

Safety climate in the surgical center: validation of a questionnaire for the Brazilian scenario

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ABSTRACT

To validate the translated and culturally adapted version of the Safety Attitudes Questionnaire/Operating Room Version to the Brazilian context. A methodological study to validate the psychometric properties of the questionnaire adapted to the Brazilian context. The sample corresponded to 590 health professionals acting in the surgical center, of four Brazilian hospitals, collecting the data from May to August 2014. The construct validation was performed by the exploratory factorial analysis and the reliability using the Cronbach's alpha. The analysis generated a questionnaire with 40 affirmations divided into six domains: *clima de segurança, percepção da gerência, percepção do estresse, condição do trabalho, comunicação no ambiente cirúrgico e percepção do desempenho profissional*. The adapted version was reliable, obtained a general Cronbach's alpha value of 0.87, and between domains, the alpha varied from 0.59 to 0.87. This study allowed to validate an instrument capable of assessing the safety environment in a surgical center.

Descriptors: Patient Safety; Surgicenters; Perioperative Nursing; Organizational Culture; Validation Studies.

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INTRODUCTION

The patient's safety in the Surgical Centre (SC) englobes the complexity of developed activities and the need of teamwork in the surgical scenario, characterized by different categories, with distinct cultural identities and acting in the same environment, with various dynamics according to the management model of each health institution⁽¹⁾.

In this context, although surgical procedures intend to save lives, flaws in the process of certain situations can result in irreparable damages⁽²⁾. Perioperative adverse events (AE) represent a 3% rate of the total procedures per year, showing the impact of unsafe care in health systems⁽³⁾.

The World Health Organization (WHO) identified as the most critical point for surgical safety, the interaction of team members: surgeons, anesthesiologists, nurses, among other professionals. The literature emphasizes that the culture of surgical teams is considered rigid and resistant to changes⁽³⁾.

Studies have been aiming to measure the perceived safety climate by professionals, aiming to assess the safety culture in health services. The patient's health assessment in the surgical setting implicates considering the aspects related to the organizational culture, the patient's safety atmosphere, and the peculiarities inherent to the work process.

In a literature review about the main measurement instruments for culture and safety climate of high psychometric properties and electronically available⁽⁴⁻⁵⁾, the Safety Attitudes Questionnaire (SAQ) was noted. It was developed by researchers of the Center of Excellence for Patient Safety Research and Practice, The University of Texas, under the coordination of Eric Thomas, John B. Sexton and Robert L. Heimreich⁽⁶⁾. This questionnaire measures the safety climate in health services from the perception of professionals about the patient's safety. It was validated in six cross-sectional studies, with a sample of 10,843 subjects, in the United States of America (USA), presenting high psychometric properties in the six domains, being: teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions and stress recognition⁽⁷⁾.

The SAQ was translated and validated in many countries, and regarding its reliability measured by the Cronbach's alpha test, it varied from 0.79 to 0.91⁽⁷⁻¹¹⁾. Authors of the questionnaire developed versions for many scenarios as SC, Intensive Care Unit (ICU), ambulatory units and primary attention⁽⁶⁻¹²⁾.

The Safety Attitudes Questionnaire/Operating Room (SAQ/OR) is the modified SAQ version for the surgical climate, developed by Makary and team. It was validated in the USA, including 60 hospitals and 2,769 professionals⁽¹³⁾. The findings showed satisfactory internal consistency, Cronbach's alpha of 0.76. Studies conducted by the authors verified that the instrument's properties truly measured variables of the safety climate in a surgical center, with impact on the patient's safety⁽¹⁴⁾.

Considering the lack of studies and measurement instruments for the safety climate in SC in Brazil, the SAQ/OR was translated and adapted for the referred context, according to steps proposed in the literature⁽¹⁵⁾, creating an instrument called SAQ/VCC⁽¹⁾. The present study objective is to assess the psychometric properties of the translated and adapted version of the SAQ/OR for the Brazilian context.

METHODS

This is a methodological study to validate the psychometric properties of the SAQ/OR, conducted after the translation and cultural adaptation of the questionnaire. This phase was indispensable to guarantee that the translated version would be valid and reliable to measure what the tool is proposed, becoming necessary to test this two properties⁽¹⁵⁾.

