertheless, collecting data on medical errors during surgery is difficult because (near) misses are often underreported or considered unavoidable complications. By using a valid and reliable measurement instrument, culture data can serve as a benchmark for hospitals to assess their performance in advancing the patient safety agenda. The Institute of Medicine states that if a safety culture exists where adverse events can be reported without people being blamed, they have the opportunity to learn from their mistakes and it is possible to make improvements to prevent future human and system errors and, thus, promote patient safety.[9,10]

The Hospital Survey on Patient Safety Culture (HSPSC) by the Agency for Healthcare Research and Quality (AHRQ) consists of 42 questions and measures 12 dimensions. It is widely used, translated, and validated in a broad range of countries and languages.[9,11–20] After translating a questionnaire into another language and applying it in a different setting, it is important to check its validity and reliability. Cross-country comparisons are possible, only if the psychometric properties of the new versions of the HSPSC are comparable with the original structure. The purpose of this study

From the *Anesthesiology Department, Erasmus University Medical Center, Rotterdam, the Netherlands; and †Departamento de Anestesiología, Universidad del Cauca, Popayán, Colombia.

Correspondence: Jose Andres Calvache, MD, MSc, Dr. Molewaterplein 40, 3015 GD Rotterdam, Department of Anesthesiology, Erasmus MC Rotterdam, 17th Flr, Postbus 2040, 3000, Rotterdam, the Netherlands (e-mail: j.calvache@erasmusmc.nl; jacalvache@unicauca.edu.co).

The authors disclose no conflict of interest.

This study was funded by the Departamento de Anestesiología, Universidad del Cauca, Popayán, Colombia and the Department of Anesthesiology, Erasmus Medical Center Rotterdam, The Netherlands.

Supplemental digital contents are available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.journalpatientsafety.com).

was to evaluate psychometric properties of a Latin American Spanish version of the HSPSC to propose a validated tool for its use in perioperative settings.

METHODS

Design and Study Population

A cross-sectional study was carried out in 2017 at the OR of the Hospital Universitario San José, a main third-tier public university-affiliated hospital in the city of Popayán, the capital city of the department of Cauca with 270,000 inhabitants in 2010. This hospital performs 11,000 surgical procedures per year, primarily in general surgery, orthopedics, gynecology/obstetrics, and plastic surgery.[21,22] All medical and nonmedical healthcare providers and OR personnel involved in the perioperative process were included. In all, 84 medical doctors participated (56%) including specialists (n = 51), residents (n = 22), and general practitioners (n = 11). In addition, 28 nurses and nursing assistants (19%), 12 surgical assistants (8%), 9 pharmacy personnel (6%), 7 administrative services (4.7%), 7 cleaning personnel (4.7%), and 3 x-ray technicians (2%). In total, we recruited 150 participants.

After development process, the HSPSC-LA was adapted to a computerized web-based response method arranged that every question had to be answered. Each member of the OR was invited to voluntarily participate in the study and fill out the web-based questionnaire, allowing for confidentiality and anonymity. The questionnaire did not ask for any personal identification data during the survey (neither name nor identification details) and allowed access only once per each link access. The research protocol was approved by the ethics committee of the hospital (Approval Act 004, 16-03-2016). In addition, the questionnaire asked for direct consent from the participants. Incentives to complete the survey were not provided. Data collection was done during a 6-month period.

Development of the Questionnaire

The original HSPSC contains 42 items organized in 12 dimensions.[23] It was developed by Westat, under contract with AHRQ, with questions derived from a review of existing safety culture literature and instruments, including the Veterans Health Administration's Patient Safety Questionnaire and the Medical Event Reporting System for Transfusion Medicine.[23] The AHRQ instrument was piloted in 20 hospitals, and the results were used to generate a list of 12 factors, which displayed high internal consistency.[24] Most items on patient safety culture can be answered by using a five-point scale reflecting the agreement rate: from "strongly disagree" (1) to "strongly agree" (5), with a neutral category "neither" (3). Other items can be answered by using a five-point frequency scale from "never" (1) to 'always' (5). In addition, there are two mono-item outcome variables, i.e., (*a*) patient safety grade, measured with a five-point scale from "excellent" (1) to "failing" (5) and (*b*) number of events reported, how often the respondent has submitted an event report in the past 12 months (answer categories: "none"; "1–2 event reports"; "3–5 event reports"; "6–10 event reports"; and "11–20 event reports") (Supplemental Digital Content, http://links.lww.com/JPS/A259).

We considered and revised in detail a previous translation and validation into Spanish (Castilian from Spain) developed by the *Sistema Nacional de Salud Español.*[16] Some items were incomprehensible in Latin American Colombian Spanish and others had translation issues due to cultural and environmental differences.

