

Validation of the Safety Attitudes Questionnaire - Short Form 2006 to Portugal

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Abstract

The growing perception of an insufficiency in patient safety and the inevitable associated costs, as well as increasingly limited resources, have required from health policies and institutions a rewriting of effective, competitive and innovative strategies to promote safety in health care.¹ In fact, this issue has become a global issue within the context of health management, research and clinical practice.²⁻⁵ It is considered a challenge for healthcare organizations, as well as for professionals and policy-makers whose it as a structural priority in the clinical governance system,^{2,3,5,6} and a matter of concern for patients and their families, who envision safety and trust in healthcare.⁷⁻⁹ The safety culture in medical institutions has a pivotal impact on the safety of healthcare¹⁰⁻¹⁵ and has been considered a decisive model within quality of care, as well as an essential structural indicator that promotes and facilitates the initiatives that minimize risks and prevent adverse events within this scope.¹⁶ The safety environment, as a psychological phenomenon of the safety culture, involves the perceptions of the state of safety at a particular moment in time and enables assessment of the professionals' perception of safety in the organization. In the Health sector, assessment of the safety environment through questionnaires has stood as a practical tool that enables organizations to act proactively, plan internal quality improvements, assess the impact and effectiveness of the implemented actions and benchmark both internally and externally.¹⁷⁻¹⁸ Sexton et al.'s Safety Attitudes Questionnaire (SAQ) is currently one of the most widely used questionnaires¹⁹ in many clinical areas and health services, within different contexts and various international environments. It has been thoroughly tested and is, therefore, considered psychometrically valid and reliable.^{17,20-29} Considering the potential of this resource, which is described in several international studies, and acknowledging the need for and relevance of such a safety environment assessment tool in the Portuguese population, the present study was conceived. Our goal is to proceed to the translation, cultural adaptation and validation of the SAQ -Short Form 2006 in Portugal.

Keywords: Patient safety, Safety climate, Validation, Safety attitudes questionnaire

Methods

Type of Study

The study is of a methodological nature with a quantitative approach, integrated in the research of methods for obtaining, organizing and processing data, discussing the construction, validation and assessment of instruments and research techniques. It also aims to establish and verify the reliability and validity of measuring instruments.³⁰ The goal of any research with this type of approach is the development of a reliable resource that may be used subsequently by other researchers,³¹ in different populations for which the resource has been designed.³⁰ The data collection for the assessment of the resource's psychometric properties was carried out in a given moment, so the study is also cross-sectional in nature, because the phenomena studied refer to a well-defined period of time and a relatively homogeneous population.³²

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Data Collection

Setting

The research was conducted at the Centro Hospitalar Cova da Beira (CHCB), Covilhã, Portugal. This is a public hospital integrated in the National Health Service, of corporate nature, with administrative, financial and equity autonomy. This national and international reference institution, accredited by the Joint Commission International (JCI) since March 2010, possesses several certifications by the International Organization for Standardization (ISO) 9001 and positive baseline reference in the process of the Portuguese National Health Assessment System (SINAS). Data collection took place in the period between October 13th and November 14th 2014.

Questionnaire Administration

The process of translation and cultural adaptation of the SAQ - Short Form 2006 began with the authorization request to Professor Jason Etchegaray, who, together with the original authors Professor John Sexton and his colleagues, issued a favourable opinion. Later, a formal authorization request was submitted to the Executive Board of the CHCB, the heads of department of the surgical and clinical units and the Ethics Committee for its implementation. Prior to the data collection, directors, head nurses and the heads of each service were contacted in order to explain the relevance and goals of the study, approximate time required to complete the questionnaire (\approx 15 minutes), clarify potential doubts and negotiate the time of delivery and collection. Some questionnaires were distributed and collected by the heads of the services or by other professionals appointed for such purpose, and others were handed out directly by the researcher. Some professionals responded upon delivery, while others filled the questionnaire in later and returned it on a pre-established date.

Ethical Issues

The data collection process complied with the recommended ethical principles, and all individuals who agreed to participate in the study did so in an intentional, anonymous, voluntary and informed manner. All questionnaires included a letter describing the context and purpose of the study, as well as a sealed envelope to return the questionnaire once completed.