The reliability analysis used the Cronbach's alpha and a construct assessment to validate the translated and adapted instrument based on the Exploratory Factorial Analysis (EFA). It was adopted for being a broadly used statistical procedure in the development and assessment of instruments, which primary function is to reduce a large number of observed variables in some factors representing the latent constructs or dimensions⁽¹⁶⁾.

In this study, the EFA was conducted using the method by main components and VARIMAX orthogonal rotation. It is important to clarify that the adopted criterion in the selection of factors was the auto-values above the value one, and as criteria to exclude the items, those with values of commonality lower than 0.5 and with a factorial load smaller than 0.4.

The Brazilian version of the SAQ/OR: *Questionário de Atitudes de Segurança/Versão Centro Cirúrgico (SAQ/VCC)*

The idealizers of the original version of SAQ/OR authorized the questionnaire's translation and validation of to the Brazilian Portuguese language. The translation and transcultural adaptation produced an instrument denominated SAQ/VCC which kept the same layout of the original instrument, in two pages⁽¹⁾.

This version of the SAQ/VCC remained divided into three parts; the first one refers to the quality of the communication and collaboration among professionals working in the SC, where the subject should answer about his relationship with each one of the ranked professional categories. The second is composed by 58 affirmations addressing the patient's safety and one item questioning if the research was previously answered and, a third one consisting on demographic information (gender, race/ethnicity, professional category, working time, working shift, within others). At last, a space where participants are asked about three recommendations to improve patient's safety in the surgical center.

The questionnaire is answered using a Likert-type scale, with five degrees, one question by simple choice referring to have previously answered the questionnaire and the request of improvement recommendations is open to the participant's free choice.

Study location and participants

Four Brazilian hospitals participated in the study, being two private and two teaching and public. The choice of institutions was in function of the number of subjects expected in the sample and the diversity of the population profile attended in the institutions. It is important to note that international organizations accredit private institutions and a public one. The hospitals were denominated by the letters A, B, C, and D, to guarantee anonymity.

The sample was selected by convenience and constituted by 590 health professionals working in the SC, and the inclusion criteria were: nurses, nursing technicians and assistants working for at least six months in the

unit, and surgeons, residents, anesthesiologists, and instrumentators participating in at least three procedures/month.

Data collection procedure

The data collection was from May to August 2014. There were meetings in the participating institutions with the directors, managers, and supervisors of the teams of professionals working in the SC, where they presented the study's objectives and methods. Depending on the work dynamics, in few units, the questionnaire and the Free and Informed Consent Term (FICT) were given to nursing managers or coordinators of the medical teams and collected after. However, as this strategy had a low return rate, the subjects were personally approached, waiting for them to complete the SC questionnaire of each institution, majorly in the comfort rooms. It took them about 15 minutes complete it.

Data analysis

For the study validation, the results were analyzed considering the total of answered questionnaires in the co-participating institutions. The collected data were organized in an electronic spreadsheet, and the data analysis was performed with a statistical program. The affirmations were analyzed regarding its responsiveness and acceptability attributes. The responsiveness was assessed using the floor and ceiling effects; such effects occur when more than 15% of answers are concentrated in the minimum or maximum level of the scale⁽¹⁷⁾. The acceptability was verified in function of the valid and non-valid answers. It was considered as non-valid: blank questions, containing more than one answer or those marked in the item "does not apply". The results found in the responsiveness and acceptability attributes allowed to produce the EFA. In this study, the Kaiser Meyer Olkin (KMO) value was 0.844 and the Bartlett sphericity of $p < 0.001$, indicating sufficient correlations between variables to continue the analysis.

The construct validity was assessed applying the EFA of the main components and the VARIMAX orthogonal rotation⁽¹⁶⁾. After, the reliability analysis was performed using the Cronbach's alpha coefficient, for the total scale and each domain/factor.

Ethical aspects

The study development attended the national and international ethic norms in studies involving human beings, and it was approved by the Ethics and Research Committee of the Nursing School at São Paulo University (EEUSP), CAAE - 19332613.4.0000.5392. The study participants signed two copies of the FICT.

