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Original Article

Factors associated with the patient safety climate at a teaching hospital[1]

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Objectives: to investigate the association between the scores of the patient safety climate and socio-demographic and professional variables. Methods: an observational, sectional and quantitative study, conducted at a large public teaching hospital. The Safety Attitudes Questionnaire was used, translated and validated for Brazil. Data analysis used the software Statistical Package for Social Sciences. In the bivariate analysis, we used Student's t-test, analysis of variance and Spearman's correlation of (α=0.05). To identify predictors for the safety climate scores, multiple linear regression was used, having the safety climate domain as the main outcome (α=0.01). Results: most participants were women, nursing staff, who worked in direct care to adult patients in critical areas, without a graduate degree and without any other employment. The average and median total score of the instrument corresponded to 61.8 (SD=13.7) and 63.3, respectively. The variable professional performance was found as a factor associated with the safety environment for the domain perception of service management and hospital management (p=0.01). Conclusion: the identification of factors associated with the safety environment permits the construction of strategies for safe practices in the hospitals.

Descriptors: Patient Safety; Safety Management; Health Personal.

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Introduction

The occurrence of adverse events entails countless losses related to the patient, such as disabilities, physical and psychological trauma, increased length of hospital stay and distancing from society and work. These losses do not only relate to the patient, but also to the professionals, who have ethical and moral damages, and losses in professional-patient interaction[1]. For health institutions, the adverse events (AEs) cause increased costs, loss of confidence in the institution, as well as moral and organizational problems[1].

All of these implications, caused by unsafe practices in health, makes the issue of AEs turn into a public health problem, indicating the need to develop strategies for the monitoring of errors and improvements related to patient safety[2]. For safe strategies to be implemented in the interest of patient safety, it is necessary that health organizations adopt a safety culture model.

Safety culture can be defined as the set of individual and group values, attitudes, perceptions that determine the commitment and style, concerning questions related to patient safety in a health organization[3].

In the literature, some instruments have been developed in order to measure the patient safety culture, through the health professionals' perception of the safety climate[4]. The climate reflects the perception of professionals on safety issues at any given time in their workplace[5]. The climate is understood as the measurable part of the safety culture[5].

Studies show that positive perceptions of the safety climate are associated with the adoption of safe behaviors, improved communication, conducting training programs, reduction of adverse events, among others, contributing to safe practices in patient care[4,6-7].

Other factors in the institutional and environmental spheres may be related to the adoption of the safety climate, such as professional stress, teamwork, job satisfaction, the institution's management structure and work conditions.

Researchers cite strengths and weaknesses that influence the implementation of a safety climate, based on the perception of nursing professionals. Among the factors that contributed to this implementation were: organizational change, professional training and development, relationship with patients, research and strategic planning The following weaknesses were highlighted: organization and infrastructure of the institution, shortcomings in communication and inefficiency of professional training with a safety focus[8].

Thus, identifying factors that are associated with the patient safety climate is an important tool, capable of diagnosing factors that need improvement within health institutions and among professionals, guaranteeing safe and high-quality patient care. In addition, there is a clear lack of Brazilian studies using tools that measure hospitals' safety climate. Among the tools, the Safety Attitudes Questionnaire (SAQ), validated in Brazil in 2012, has been adopted in some Brazilian studies, being a valid and reliable tool that is considered one of the most sensitive and capable of assessing safety attitudes[9]. Other studies are observed in the country assessing the safety climate, but with the use of other tools, such as the study conducted in the state of Paraná, in which the scale called "Safety Climate " was applied, translated and validated in Brazil[10].

Based on the above, the aim of this research was to determine the association among patient safety scores, sociodemographic variables and health professionals.

Method

Observational and sectional study with a quantitative approach, undertaken at a large public teaching hospital that attends to high-complexity patients, located in the region of Triângulo Mineiro, Minas Gerais, Brazil.