The Safety Attitudes Questionnaire

Development and History

The Safety Attitudes Questionnaire (SAQ) is a refinement of the Intensive Care Unit Management Attitudes Questionnaire (ICUMAQ)^{11,33,34} which derived from the Flight Management Attitudes Questionnaire (FMAQ), widely used in commercial aviation.³⁵ It was developed in 2006 by Bryan Sexton, Eric Thomas and Bob Helmreich from the University of Texas, with funding from the Robert Wood Johnson Foundation and the Agency for Healthcare Research and Quality (AHRQ).²⁴

Evidence on SAQ data validity and reliability

The SAQ allows assessment of the perceptions and attitudes of health professionals related to patient safety in several clinical areas and health services, and was validated in a sample of 10.843 health care providers in 203 clinical areas (including intensive care units (ICUs), operating theatres, inpatient units and outpatient clinics) in three countries (United States of America (USA), the United Kingdom and New Zealand), featuring good psychometric properties.²⁴ Since then, the SAQ has been implemented in a variety of inpatient and outpatient environments in more than 1.300 hospitals in the USA, England, Australia, Switzerland, Italy, Spain and New Zealand,¹⁴ and its reliability and validity have been documented in several countries, such as: the United Kingdom,³⁶ Norway,¹⁴ Ireland,³⁷ Iran,³⁸ Turkey,³⁹ Sweden,⁴⁰ China,²⁶ Egypt,⁴¹ the Netherlands,⁴² Greece,⁴³ Brazil,¹⁷ Holland,⁴⁴ German-speaking Switzerland⁴⁵ and Malaysia,⁴⁶ and is available in more than ten languages.⁴⁶ In addition to the above, it is considered the only safety environment measurement tool providing evidence of direct association with the results observed in patients.^{19-21,28}

Items, Factors and Scoring

The full version of the questionnaire includes 60 items, of which only 30 are standard and identical in all clinical settings. These 30 basic items make up the short version reviewed in this study (SAQ - Short Form), to which other items are added to provide a total of 36, thus completing the first part of the resource. In the second part, there is additional information on the professionals' data (gender, function, area of operation and seniority of their functions in the service).²⁴

The generic version may be used to assess patient safety culture throughout the organization, while the additional versions have been adapted for use in specialized areas such as intensive care units, operating theatre, inpatient and outpatient services. For each version of the SAQ, the contents of the items are the same, with minor changes that reflect the clinical area in question. For example: "in this unit it is difficult to discuss errors" in the generic version versus "in this ICU it is difficult to discuss errors" in the ICU version.²⁴

The SAQ features six dimensions ranging from organizational factors, work environment factors and team factors:

- Teamwork environment: perception of the quality of the collaboration among the team's professionals (Items 1-6);
- Safety environment: perception of a strong and proactive organizational commitment to safety (Items 7-13);
- Job satisfaction: pleasant feeling or emotionally positive state resulting from the perception of the work experience (Items 15-19);
- Stress recognition: recognition of how the performance is influenced by stressful factors (Items 20-23);
- Perception of management: approval of the management's actions regarding safety issues (Items 24-29). Each of these items is measured at two levels (perception of service management and perception of hospital management);
- Working conditions: perception of the quality of the environmental and logistical support within the workplace (eg, equipment and professionals) (Items 30-32).

Items 14 and 33-36 are not part of the dimensions referred to above, and items 2, 11 and 36 are written in reverse.²⁴ The answers to each question follow a five-level Likert scale: strongly disagree, slightly disagree, neutral, slightly agree and strongly agree. The final score ranges from 0 to 100, where zero represents the worst and 100 the best perception of the safety environment.

Translation and Cultural Adaptation to Portugal

The process of translation and cultural adaptation was based on the respect for scientific reliability, following the guidelines prescribed by Beaton et al.(2000):⁴⁷ translation, synthesis, back translation, expert committee, pre-test and validation by the original authors of the questionnaire. The translation stage was provided by two bilingual translators, native in the target language. As recommended, only one of the translators was aware of the goals of the study and concepts researched. In the following stage, the two translations were compared, thus requiring special care in order to obtain a version suited to the new context, but congruent with the original version.⁴⁸ In the back-translation stage, the questionnaire was translated back into its original language by two independent bilingual translators. These translators have the document's source language as their mother tongue and had no prior knowledge of the original questionnaire. Subsequently, a committee of experts (experts in the field that the resource is supposed to assess) assessed the validity of its theoretical content. For two weeks, these experts reviewed the documents produced in the previous stages, taking into account the semantic, idiomatic, experimental and conceptual equivalence between the original resource and the version created, thus ensuring the adequacy of the translation and validity of its content, and preserving the repeat ability thereof.^{47,49} The changes suggested by the committee were considered pertinent and relevant and were included by consensus, thus obtaining a preliminary draft version of the SAQ - Short Form 2006 PT or pre-test version. This version was applied to a sample of the target population consisting of twenty professionals employed at CHCB, of which ten were nurses and ten were operational workers, including people with different levels of education. Sampling was by convenience and the invitation was made through personal contact. Since there were no difficulties in the understanding of any statements in the document, nor were any questions raised relating to the format and content thereof, the pre-final version did not require reformulation, thus becoming the final version in Portuguese: SAQ - Short Form 2006 PT. In the final stage, the documents resulting from the different stages of this methodological process were sent by email to the authors of the resource, who approved the Portuguese version while emphasizing the reliability of the methodological approach applied throughout the entire process. Afterwards, the process of translation and cultural adaptation was concluded, followed by the assessment study on the psychometric properties of the resource.