RESULTS

The study resulted in a sample composed by 68.5% (of surgeons, anesthesiologists, surgery and anesthesiology residents) and 31.2% of the nursing team (nurses, nursing technicians, and instrumentators/circulating). Of the answered questionnaires, 37% was in the Hospital A, 17% in the Hospital B, 15% in the Hospital C and, 31% in the Hospital D. From the 590 subjects, 38.7% were surgeons/assistant surgeons,

26.6% instrumentators/room circulating, 17.3% anesthesiologists/assistant anesthesiologists and, 17.4% were surgery or anesthesia residents.

The majority of subjects (55.7%) were male and of white race/ethnicity (76.3%). The mean age was 39.62 years (sd 10.80), and the median was 36.32 years. The data showed that the mean work experience in the specialty was 13.41 years (sd 10.7) and regarding the average time working in the institution corresponded to 8.93 years (sd 9.2).

Psychometric properties: exploratory factorial analysis

The initial EFA pointed the existence of 17 factors that explained 66.1% of the total variance of 58 positive and negative items. In the subsequent factorial analyses, the items which factorial loads and/or communality were lower than the pre-established criteria were eliminated. The eliminated items in each step are presented in Table 1 and the values in bold point the exclusion motive, totalizing 18 items.

Table 1: Distribution of eliminated items and its respective factorial loads and communalities. São Paulo, SP, Brazil, 2014.

Step	Eliminated Item	Factorial load	Communality
1	33. (N)* Estresse devido a problemas pessoais afeta de forma adversa o meu desempenho.	0.312	0.691
2	30. Neste Centro Cirúrgico, as discordâncias são resolvidas de modo apropriado.	0.326	0.611
3	34. Eu tenho apoio que necessito de outros membros da equipe para cuidar dos pacientes.	0.341	0.574
4	55. Durante situações de emergência, meu desempenho não é afetado ao trabalhar com pessoal inexperiente ou menos capacitado.	0.352	0.594
5	39. (N) Frequentemente, não consigo expressar desacordo com a equipe médica.	0.376	0.636
6	3. As sugestões do enfermeiro sobre a assistência ao paciente são bem recebidas no Centro Cirúrgico.	0.352	0.576
7	6. Este hospital faz um bom trabalho no treinamento de novos membros da equipe.	0.337	0.489
8	42. Estagiários da minha área são supervisionados adequadamente.	0.306	0.438
9	38. Os médicos e os enfermeiros daqui trabalham em conjunto como uma equipe bem coordenada.	0.327	0.563
10	27. (N) Eu tenho visto outros profissionais cometerem erros que tinham potencial de prejudicar os pacientes.	0.354	0.572
11	37. Durante as situações de emergências, posso prever o que outros profissionais farão em seguida.	0.430	0.482
12	43. Conheço o nome e sobrenome completo de todo o pessoal com quem trabalhei no meu último turno.	0.366	0.598
13	56. (N) Os profissionais, frequentemente, não levam em consideração as regras ou diretrizes estabelecidas neste Centro Cirúrgico.	0.370	0.594
14	1. (N) Neste Centro Cirúrgico são comuns altos níveis de carga de trabalho.	0.357	0.607
15	29. Eu me orgulho de trabalhar neste hospital	0.381	0.640
16	8. Trabalhar neste hospital é como fazer parte de uma grande família.	0.521	0.497
17	36. (N) Interrupções na continuidade do atendimento podem ser prejudiciais para a segurança do paciente.	-0.375	0.575
18	44. (N) Cometi erros que poderiam prejudicar os pacientes.	0.464	0.493

Footnotes: * (N): Negative affirmations / *Bold: exclusion values.

The SAQ/VCC presented a multidimensional scale, and the EFA pointed the exclusion of 18 items. Thus, the 40 remaining items were distributed in 12 factors/domains that explained 64.3% of the variance, and they were submitted to the Cronbach's alpha test. From these items, 30 were organized in the six first factors/domains and presented an alpha higher than 0.50. Six items obtained lower values, and the number of items varied from one

to three in each factor, and they were not considered as domains. Therefore, of the 40 affirmations of the questionnaire, 30 were allocated in the domains, and ten stayed in the factors.