Therefore, we translated the original survey into Latin American Colombian Spanish by following the AHRQ guidelines for translating surveys on patient safety culture and combined those results with the previous Spanish version.[25] These guidelines propose a team approach based on current best practices for survey translations.[25,26] To develop a well-translated HSPSC-LA, the original survey was translated into Latin American Spanish, then it was compared and adjusted with the Spanish version and, finally, translated back into English. The entire process was done by a research team, along with a bilingual translator with professional work experience in developing surveys. Environmental, cultural, and local issues present in the questions were actively discussed by the team to reach consensus.

Work-related information and primary work area were not included in this study because all the participants were active OR members. Other related variables collected included how long they had been working in this OR, how many hours a week, and in which function.

Face and Content Validity

We investigated the face and content validity of the HSPSC-LA. To obtain face validity, a group of advisors (three physicians and three nurses from the hospital) conducted an initial review of the questionnaire. They met to review the translation, suggested changes, and decided on the most suitable translation. Thereafter, based on consensus with the research team, together they determined whether the questions from the prefinal HSPSC-LA version suited the Colombian culture and whether the format of the questions was conceptually equivalent to the original English questions (content validity). All information gathered was used to prepare the final version of the HSPSC-LA (Supplemental Digital Content, http://links.lww.com/JPS/A259).

Construct Validity and Factor Analysis

Given that the questionnaire contains positively and negatively worded items, the negatively formulated items were first recoded to make sure that a higher score always means a more positive response. Factor analysis defines which items are closely linked and refer jointly to an underlying dimension (or factor). Thus, the items can be reduced to the smallest possible number of concepts that still explain the largest possible part of the variance. In line with other validation related studies,[9,12–15] first a confirmatory factor analysis (CFA) was performed to investigate whether the factor structure of the original questionnaire can be used with Latin American data. First, the χ^2 goodness-of-fit statistic was examined. For χ^2 statistics, lower and nonsignificant χ^2's indicate good fit. χ^2, however, is influenced by sample size such that the larger the sample size the more likely it is that the χ^2 will be significant.[27] A large χ^2 may emerge even when the model fits the data well; therefore, the following fit measures were used: comparative fit index, nonnormalized fit index (also known as Tucker-Lewis Index), root mean square error of approximation, standardized root mean square residual, goodness-of-fit index, adjusted goodness of fit index, and normalized fit index.[28,29] These measures range from poor fit to perfect fit and details about recommended criteria are presented in Table 1.

The data were also studied with explorative factor analysis (EFA) to examine whether another composition of items and factors would best fit the data. We checked whether the interitem correlations were sufficient through an exam of the correlation matrix by using Bartlett test. Questions belonging to the same underlying dimension will correlate, given that they measure the same aspect of patient safety culture. Items that do not correlate, or correlate with only a few other variables, are not suited for factor analysis.[37] We also checked whether the opposite occurred: too much correlation between the items. Ideally, every aspect of patient safety culture uniquely contributes toward the concept of patient safety culture. A high correlation between two items means that patient safety culture

TABLE 1. Confirmatory Factor Analysis of the HSPSC in This Study and Other Published Sources

			Other Validation Studies[30–34]		Recommended Criteria of Good Fit	
	This Study	Original Study	Range	Median	Kline[35]	Hu and Bentler[36] and Hair[29]
Comparative fit index	0.752	0.94	0.89–0.99	0.91	>0.90	>0.95
Nonnormalized fit index	0.716	0.93	0.88–0.98	0.90	>0.90	>0.95
Root mean square error of approximation	0.073	0.04	0.033–0.047	0.043	<0.10	<0.06
Standardized root mean square residual	0.086	0.04	0.044–0.05	0.047	<0.06	<0.08
Goodness of fit index	0.717	—	0.88–0.99	0.94	>0.95	—
Adjusted goodness of fit index	0.661					>0.90
Normalized fit index	0.687					>0.90

aspects overlap to a large extent.[37] Finally, the Kaiser-Meyer-Olkin of greater than 0.5 (Kaiser criterion) was used as a measure of sampling adequacy. This value can range from 0 to 1. A value near 1 indicates hardly any spread in the correlation pattern, enabling reliable and distinctive dimensions by factor analysis.[20]

Initially, the eigenvalue (eigenvalue >1: Kaiser criterion) was taken into account, besides the extent of variance explained, the shape of the scree plot, and the possibility of interpreting the factors. Then, an oblique rotation was performed to determine which items loaded most highly on which factor. Using a conservative approach, an item was considered to have sufficient contribution to the particular factor if its loading was 0.4 or greater. Items with low-factor loadings (<0.4) or cross-loading on multiple factors (>0.3) were removed.