Data Analysis

All data were processed and statistically analyzed using the software Statistical Package for Social Sciences (SPSS) version 22 for Windows. Cronbach's α , the item-total correlation coefficient and Cronbach's α with the removal of each of the resource's items were defined for the reliability study.

Test-retest reliability was assessed to determine the degree of correlation of the results obtained in both instances through Pearson's correlation coefficient. In order to analyze the validity of the construct, we drew upon the confirmatory factor analysis (CFA) through the software Analysis of Moment Structures (AMOS) version 22, based on Marôco's reference values.⁵⁰

Results and Discussion

Response Rates

700 questionnaires were distributed and 640 were collected, resulting in a significant response rate of 91.0%. Initial screening showed 17 questionnaires to be invalid, and these were therefore excluded, leaving a sample of 623. There was a breakdown by intervention areas, with higher incidence in General Emergency Services (6.6%), Medicine II (6.3%) and Medical Specialties (5.3%). With regard to the function performed, it was found that the sample was mainly composed of nurses (47.0%), followed by auxiliary staff (22.3%), administrative assistants (10.1%), diagnostics and therapeutics technicians (9.8%) and physicians (5.3%). In its most part, the sample is of female gender (70.9%), provides care to adults (60.0%) and has been operating in the service from 11 to 20 years (38.2%).

Reliability Analysis

The reliability analysis of the adapted version of the SAQ - Short Form 2006 was carried out by determining Cronbach's α coefficient to analyse its internal consistency. Table 1 shows that the Portuguese version of the resource showed an alpha of 0.92.

Table 1 - Cronbach's α Coefficient SAQ - Short Form 2006 PT and Dimensions

Total SAQ and dimensions	Number of items	Cronbach's α
Total SAQ	41	0,92
Teamwork environment	6	0,70
Safety environment	7	0,73
Job satisfaction	5	0,86
Stress recognition	4	0,82
Perception of management	10	0,88
Working conditions	3	0,71

This value is higher than that that obtained in the original version of Sexton, 0.90²⁴, as well as that of validation studies by Carvalho and Cassiani¹⁷, Devriendt et al.⁴⁴ and Kar and Hamid⁴⁶ with alphas of 0.89, 0.90 and 0.85 respectively. According to the literature, this alpha value indicates a strong correlation between the items and provides evidence that the resource is highly accurate, thus generating fewer errors.³⁰ The same was confirmed by Sexton et al.,²⁴ Deilkås and Hofoss,¹⁴ Kaya et al.,³⁹ Lee et al.,²⁶ Nordén-Hägg et al.,⁴⁰ Carvalho and Cassiani,¹⁷ Devriendt et al.,⁴⁴ Etchegaray and Thomas,²⁷ and Bondevik et al.²⁹ The dimension assessment shows that the six dimensions each presented an alpha above 0.70, with Perception of management (0.88), Job satisfaction (0.86) and Stress recognition (0.82) being of high reliability, and all others of moderate reliability. Perception of management recorded the best internal consistency (0.88) and the dimensions of Working conditions and Teamwork environment showed the lowest, though acceptable, values (0.71 and 0.70 respectively). Table 2 combines the results of several studies that assessed the internal consistency of the SAQ within different contexts, with alpha values for the different dimensions ranging between 0.44 and 0.91. We highlight that the Chinese version²⁶ and the Swedish version⁴⁰ revealed values of internal consistency above the Portuguese version in all dimensions except for Perception of management, which presented the highest alpha value when compared to other studies.