Simple random samping was applied using the application Power Analysis and Sample Size (PASS), which considered a determination coefficient R^2=0.02 in a multiple linear regression model with four predictors, adopting a significance level or type I error of α=0.05 and type II error of β=0.2. The sample consisted of 556 health professionals , including the nursing team (baccalaureate nurse, nursing technicians and auxiliary nurses), physicians, physiotherapists, social workers, speech, language and hearing therapists, laboratory, pharmacy and radiology technicians, dieticians, occupational therapists, pharmacists, health aids and psychologists. The data were collected between May and July 2013.

The study participants were health professionals who had worked at their services for at least one month, working at least 20 hours per week and who agreed to participate in the study by signing the Informed Consent Form. Professionals on medical leave or leave of absence during the data collection period and who could not be contacted after three attempts were excluded.

To collect the data, the tool called Safety Attitudes Questionnaire (SAQ) was used, validated for Brazilian Portuguese[11]. The SAQ is divided in two parts. The

first part contains 41 items and corresponds to six domains, divided in: Teamwork Climate, Satisfaction at Work, Perception of Service and Hospital Management, Safety Climate, Work Conditions and Perceived Stress. The response to each item follows a five-point Likert scale*:* disagrees completely (A), disagrees partially (B), neutral (C), agrees partially (D), agrees completely (E) and does not apply. The final score of the SAQ ranges between 0 and 100, with zero corresponding to the worst perceived safety climate and 100 to the best. According to the authors of the original tool, scores of 75 or higher are considered as positive[12].

The second part aims to collect sociodemographic and professional data (sex, professional category, length of experience in the specialty and work unit). In addition, other professional variables were added (activity sector, main and professional activity, time since graduation and length of experience at the institution, graduate degree and other employment). The professional's activity sectors were divided in accordance with Ministry of Health Decree 930, issued on August 27th 1992[13], which classifies the hospital areas according to the contamination potential as critical, semi-critical and non-critical.

The health team professionals received the data collection instrument for completion and return, with a preset deadline, after signing the Free and Informed Consent Form.

The data were included in an electronic worksheet in *Excel*® for *Windows*®, validated using double data entry and exported to Statistical Package for the Social Sciences (SPSS), version 19.0 for Windows® for further processing and analysis.

To verify the patient's safety climate, initially, any reverse items in the tool were inverted and, then, the formula (*m*(q.1,q.2r,q.3,q.4,q.5,q.6,q.7,q.8,q.9,q.10,q.11r,...q.41))-1)x25) was applied, in which *m* corresponds to the mean score of the items in the tool as a whole. The score in each domain was calculated based on the formula (*m*-1)x25, where *m* is the mean item score in that domain, ranging in the interval [0-100].

In the preliminary bivariate analysis, Student's t-test was used (dichotomous categorical), variance analysis (ANOVA) for three or more categories and Spearman's correlation test for the ordinal variables. Associations were considered statistically significant when $p \leq 0.05$.

Next, multiple linear regression was used to determine the predictors associated with the safety climate. Statistical significance was set at 0.05.

This study received Institutional Review Board approval under opinion 2306/2012, In compliance with Resolution 196/96 on research involving human beings[14].

Results

Sociodemographic and professional characteristics

Among the 556 professionals who participated, the majority was female (426, 76.6%); nursing team members (401, 72.1%); main activity involving adult patients (300, 54.0%); care functions only (393, 70.7%); active in critical care area, according to contamination potential of hospital areas (287, 51.5%); without any graduate degree (320, 57.6%); and without any other employment contract (394, 70.9%), according to Table 1.

As regards the length of experience in the specialty area, the largest proportion had between 5 and 10 years of experience, (134, 24.1%). Concerning the length of professional activity at the institution where the field study was carried out, between 11 and 20 years prevailed, (161, 29.0%). What the time since graduation is concerned, more professionals had graduated between 11 and 20 years earlier, (177, 31.8%), according to Table 1.

Table 1 presents the research participants' (n=556) sociodemographic and professional characteristics.