Of the 12 factors encountered in the EFA, they were defined as domains the six first ones, consonant to other SAQ versions, being: ***Clima de segurança, Percepção da gerência, Percepção do estresse, Condição do trabalho, Comunicação no ambiente cirúrgico, Percepção do desempenho profissional***. The researchers chose the domains' nomenclatures, based on a literature review, items' semantics, in studies about the SAQ cultural adaptation for many countries and, in international studies using the SAQ/OR to assess safety environment. The items referring to the domains are presented in Table 2.

Tabela 2: Description of items in each domain, item-total correlation, and Chronbach's alpha if the item is excluded. São Paulo, SP, Brazil, 2014.

	Item - Total correlation	Cronbach's Alpha if the item is excluded
Clima de Segurança (Cronbach's Alpha = 0.82)		
46. Todo o pessoal do Centro Cirúrgico assume responsabilidade pela segurança do paciente.	0.62	0.79
51. Aqui existe adesão ampla às diretrizes clínicas e critérios baseados em evidências relacionados com segurança do paciente.	0.64	0.79
54. As informações obtidas por meio dos relatórios de eventos adversos são usadas para tornar a assistência do paciente mais segura neste Centro Cirúrgico.	0.54	0.80
50. Assuntos importantes são bem comunicados nas mudanças de turno.	0.55	0.80
48. A segurança do paciente é, constantemente, reforçada como prioridade aqui no Centro Cirúrgico.	0.60	0.79
41. O moral neste Centro Cirúrgico é alto	0.54	0.80
45. A equipe médica deste Centro Cirúrgico faz um bom trabalho.	0.47	0.81
Percepção da Gerência (Cronbach's Alpha = 0.79)		
10. A administração deste hospital apoia meus esforços diários.	0.73	0.69
9. A administração deste hospital está fazendo um bom trabalho.	0.69	0.71
11. Eu recebo retorno apropriado sobre o meu desempenho.	0.59	0.74
15. Este hospital é um bom lugar para se trabalhar.	0.46	0.79
18. Neste Centro Cirúrgico o número de profissionais é suficiente para atender o número de pacientes.	0.43	0.81
Percepção do Estresse (Cronbach's Alpha = 0.78)		
47. (N)* Sinto-me cansado quando levanto pela manhã e tenho que enfrentar outro dia de trabalho.	0.66	0.69
49. (N) Eu me sinto exausto com o meu trabalho.	0.65	0.70
53. (N) Sinto que estou trabalhando demais.	0.57	0.74
52. (N) Sinto-me frustrado com o meu trabalho.	0.50	0.77
Condição do Trabalho (Cronbach's Alpha = 0.77)		
21. A cultura de segurança neste Centro Cirúrgico torna fácil aprender com os erros dos outros.	0.59	0.72
28. Eu conheço os meios adequados para encaminhar questões relacionadas à segurança do paciente neste Centro Cirúrgico.	0.50	0.75
26. Recebo informações adequadas e oportunas sobre ocorrências no hospital, que podem afetar o meu trabalho.	0.53	0.74
22. O hospital lida de maneira construtiva com os profissionais problemáticos.	0.47	0.75
35. É fácil para os profissionais que atuam neste Centro Cirúrgico fazerem perguntas quando existe algo que não entendem.	0.51	0.74
20. Sou encorajado por meus colegas a informar qualquer preocupação que eu possa ter com a segurança do paciente.	0.51	0.74
Comunicação no ambiente cirúrgico (Cronbach's Alpha = 0.59)		
23. Os equipamentos deste Centro Cirúrgico são adequados.	0.36	0.54

	Item - Total correlation	Cronbach's Alpha if the item is excluded
19. A tomada de decisão no Centro Cirúrgico utiliza informações dos profissionais envolvidos.	0.44	0.47
13. A transmissão de informações entre os profissionais do Centro Cirúrgico antes da realização de um procedimento cirúrgico é importante para a segurança do paciente.	0.29	0.59
14. A transmissão de informações é comum no Centro Cirúrgico.	0.46	0.45
Percepção do desempenho profissional (Cronbach's Alpha = 0.71)		
31. (N) Sou menos eficiente no trabalho quando estou cansado.	0.65	0.56
25. (N) Quando a minha carga de trabalho se torna excessiva, meu desempenho é prejudicado.	0.55	0.63
16. (N) O cansaço prejudica meu desempenho durante situações de emergência.	0.43	0.70
32. (N) Eu tenho maior probabilidade de cometer erros em situações tensas ou hostis.	0.40	0.72

Footnote: *(N): Negative affirmations.