The internal consistency of the factors was calculated with Cronbach α, a value between 0 and 1. If different items are supposed to measure the same concept, the internal consistency (reliability) should be greater than or equal to 0.6.[37]

Construct validity was also studied by calculating scale scores for every factor and subsequently, calculating Pearson correlation coefficients between the scale scores. The construct validity of each factor is reflected in moderately related scale scores. High correlations ($r > 0.7$), however, would indicate that factors measure the same concept and these factors may be combined and/or some items could be removed. In addition, correlations of the scale scores were calculated with the outcome variable: patient safety grade.

Data were summarized as proportions, means, and SD values considering their distribution. *T* tests were applied to compare the mean values, and $P < 0.05$ was considered statistically significant. For each positively worded item, the proportion of positive responses was calculated, i.e., the percentage of respondents answering the question by checking "strongly agree" and "agree" or "always" and "most of the time."[23] All statistical analyses were performed by using SPSS Statistics for Windows, (Version 24.0; IBM Corp, Armonk, NY) and Lavaan package in R Statistics.[38,39]

RESULTS

All 159 members from the OR were asked to participate from August 2016 to January 2017 and 150 completed the survey. Nine participants (all temporary personnel) did not complete the questionnaire and were excluded from the analysis. We did not identify missing data. Therefore, 150 participants yielded a 94% response rate.

Confirmatory Factor Analysis

A CFA of the original model was run ($\chi^2 = 1349.32$, $df = 753$, $P < 0.000$). The full range of fit indices suggested a level of poor fit with the original version of the HSPSC. All details of CFA fit indices, results of other validation studies, and recommended criteria for good fit are presented in Table 1. This led to carrying out an EFA to investigate whether a factor structure exists that best fits the Latin American data.

Exploratory Factor Analysis

After analyzing the initial correlation matrix, we excluded one item (C6) because of poor intercorrelations (<0.3) with all items. Bartlett test demonstrated that the interitem correlations were sufficient for analysis ($\chi^2 = 2920.2$, $df = 861$, $P < 0.001$). The Kaiser-Meyer-Olkin value was 0.81. These preanalyses demonstrated that the data could be suitable for EFA.

Eleven factors were drawn by exploratory factor analysis (eigenvalues >1.0). Two were deleted because one did not include items after rotation and another only contained one item. Five items had low-factor loadings (<0.4) and were not included in the final structure (A15, A17, F2, F4, C4). Finally, a version with 9 factors and 36 items was the best solution that explained 60.5% of the variance in the responses.

Table 2 shows the factor loadings after rotation. Internal consistency was calculated for every factor (Cronbach α). Overall, it was variable ($0.60 < \alpha < 0.84$), but all the HSPSC-LA factors have values of greater than 0.6.

One of the nine factors was similar to the original HSPSC questionnaire: "Frequency of events reported" (Cronbach α = 0.78). Four factors were used as in the original with the addition of one item to each: "Teamwork within units" (A2) (Cronbach α = 0.77), "Nonpunitive response to errors" (A7) (Cronbach α = 0.66), "Hospital handoffs and transitions" (F6) (Cronbach α = 0.80), "Feedback and communication about errors" (C2) (Cronbach α = 0.80).

One factor was adjusted containing two original items in addition to two new ones. It was titled: "Staffing and work pressure" (B3, F9) (Cronbach α = 0.72). One factor, "Supervisor/manager expectations & actions promoting patient safety" was created with less items than the original (Cronbach α = 0.74).

The factors, "Organizational learning – Continuous improvement" and "Hospital management support for safety" were brought together to a single new factor labeled "Organizational learning, continuous improvement, and hospital support for safety" including seven items (Cronbach α = 0.84). Finally, item A10 – included in the original factor, "Overall perceptions of safety" – was combined with B4 and named "Repeated errors and perception of safety" (Cronbach α = 0.60).

Table 3 presents the correlation between mean values, scale scores, and intercorrelations among factors prepared to assess construct validity. The highest correlations were those between factor 1 and factor 6 ($r = 0.547$), but no exceptionally high correlations were noted. The highest correlation with patient safety grade was for the

TABLE 2. Characteristics of the HSPSC-LA Factors After Exploratory Factor Analysis