Table 2 - Cronbach's α Coefficient Assigned to the Dimensions of the SAQ - Short form 2006 PT and Comparison with other Validation Studies

Dimensions	1	2	3	4	5	6	7	8
Teamwork environment	0,70	0,68	0,79	0,81	0,65	0,80	0,68	0,65
Safety environment	0,73	0,76	0,82	0,75	0,67	0,83	0,67	0,75
Job satisfaction	0,86	0,85	0,91	0,89	0,77	0,78	0,80	0,79
Stress recognition	0,82	0,82	-	0,86	0,78	0,76	0,85	0,79
Perception of management	0,88	0,82/0,84*	0,87	0,72	0,75/0,79*	0,63	0,80	0,44
Working conditions	0,71	0,71	0,79	0,72	0,65	0,59	0,78	0,65

(1) Current study; (2) Deilkås & Hofoss, 2008; (3) Lee et al., 2010; (4) Nordén-Hägg et al. (2010);

(5) Carvalho (2011); (6) Göras et al., 2013; (7) Kar & Hamid, 2013; (8) Zimmermann et al., 2013.

* Includes alpha values for the Perception of hospital management and Perception of service management

These results disagree, however, with the studies by Zimmerman et al.⁴⁵ and of Bondevik et al.²⁹ in which the dimension of Perception of management obtained the lowest alpha. Cultural differences regarding the perception of management as to patient safety issues may be the cause of such asymmetry. In line with the Portuguese version, in the Norwegian¹⁴, Chinese²⁶ and Brazilian¹⁷ studies, the dimension of Teamwork environment presented the lowest alpha value (0.68, 0.79 and 0.65 respectively), when compared to all other dimensions. Despite the alpha value for this dimension in this study being acceptable, these results may indicate that some items in this dimension should be reviewed. Table 3 demonstrates the results of the Pearson correlations between the dimensions and the total value of the resource. We observe that the adapted version of the SAQ to Portugal indicated correlation values for each dimension with the total value ranging from 0.094 to 0.866.

Table 3 - Pearson's Correlation Coefficient between Dimensions and the Total SAQ

Dimensions and Total SAQ	1	2	3	4	5	6	Total SAQ
1	1,000	,680**	,586**	-,055	,512**	,482**	,765**
2	,680**	1,000	,637**	-,105**	,553**	,495**	,797**
3	,586**	,637**	1,000	-,094**	,506**	,460**	,747**
4	-,055	-,105**	-,094**	1,000	-,039	-,068*	,094**
5	,512**	,553**	,506**	-,039	1,000	,614**	,866**
6	,482**	,495**	,460**	-,068*	,614**	1,000	,710**
Total SAQ	,765**	,797**	,747**	,094**	,866**	,710**	1,000

1- Teamwork environment, 2- Safety environment, 3- Job satisfaction, 4- Stress recognition, 5- Perception of management, 6- Working conditions. ** $p < 0,01$; * $p < 0,05$.

There were positive (moderate to very strong) and significant correlations among all dimensions, except for the Stress recognition in which we verified a rather weak correlation. The results for the dimension of Stress recognition (with the total SAQ and all other dimensions) are in accordance with the study of the original authors of the SAQ,²⁴ as well as the studies conducted by Lee et al.,²⁶ Nordén-Hägg et al.,⁴⁰ Abdou and Saber,⁴¹ Carvalho and Cassiani,¹⁷ Göras et al.⁵¹ and Zimmermann et al.⁴⁵ For the internal consistency analysis, Pearson's item-total correlation coefficients and the value of Cronbach's alpha, should the item be removed, were also determined in order to verify whether all items contribute to greater consistency or if any of the items should be excluded from the questionnaire (table). The corrected item-total correlation values ranged from a minimum of 0.21 (item 2) to a maximum of 0.74 (item 21), proving the homogeneity of the scale. The reverse items and items 14 and 29 present poor correlation, although their removal does not contribute to an increase in the internal consistency; therefore, all items suggested by the authors of the questionnaire were maintained. To complete the reliability analysis of the Portuguese version of the SAQ - Short Form 2006, we estimated its repeatability by applying the Test-Retest to twenty professionals of the sample at two different times, about two weeks apart. On table 4 it is possible to observe that this measure, assessed according to Pearson's correlation, presents a value of 0.999 ($p = 0.000$). For the dimensions, the value ranged from 0.985 (dimension: Teamwork environment) and 1.000 (dimensions: Job satisfaction and Perception of management).