Reliability analysis of the questionnaire

The reliability analysis of the 40 items of the SAQ/VCC questionnaire was conducted through internal consistency, applying the Cronbach's alpha, which presented a general value of 0.87 and varied from 0.59 to 0.82 in the domains, demonstrating the instrument's reliability (Table 3).

Table 3: Description of the Cronbach's alpha in general and domains of the SAQ/VCC. São Paulo, SP, Brazil, 2014.

Domains of the SAQ/VCC*	Number of items	Cronbach's Alpha
Total SAQ	40	0.87
1. Clima de Segurança	7	0.82
2. Percepção da Gerência	5	0.79
3. Percepção do Estresse	4	0.78
4. Condição de Trabalho	6	0.77
5. Comunicação no ambiente cirúrgico	4	0.59
6. Percepção do desempenho profissional	4	0.71

Footnote: * SAQ/VCC - Questionário de Atitudes de Segurança/Versão Centro Cirúrgico.

Through the analysis of psychometric properties, factors presenting a Cronbach's alpha lower than 0.50 were not denominated as specific domains of a construct. Thus, these items were pooled in factors numbered as seven, eight, nine, 10, 11 and 12, becoming a total of 10 affirmations and they deserve to be re-assessed with a more significant number of subjects, to determine if they can be incorporated in a specific domain.

Therefore, the 40 resulting items of this study produced a reduced version of the questionnaire, denominated *Questionário de Atitudes de Segurança/Centro Cirúrgico – SAQ/CC*.

The findings of the present study demonstrated the positive assessment and the instrument's reliability, presenting a Cronbach's alpha of 0.87 for the 40 affirmations defined by the EFA. The six domains of this study showed an alpha variation of 0.59 to 0.82. The communication domain represented the lower value in the surgical climate composed of four items.

DISCUSSION

This study represents the first validation of the adapted version to Brazil of the questionnaire that measures safety climate in the surgical setting. Based on our results, the internal consistency and the construct validation were assessed and produced the domains extracted from the Exploratory Factorial Analysis (EFA). Research

demonstrated the internal consistency results of this study correlates to studies conducted in Sweden, Portugal, and Japan⁽¹⁸⁻²⁰⁾.

Studies applying the SAQ in its generic version present six domains: Teamwork climate, job satisfaction, perception of management, safety climate, working conditions and, stress recognition⁽⁶⁾. Within the ones that adapted the SAQ/OR in the three countries mentioned above, the specific domains of the SC were not explicit, appropriating from the domains of the generic version⁽¹⁸⁻²⁰⁾. On the other hand, the studies destined to measure the safety climate with the SAQ/OR used the domains of the generic version, not considering the specific SC items to compose other domains⁽²¹⁻²²⁾. These findings show the need to apply the particular questionnaire according to the environment/field, as well as, the respective domains to assess the safety climate in a surgical environment.

Through the EFA, it was possible to identify the latent construct to questions of the questionnaire adapted to the Brazilian context, especially, about the dimensionality, contributing to the elaboration of SAQ/CC domains.

As previously described, the domains of this study were: ***clima de segurança, percepção da gerência, percepção do estresse, condição de trabalho, comunicação no ambiente cirúrgico e percepção do desempenho profissional***. Thus, the first four domains are similar to another SAQ study. However, the fourth and fifth domains were nominated by the researchers, considering that the items refer to the surgical environment and are different of the SAQ domains -generic version. The domain ***clima de segurança*** indicates the professionals' perception regarding the pro-active organizational compromising for the patient's safety^(7,13,23). The second domain, described as ***percepção da gerência***, relates to the approval of management actions regarding safety matters. About the third domain, ***percepção do estresse***, it addressed the recognition of how much stressing factors influence work execution. The fourth domain refers to ***condição de trabalho*** and it relates to the quality perception of the work environment and in our study. The items pointed by the factorial analysis relates to questions about the patient's safety in the organization of the professional routine.