Factor/Items and Cronbach α	1	2	3	4	5	6	7	8	9
Factor 1. Organizational learning, continuous improvement, *and hospital support for safety* (α = 0.77)*									
F8. Actions of hospital management show that patient safety is a top priority.	0.706								
A9. Mistakes have led to positive changes here.	0.646								
F10. Hospital units work well together to provide the best care for patients.	0.622								
A13. After we make changes to improve patient safety, we evaluate their effectiveness.	0.584								
A18. Our procedures and systems are good at preventing errors from happening.	0.557								
F1. Hospital management provides a work climate that promotes patient safety.	0.533								
A6. We are actively doing things to improve patient safety.	0.471								
Factor 2. Hospital handoffs and transitions (α = 0.80)									
F11n. Shift changes are problematic for patients in this hospital.		0.746							
F7n. Problems often occur in the exchange of information across hospital units.		0.692							
F5n. Important patient care information is often lost during shift changes.		0.600							
F6n. It is often unpleasant to work with staff from other hospital units.		0.562							
F3n. Things “fall between the cracks” when transferring patients from one unit to another.		0.537							
Factor 3. Staffing *and work pressure* (α = 0.72)									
A14n. We work in “crisis mode,” trying to do too much, too quickly.			0.616						
B3n. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts.			0.553						
A5n. Staff in this unit work longer hours than is best for patient care.			0.525						
F9n. Hospital management seems interested in patient safety only after an adverse event happens.			0.488						
Factor 4. Teamwork within units (α = 0.77)									
A1. People support one another in this unit.				0.757					
A3. When a lot of work needs to be done quickly, we work together as a team to get the work done.				0.712					
A4. In this unit, people treat each other with respect.				0.606					
A11. When one area in this unit gets really busy, others help out.				0.518					
A2. We have enough staff to handle the workload.				0.423					
Factor 5. Nonpunitive response to error (α = 0.66)									
A12n. When an event is reported, it feels like the person is being written up, not the problem.					0.571				
A16n. Staff worry that mistakes they make are kept in their personnel file.					0.569				
A8n. Staff feel like their mistakes are held against them.					0.494				
A7n. We use more agency/temporary staff than is best for patient care.					0.448				
Factor 6. Feedback and communication about error (α = 0.80)									
C2. Staff will freely speak up if they see something that may negatively affect patient care.						0.687			
C3. We are informed about errors that happen in this unit.						0.655			
C1. We are given feedback about changes put into place based on event reports.						0.596			
C5. In this unit, we discuss ways to prevent errors from happening again.						0.442			
Factor 7. Frequency of events reported (α = 0.78)									
D3. When a mistake is made that could harm the patient, but does not, how often is this reported?							0.960		
D2. When a mistake is made, but has no potential to harm the patient, how often is this reported?							0.631		
D1. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?							0.416		
Factor 8. Supervisor/manager expectations & actions promoting patient safety (α = 0.74)									
B1. My supervisor/manager says a good word when he/she sees a job done, according to established patient safety procedures.								0.939	

(Continued next page)

TABLE 2. *(Continued)*

Factor/Items and Cronbach α		
B2. My supervisor/manager seriously considers staff suggestions for improving patient safety.	0.483	
Factor 9. Repeated errors and perception of safety (α = 0.60)		
A10n. It is just by chance that more serious mistakes do not happen around here.		0.493
B4n. My supervisor/manager overlooks patient safety problems that happen over and over.		0.472

* Underlines represent modifications of the factor's titles from the original.

factor, "Organizational learning, continuous improvement, and hospital support for safety" ($r = 0.492$).

Survey Findings

Of the 150 participants, 132 (88%) had direct contact with patients in the OR. Healthcare personnel working hours ranged from four to 98 per week; 57 participants (38%) work less than 40 hours per week, 60 from 41 to 59 hours per week (40%), and 33 more than 61 hours per week (22%) (mean = 42 hours per week, SD = 20). Length of employment varied, with 53.3% having worked for 5 years or less at the OR, and 31% having professional experience of 10 years or longer.

The patient safety culture score was 79% (SD = 12%). The overall mean scores were 78 ± 1.2% for doctors, 83 ± 1.1% for nurses/nurses assistants, and 68 ± 1.2% for surgical assistants. Scores were lower in personnel with direct contact with patients at 78%, compared with administrative staff at 81% (MD = −3.0%, 95% confidence interval = −7% to 1%, $P < 0.144$). There were no group differences of patient safety culture score among professions or length of employment.

More than half of healthcare personnel (62%) have never reported medical errors or incidents relating to patient safety during the last year and 82% of the personnel reported less than two events during the last year. The highest percentage of positive responses was obtained by the factors "Teamwork within units" and "Organizational learning—continuous improvement" (70%), whereas the lowest were "Staffing" (37%), "Nonpunitive response to error" (34%), and "Communication openness" (30%).