Table 4: Pearson's Correlation Coefficient on the Test-Retest

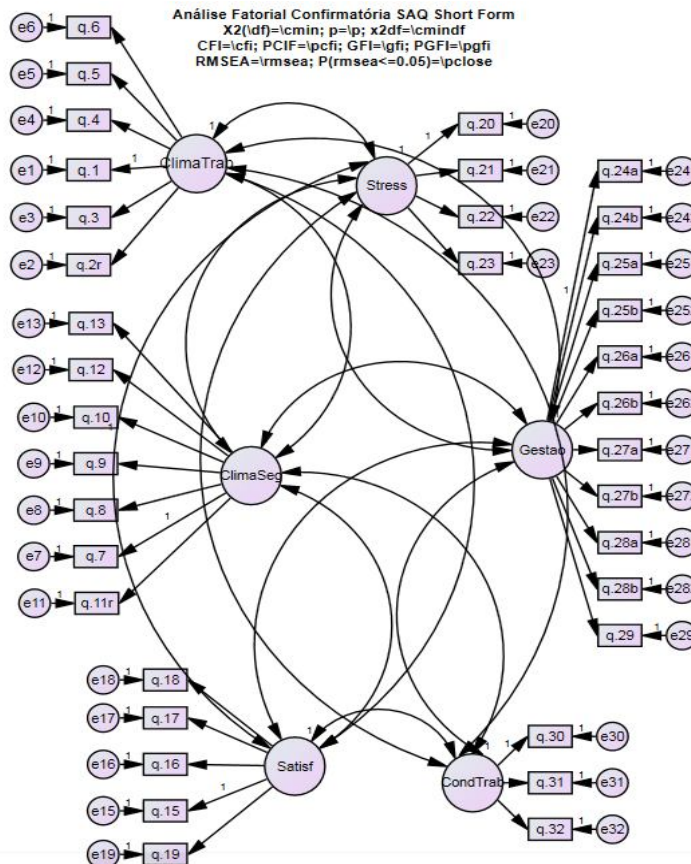
Total SAQ and dimensions	N	r	P
Total SAQ	20	0,999	0,000**
Teamwork environment	20	0,985	0,000**
Safety environment	20	0,994	0,000**
Job satisfaction	20	1,000	0,000**
Stress recognition	20	0,996	0,000**
Perception of management	20	1,000	0,000**
Working conditions	20	0,996	0,000**

The results obtained show the strong repeatability potential of this measuring resource, highlighting the magnitude of the concordance and consistency of the responses obtained upon the required repetition of the measure, carried out with the same subjects and under the same conditions. These values attest in favour of its temporal stability, and so once again we may state that the questionnaire SAQ - Short Form 2006 PT shows good internal consistency or reliability.

Validity Analysis

The construct validity was analysed through the CFA, which assesses the quality of the adjustment of the theoretical model to the correlational structure observed between the items that make up the questionnaire SAQ - Short Form 2006 PT. The adequacy of the data for the implementation of this procedure was verified through the Kaiser-Meyer-Olkin test (0.879) and the Bartlett test ($\chi^2(820)=7480.460, p=0.000$), which revealed that the sample under study may be submitted to a CFA. Image 1 shows the theoretical model under study, also termed the model pathway diagram. In order to attain an approximation to the factor analysis carried out by the author of the questionnaire, we performed an analysis of the master model through the IT software AMOS (version 22).

Image 1 - Path Diagram of the Structural Equation Model SAQ - Short form 2006



Clima Trab -Teamwork environment; Clima Seg -Safety environment; Satisf -Job satisfaction; Stress - Stress recognition; Gestao - Perception of management; CondTrab - Working conditions.