Through the investigation findings, the fifth domain was identified as ***comunicação no ambiente cirúrgico***. It is a specific domain of the surgical environment, as its items refer to the information shared among health professionals that interferes with the patient's safety.

Under this light, the literature highlights the nurse's responsibility in establishing a communication system that includes material resources and equipment and, the surgical team to guarantee a safe climate to the patient and also to professionals who work in this environment⁽²⁴⁾. It is noteworthy that surgical procedures require the correct use of equipment and in good working conditions and, the medications should be administered in adequate time.

Thus, because the roles of professional categories working in the surgical environment are interdependent, the team of anesthesiologists, nurses and surgeons should effectively communicate to prevent avoidable complications⁽²⁵⁾.

The authors of the original questionnaire proposed to measure the communication and the collaboration within professional categories working in this environment, as the first part of the questionnaire⁽⁷⁾.

Therefore, it is notable the contribution of this research when developing a domain measuring this construct and that allow to assess the decision making based on the communication in the surgical environment. As a consequence, this domain enables the analysis of a key aspect in the work process of surgical teams, when

relating the data of the first part of the questionnaire with the results of this domain, which will allow thickening the assessment of the communication and collaboration between health professionals who work in this environment.

And finally, the sixth domain, that was also defined and nominated in this study, ***percepção do desempenho profissional***. Therefore, when analyzing the semantic of items in the sixth domain, we observed that they refer to the repercussion of the tiredness and work overload in the professional performance. We believe in a fundamental aspect of the patient's safety, the individual capacity of recognizing and assuming the fatigue and how much this factor affects the professional action. We observed that the items pooled in this domain are found in studies of the SAQ short-form original version and version adapted to Portuguese, in the domain *reconhecimento/percepção do estresse*^(7, 23).

Adaptation and validation studies of the SAQ/OR, developed in Sweden, Portugal, and Japan, conducted the translation and adaptation process according to the methodology internationally recommended. However, in the validation, they analyzed the total Cronbach's alpha, but they did not investigate the domains, or they only analyzed few items of few domains in the generic version⁽¹⁸⁻²⁰⁾. For this reason, there are no studies to compare the domains found in our exploratory factorial analysis. In the same direction, a study conducted in a center for pediatric heart surgery analyzed the items composing the SAQ/OR disregarding the domains⁽²¹⁾. Still, the research conducted in the SC of the Veterans Health Administration (VHA) applied the SAQ/OR analyzing only the items of the domain safety environment⁽²²⁾.

The SAQ/CC reliability is similar to other transcultural adaptation studies of the SAQ/OR. Therefore, there is a need to extend the research in other Brazilian surgical scenarios to consolidate the psychometric properties.

Study limitations

We understand as a limitation of this study the low adherence of the nursing team and the inexistence of studies in the literature with the items of the domains referring to SAQ version CC, which impeded the comparison of psychometric properties related to the domains.

Therefore, we considered that new studies should be developed, using samples with homogeneous distributions within the professional categories and other analyses, as the confirmatory factorial analysis, aiming to confirm the factorial structure of the questionnaire.

CONCLUSIONS

The Brazilian version of the SAQ/OR has satisfactory construct validity, and the instrument appeared to be reliable, presenting a general Cronbach's alpha value of 0.87, and, in the domains, they varied from 0.59 to 0.82. The domains ranked in this study were: *clima de segurança, percepção da gerência, percepção do estresse, condição de trabalho, comunicação no ambiente cirúrgico e percepção do desempenho profissional*.

The version produced by this study, denominated SAQ/CC, will favor the reproduction of research in other surgical scenarios of Brazil, to improve the data collection and professionals' adherence.

This research allowed to validate an instrument that assesses the safety climate in the SC; considering a vulnerable environment to the occurrence of events that compromise the patient's safety, overall, resulting from the need of effective communication between health professionals and inherent risks of the surgical procedure.

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