DISCUSSION

This study examined the psychometric properties of the HSPSC-LA. The original U.S. 12-factor survey is not directly applicable to Colombian personnel in a surgical setting. Rather, a 9-factor, 36-item instrument showed acceptable factor loadings and internal consistency. Our results suggest that with appropriate translation into Latin American Spanish, slight modifications, and adaptation, the HSPSC performs adequately in surgical settings in Colombia. The construct validity was satisfactory for all factors and moderate correlations among them show that no two factors measure the same construct. In addition, all factors correlated positively with the outcome variable patient safety grade. Our findings are consistent with previous studies supporting that the HSPSC requires adaptation and setting adjustments to meet minimum psychometric criteria.[14,30,31]

The internal consistency of the nine factors exhibited good to satisfactory Cronbach α scores (>0.60). Small shifts of items were noted across factors; two original factor titles were modified to improve their understandability and six questions were excluded from the original HSPSC. These changes could be explained by underlying differences with the original language, cultural environment, and specific setting of use of the questionnaire. This HSPSC-LA version has been developed and evaluated in a surgical setting, whereas the original one included all areas in hospitals in the United States. This could alter the importance of some items that describe interaction among units and teamwork across units.

Five original factors received items from other ones, suggesting a simplification of the original domains in the HSPSC-LA. Internal similarities in personnel from a single hospital area could explain this

TABLE 3. Mean Values, Correlation With Patient Safety Grade, and Intercorrelations of the Factors

Factor	Mean	SD	Patient Safety Grade	1	2	3	4	5	6	7	8	9
Factor 1. Organizational learning, continuous improvement, and hospital support for safety	3.62	0.63	0.492	1								
Factor 2. Hospital handoffs and transitions	3.12	0.71	0.392	0.421	1							
Factor 3. Staffing and work pressure	2.95	0.80	0.382	0.388	0.446	1						
Factor 4. Teamwork within units	3.53	0.65	0.347	0.520	0.232	0.376	1					
Factor 5. Nonpunitive response to error	2.96	0.73	0.223	0.126*	0.325	0.452	0.265	1				
Factor 6. Feedback and communication about error	3.19	0.81	0.445	0.547	0.316	0.334	0.334	0.243	1			
Factor 7. Frequency of events reported	3.21	0.80	0.369	0.471	0.245	0.247	0.251	0.159*	0.495	1		
Factor 8. Supervisor/manager expectations & actions promoting patient safety	3.35	0.87	0.348	0.412	0.199	0.406	0.400	0.203	0.402	0.266	1	
Factor 9. Repeated errors and perception of safety	3.51	0.81	0.261	0.274	0.337	0.410	0.343	0.385	0.192	0.172	0.171	1

All correlations were below $r^2 = 0.7$. Correlation between factors 2 and 8, 5 and 8, 6 and 9, 7 and 9, and 8 and 9 are significant at $P < 0.05$. The remaining correlations are significant at $P < 0.01$.

*Not significant.

finding. Original factors "Organizational learning – continuous improvement" and "Hospital management support for safety" have formed together a single new factor with seven items that seem to be linked. Personnel at hospitals in Colombia consider hospital management and their support as the main source of improvement and information about safety, and this may differ in other developed countries.[40–44]

The factor "Supervisor/manager expectations and actions promoting patient safety" lost question B3, which refers mainly to work pressure and working fast. In the HSPSC-LA, B3 was included with items of "Staffing." We interpret that personnel consider that work pressure is quite related with the number of people available in the OR. This may be the case of this hospital, and certainly, limited staff is a situation present in some hospitals in developing countries. This perception is consistent with its potential effect on safe care.[45,46]

A new factor was formed by items B4 and A10. The first one referred to repeated errors by manager/supervisor and the second one to the effect of chance on more serious mistakes. Personnel perceive a close relationship between repetitive errors—as a source of unsafe practices—and the manager/supervisor responsibility in the response to them. Parand et al[47] systematically reviewed the literature to assess the role of hospital managers in quality and patient safety. They found evidence that managers' time spent and work can influence quality and safety clinical outcomes, processes, and performance at hospital level.[47] In addition, poor relationships between doctors and managers affect staff and patients' care and seem to be associated with the long-term failure of organizations to thrive.[48]

The percentage of positive scores for individual domains was higher than U.S. results.[49] "Teamwork across units" had low positive responses (48%). This agrees with others, suggesting that interaction between units/departments could be perceived as a source of unsafe practices.[50,51] Personnel seemed unhappy to work with colleagues in other units but reported good teamwork within their own units.[15] The OR has strong interactions and communication with areas such as intensive care units or the emergency department. Teamwork is a crucial part for the improvement of patient safety, and personnel should be encouraged and supported in their efforts to establish good relationships with people working in other units.[15]

An important finding was the low rate of reporting of incidents. Participants without any report during the past year exceeded 50%. This estimate was lower than the 84% described in Turkey,[15] but much higher than 40% reported in Dutch hospitals.[9] Fear of reprisal in a punitive system has been identified as a determinant of reluctance to report adverse events.[20] Recently, Elmontsri et al[52] presented a systematic review about the status of patient safety culture in Arab countries in which they identified that nonpunitive response to error is seen as a serious issue that needs to be improved. Healthcare professionals in Arab countries tend to think that a "culture of blame" still exists that prevents them from reporting incidents.[52] This situation is similar in Latin America where only few report events and still staff feel that their mistakes and reported events could be used against them.[53–56]