However, the quality of the adjustment indices were not satisfactory ($X^2/df=5,323$; $CFI=0.626$, $RMSEA=0.106$; $GFI=0.718$; $P(rmse\leq 0.05)<0.001$). With the same software we tested other alternative models, with the factor solution comprising six factors (image): Teamwork environment, Safety environment, Job satisfaction, Perception of service management, Perception of hospital management and Working conditions, which revealed rather robust model adequacy indices ($X^2/df=1.864$; $GFI=0.908$; $CFI=0.951$ and $RMSEA=0.047$), proving the quality of the adjustment to the empirical data. Prior studies that sought to investigate the organization of the items in the questionnaire presented different results as to the most appropriate model. The reason for this asymmetry may be related to the differences produced in the translation and cultural adaptation processes and even in the different concepts of safety environment in the study locations. The original authors of the questionnaire began by submitting the six factor model and all of the items to the CFA. However, similar to the results of this particular study, they obtained poor associations and unsatisfactory adjustment index values. They re-specified the model, sequentially excluding items until satisfactory adequacy was obtained. The adjustment of their final model (containing ten items less than initially) was broadly satisfactory, as shown by indices: $X^2(784)=10,311.27$, $p<0.0001$; $CFI=0.90$; $RMSE=0.03$.²⁴ The same procedure was carried out by Zimmermann et al.,⁴⁵ having obtained acceptable to good adjustment values for only 29 items of the questionnaire. However, the results of the CFA highlighted some potentially problematic items in terms of factor allocation (all of them in the Perception of management and Working conditions dimensions). On the other hand, the exploratory factor analysis conducted by these authors did not reveal a superior structure to the original. The correlations have shown that all dimensions are significantly correlated with each other, except for the Stress recognition. These results corroborate the studies by Speroff et al.,⁵² Taylor et al.⁵³ and Zimmermann et al.⁴⁵ The finding that the Stress recognition dimension should not be included in the hypothetical model of factors is consistent with the studies by Deilkås and Hoffoss,⁵⁴ Lee et al.²⁶ and Bondevik et al.²⁹ This dimension is considered invalid as a dimension to explain the safety environment because it does not vary significantly among organizational units⁵⁴⁻⁵⁷ and reveals issues in the construct validity.⁵⁸ In the Chinese version of the SAQ²⁶, this dimension was removed from the final model because its association with the safety environment was significantly poorer than that of the other five dimensions.

Confirming, thus, the results, Bondevik et al.²⁹ based their analysis on the model with five factors, meaning the six-factor model, containing Stress recognition, could not be confirmed. The lack of association between Stress recognition and the remaining dimensions was studied by Taylor and Pandian.⁵⁸ In the article "A dissonant scale: stress recognition in the SAQ", the authors state the possible explanation for these results may be related to how the professionals answering the questionnaire interpret the items in this dimension. The authors' intent is to capture the attitudes that reflect the recognition of how performance is influenced by stress ful factors, indicating the level at which people are placed or place themselves into error-inducing conditions.^{11,59} However, it appears that in many cases the responses are indicative of the level of stress experienced at that time, thus reflecting the fatigue/stress index in the workplace and not the safety environment. Considering the results, we suggest further research and refinement of the items that make up the dimension of stress recognition, with a view to correct interpretation and improvement of the adjustment model containing this factor. In addition to the above, the model indices were significantly improved when the Perception of management dimension was divided into two groups: one on the Perception of hospital management and another on the Perception of service management. This reasoning was originally put across by Sexton et al.⁶⁰ in their report published on the structure of the short version of the SAQ, and has also been confirmed in previous studies.^{14,17} Considering the adjustment values resulting from the final model, the Portuguese version of the SAQ presents good construct validity, thus indicating it is a valid measure of the safety environment within the healthcare context in Portugal.

Conclusions

After being subjected to rigorous procedures of reliability and validity assessment, the SAQ version –Short Form 2006 PT revealed good psychometric properties, with highly satisfactory and auspicious results, thus allowing its implementation within the Portuguese cultural context, so as to allow international benchmarking.

We expect to provide Portuguese healthcare institutions with an important tool for the assessment of the safety culture, by measuring the safety environment, capable of diagnosing the areas that need to be optimized (management, working conditions and safety environment) and among professionals (stress, job satisfaction and teamwork environment), so it may be used in the institution as a whole as well as providing specific analysis by sectors or units, in different clinical areas and different types of healthcare providers. While envisaging its maximum potential in contributing to the improvement of healthcare within the national context, we suggest the development and dissemination of new research projects with this resource in different contexts within the healthcare area, such as: the implementation of longitudinal studies to assess the effects of safety interventions over time, as well as studies that drill deeper into the association between safety environment and patient outcomes (clinical outcomes, adverse events, patient satisfaction) and the safety environment and outcomes for health professionals (turnover, burnout, job satisfaction).

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Abbreviations

AFC: análise fatorial confirmatória; CHCB: Centro Hospitalar Cova da Beira; SAQ: Safety Attitudes Questionnaire.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgements

We are grateful to all the health professionals who participated in the study and completed the SAQ questionnaire.