Although most individual institution reporting systems would have a limited volume of reports and insufficient power to draw statistically valid conclusions about certain events, they could be valuable to management and educators by identifying problems. Merely one report of a near miss could identify a critical situation and lead to quality improvement.[57] The Iberoamerican study of adverse events (IBEAS study) has enabled us to grasp the situation of patient safety and harmful incidents in certain hospitals in Latin America.[5] Critical areas of improvement detected in this study include (*a*) implementation of a nonblaming system to report adverse events, (*b*) enhancement of nonpunitive policies with respect to error reporting, (*c*) promotion of open communication, and (*d*) promotion of management support of safety culture. However, active reporting has yet to be established in the sector, starting from our health care educational system in which students feel uncomfortable speaking up about patient safety issues and feel lack of confidence in their skills to manage safety risks.[58]

Our results show that administrative staff (without direct patient contact) have a higher perception of safety than those with direct contact. We hypothesize that they look upon care and safety more through their role as potential patients than as care providers and, thus, are less concerned. Although administrative staff are always considered an important part of the safety culture system, studies are scarce regarding their role in perioperative safety.

Self-report instruments are commonly used, although weaknesses are widely recognized. Some tests are long and tedious, and respondents simply lose interest and do not answer questions accurately. In addition, people are sometimes not the best judges of their own behavior and try to hide true feelings, thoughts, and attitudes.[15] We used an online web-based version of the questionnaire with a high rate of completeness compared with previous reports.[11,12,19] Survey response rates have been declining for the past decade, and web-based questionnaires could replace traditional paper questionnaires with minor effects on response rates and at lower costs.[59,60] This could be an alternative to improving adherence, preventing bias, and aiding in the practical usefulness of the HSPSC.

There are limitations to consider when interpreting these results. The incomplete transferability of the 12 factors of the original The HSPSC remains a limitation to compare with other areas worldwide, and the source of those differences is worth discussing. Our findings provide an initial assessment of the participating OR. Explorative factor analysis is a highly sample size–dependent analysis and further research should include a larger sample across multiple surgical and perioperative facilities in other Colombian and/or Latin American hospitals to confirm the underlying structure of the HSPSC-LA in surgical settings and also to increase the external validity and generalizability of these results. Finally, strong cultural differences could potentially reduce the external validity of our results but not their usefulness. We hypothesize that the main differences in the psychometric properties of this instrument compared with the original HSPSC are not due to language differences but due to the setting in which it is used.

CONCLUSIONS

We present a first tool, which can help assess safety culture in the perioperative setting in Latin America. We hope that the availability of this version will promote its further validation and application by others, and we look forward to cooperating and benchmarking with them.

ACKNOWLEDGMENTS

The authors thank all participants in the study, all the staff who answered the questionnaire, and the Colombian Society of Anesthesiologist SCARE for their technical support with the web-based version. The authors also thank Mr. Albert Ortiz at Ilsas SAS for his assistance during translation process.

REFERENCES

1. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Qual Saf Health Care*. 2003;12(suppl 2): 17–23.
2. Singla AK, Kitch BT, Weissman JS, et al. Assessing patient safety culture. *J Patient Saf*. 2006;2:105–115.

3. Colla JB, Bracken AC, Kinney LM, et al. Measuring patient safety climate: a review of surveys. *Qual Saf Health Care*. 2005;14:364–366.

4. Benavides-Hernández EA, Echeverri-Uribe JS, Agredo-Villaquirán FE, et al. Key concepts in perioperative safety: a review. *Rev Fac Cienc Salud Univ Cauca*. 2015;17:23–29.

5. Aranaz-Andres JM, Aibar-Remon C, Limon-Ramirez R, et al. Prevalence of adverse events in the hospitals of five Latin American countries: results of the "Iberoamerican study of adverse events" (IBEAS). *BMJ Qual Saf*. 2011;20:1043–1051.

6. Meara JG, Leather AJM, Hagander L, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *The Lancet*. 2015;386:569–624.

7. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med*. 2009; 360:491–499.

8. de Vries EN, Prins HA, Crolla RMPH, et al. Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med*. 2010;363: 1928–1937.

9. Smits M, Christiaans-Dingelhoff I, Wagner C, et al. The psychometric properties of the "hospital survey on patient safety culture" in Dutch hospitals. *BMC Health Serv Res*. 2008;8:230.

10. Kohn L, Corrigan J, Donaldson M, Institute of Medicine. *To Err Is Human: Building a Safer Health System*. 1st ed. Washington, DC: National Academies Press (US); 2000.

11. Eiras M, Escoval A, Grillo IM, et al. The hospital survey on patient safety culture in Portuguese hospitals. *Int J Health Care Qual Assur*. 2014;27: 111–122.

12. Brborović H, Šklebar I, Brborović O, et al. Development of a Croatian version of the US Hospital Survey on Patient Safety Culture Questionnaire: dimensionality and psychometric properties. *Postgrad Med J*. 2014;90: 125–132.

13. Najjar S, Hamdan M, Baillien E, et al. The Arabic version of the hospital survey on patient safety culture: a psychometric evaluation in a Palestinian sample. *BMC Health Serv Res*. 2013;13:193.

14. Aboneh EA, Look KA, Stone JA, et al. Psychometric properties of the AHRQ community pharmacy survey on patient safety culture: a factor analysis. *BMJ Qual Saf*. 2016;25:355–363.

15. Bodur S, Filiz E. Validity and reliability of Turkish version of "hospital survey on patient safety culture" and perception of patient safety in public hospitals in Turkey. *BMC Health Serv Res*. 2010;10:28.

16. Spanish Translation of AHRQ's Hospital Survey on Patient Safety. Background on translation Development. 2009. Available at: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/patientsafetyculture/hospital/userguide/hospdim-sp.pdf. Accessed February 18, 2018.

17. Hedsköld M, Pukk-Härenstam K, Berg E, et al. Psychometric properties of the hospital survey on patient safety culture, HSOPSC, applied on a large Swedish health care sample. *BMC Health Serv Res*. 2013;13:332.

18. Occelli P, Quenon JL, Kret M, et al. Validation of the French version of the hospital survey on patient safety culture questionnaire. *International J Qual Health Care*. 2013;25:459–468.

19. Sarac C, Flin R, Mearns K, et al. Hospital survey on patient safety culture: psychometric analysis on a Scottish sample. *BMJ Qual Saf*. 2011;20: 842–848.

20. Tereanu C, Smith SA, Sampietro G, et al. Experimenting the hospital survey on patient safety culture in prevention facilities in Italy: psychometric properties. *International J Qual Health Care*. 2017;29: 269–275.

21. DANE. Censo General 2005. Available at: http://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-general-2005-1. Accessed October 10, 2017.

22. Agredo-Delgado V, Álvarez-Morales J, Belalcazar-HernÁndez G, et al. Epidemiologic surgical profile of the hospital Universitario San José, Popayan. *RFS Rev Fac Salud*. 2016;8:30–37.

23. Sorra J, Gray L, Streagle S, et al. *AHRQ Hospital Survey on Patient Safety Culture: User's Guide. (Prepared by Westat, under Contract No. HHSA290201300003C)*. Rockville, MD: AHRQ Publication No. 15-0049-EF (Replaces 04-0041); 2016.

24. Sorra JS, Dyer N. Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Serv Res*. 2010;10:199.

25. Agency for Healthcare Research and Quality. *Translation Guidelines for the Surveys on Patient Safety Culture. (Prepared by Westat under contract number HHSA 290200710024C)*. Rockville, MD: AHRQ; 2010. Available at: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/patientsafetyculture/resources/transguide.pdf. Accessed February 18, 2017.

26. Douglas SP, Craig CS. Collaborative and iterative translation: an alternative approach to back translation. *J Int Mark*. 2007;15:30–43.

27. Schumacker RE, Lomax RG. Chapter 8. Confirmatory factor models. In: Schumacker RE, ed. *A Beginner's Guide to Structural Equation Modeling*. 2nd ed. Denton, TX: Lawrence Erlbaum Associates Publishers; 2014.

28. Thompson B. *Exploratory and Confirmatory Factor Analysis: Understanding Concepts and Applications*. 1st ed. Washington, DC: American Psychological Association; 2004.

29. Hair JF. *Multivariate Data Analysis*. 5th ed. Upper Saddle River, NJ: Prentice Hall; 1998; 730.

30. Waterson P, Griffiths P, Stride C, et al. Psychometric properties of the hospital survey on patient safety culture: findings from the UK. *Qual Saf Health Care*. 2010;19:e2.

31. Perneger TV, Staines A, Kundig F. Internal consistency, factor structure and construct validity of the French version of the hospital survey on patient safety culture. *BMJ Qual Saf*. 2014;23:389–397.

32. Ito S, Seto K, Kigawa M, et al. Development and applicability of hospital survey on patient safety culture (HSOPS) in Japan. *BMC Health Serv Res*. 2011;11:28.

33. Pfeiffer Y, Manser T. Development of the German version of the hospital survey on patient safety culture: dimensionality and psychometric properties. *Saf Sci*. 2010;48:1452–1462.

34. Chen IC, Li HH. Measuring patient safety culture in Taiwan using the hospital survey on patient safety culture (HSOPSC). *BMC Health Serv Res*. 2010;10:152.

35. Kline RB. *Principles and Practice of Structural Equation Modeling*. 4th ed. New York, NY: Guilford Press; 2016.

36. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Model A Multidiscip J*. 1999;6:1–55.

37. Field A. Chapter 17. Exploratory factor analysis. In: Field A. *Discovering Statistics Using IBM SPSS Statistics*. 3rd ed. London: SAGE; 2009.

38. Rosseel Y. Lavaan: an R package for structural equation modeling. *J Stat Softw*. 2012;48:1–36.

39. R Development Core Team (2013). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing; 2013. Available at: http://www.r-project.org. Accessed October 10, 2018.

40. Hull L, Arora S, Amaya AC, et al. Building global capacity for patient safety: a training program for surgical safety research in developing and transitional countries. *Int J Surg*. 2012;10:493–499.

41. Collazos C, Bermudez L, Quintero A, et al. Checklist verification for surgery safety from the patient's perspective. *Colomb J Anesthesiol*. 2013;41:109–113.

42. Duque Henao SL, Echeverri Montoya MJ. Evaluation of the care safety of patients with surgical interventions from a high-complexity institution in Medellín, Colombia. *Invest Educ Enferm*. 2016;34:456–464.

43. Reis CT, Paiva SG, Sousa P. The patient safety culture: a systematic review by characteristics of hospital survey on patient safety culture dimensions. *International J Qual Health Care*. 2018;30:660–677.

44. Gómez O, Arenas W, González L, et al. Patient safety culture of nursing staff in Bogotá, Colombia. *Cienc y enfermería*. 2011;17:97–111.

45. van Beuzekom M, Boer F, Akerboom S, et al. Patient safety in the operating room: an intervention study on latent risk factors. *BMC Surg*. 2012;12:10.

46. Gosselin RA, Gyamfi YA, Contini S. Challenges of meeting surgical needs in the developing world. *World J Surg*. 2011;35:258–261.

47. Parand A, Dopson S, Renz A, et al. The role of hospital managers in quality and patient safety: a systematic review. *BMJ Open*. 2014;4:e005055.

48. Edwards N. Doctors and managers: poor relationships may be damaging patients-what can be done? *Qual Saf Health Care*. 2003;12(suppl 1):i21–i24.

49. AHRQ. *Hospital Survey on Patient Safety Culture: 2014 User Comparative Database Report: Executive Summary.* Rockville, MD: Agency for Healthcare Research and Quality; 2014.

50. Pronovost PJ, Weast B, Holzmueller CG, et al. Evaluation of the culture of safety: survey of clinicians and managers in an academic medical center. *Qual Saf Health Care*. 2003;12:405–410.

51. Kim J, An K, Kim MK, et al. Nurses' perception of error reporting and patient safety culture in Korea. *West J Nurs Res*. 2007;29:827–844.

52. Elmontsri M, Almashrafi A, Banarsee R, et al. Status of patient safety culture in Arab countries: a systematic review. *BMJ Open*. 2017;7:e013487.

53. Silva-Batalha EMS, da Melleiro MM, Silva-Batalha EMS, et al. Patient safety culture in a teaching hospital: differences in perception existing in the different scenarios of this institution. *Texto Context - Enferm*. 2015;24:432–441.

54. Minuzzi AP, Salum NC, Locks MOH. Assessment of patient safety culture in intentive care from health team's perspective. *Texto Context – Enferm*. 2016;25:e1610015.

55. Arrieta A, Suárez G, Hakim G. Assessment of patient safety culture in private and public hospitals in Peru. *International J Qual Health Care*. 2018;30:186–191.

56. Hamdan M, Saleem AA. Assessment of patient safety culture in Palestinian public hospitals. *International J Qual Health Care*. 2013;25:167–175.

57. Ulmer C, Miller Wolman D, Johns M, eds. *IOM (Institute of Medicine). Resident Duty Hours: Enhancing Sleep, Supervision, and Safety.* Washington, DC: The National Academies Press; 2009.

58. Mira JJ, Navarro IM, Guilabert M, et al. A Spanish-language patient safety questionnaire to measure medical and nursing students' attitudes and knowledge. *Rev Panam Salud Publica*. 2015;38:110–119.

59. Hohwü L, Lyshol H, Gissler M, et al. Web-based versus traditional paper questionnaires: a mixed-mode survey with a Nordic perspective. *J Med Internet Res*. 2013;15:e173.

60. Ebert JF, Huibers L, Christensen B, et al. Paper- or web-based questionnaire invitations as a method for data collection: cross-sectional comparative study of differences in response rate, completeness of data, and financial cost. *J Med Internet Res*. 2018;20:e24.