Table 1 – Sociodemographic and professional characteristics of research participants (n=556). Uberaba, MG, Brazil, 2013

Variables	n	%
Sex		
Male	130	23.4
Female	426	76.6
Professional categoryl		
Nursing team	401	72.1
Medical team	52	9.4
Other professionals	103	18.5

(continue...)

Table 1 - (continuation)

Variables	n	%
Main activity		
Adult	300	54.0
Pediatric	105	18.9
Both	151	27.2
Professional activity		
Care only	393	70.7
Administrative only	15	2.7
Both	121	21.8
Not in direct contact with patient	27	4.9
Activity sector		
Critical area	287	51.5
Semi-critical area	242	43.8
Non-critical area	27	4.9
Length of experience in specialty		
Less than 6 months	6	1.1
6 to 11 months	22	4.0
1 to 2 years	67	12.1
3 to 4 years	103	18.5
5 to 10 years	134	24.1
11 to 20 years	128	23.0
21 years or more	96	17.3
Length of work at the institution		
Less than 6 months	6	1.1
6 to 11 months	19	3.4
1 to 2 years	56	10.1
3 to 4 years	67	12.1
5 to 10 years	155	27.9
11 to 20 years	161	29.0
21 years or more	92	16.5
Time since graduation		
Less than 6 months	1	0.2
6 to 11 months	4	0.7
1 to 2 years	30	5.4
3 to 4 years	60	10.8
5 to 10 years	148	26.6
11 to 20 years	177	31.8
21 years or more	136	24.5
Graduate program		
Yes	236	42.4
No	320	57.6
Type of graduate program		
Lato sensu		
Specialization	203	36.5
Stricto Sensu		
Master's	27	4.9
Doctorate	9	1.6
Post-doctorate	1	0.2
Does not apply	316	56.8
Other job contract		
Yes	162	29.1
No	394	70.9

Descriptive analysis of Safety Attitudes Questionnaire scores

The mean and median of the general score were 61.8 (SD=13.7) and 63.3, respectively. The higher the score, the better the professionals perceive the safety climate. According to the original authors of the SAQ, however, scores are considered positive when the total score is equal to or higher than 75, indicating a negative general perception of the safety climate in this study.

Per domains, the mean (score) ranged between 52.4 (SD=19.5) and 80.5 (SD=17.7) and the median between 50.0 and 85.0. It was perceived that domain 5, perception of unit and hospital management, showed the worst score (mean 52.4; SD=19.5), while domain 3, satisfaction at work, showed the highest score (mean 80.5; SD=17.7) among the professionals studied, according to Table 2.

Table 2 shows the general and domain scores and descriptive analysis of the SAQ.

Table 2 – Descriptive analysis of general and domain scores of SAQ (n=556). Uberaba, MG, Brazil, 2013

Score	Mean	Median	Min-Max Value		Standard Deviation
General	61.8	63.3	10.9	95.7	13.7
Domain 1- Teamwork climate	68.3	70.8	4.17	100	19.0
Domain 2- Safety climate	63.5	67.8	7.1	100	18.2
Domain 3- Satisfaction at work	80.5	85.0	0	100	17.7
Domain 4- Perceived stress	64.9	68.7	0	100	27.2
Domain 5- Perception of unit and hospital management	52.4	52.3	0	100	19.5
Domain 6- Work conditions	53.5	50.0	0	100	26.3

Factors associated with the safety climate

In the preliminary bivariate analysis, the variables that revealed statistically significant associations were: professional activity, professional category, length of professional activity, time since graduation and length of experience at the institution.

For the variable professional activity (care and non-care), the associations were significant for the domain perception of unit and hospital management (p=0.01), where the non-care professionals obtained a better score than the professionals active in direct care.

As regards the professional category, statistically significant relations were found for the general score (p=0.02), for the domain perception of unit and hospital management (p=0.03) and the domain work conditions (p=0.05). As perceived, the medical team's perception was better when compared to the nursing team category for these three variables.

What the variable length of professional activity is concerned, p=0.01 was found for the domain perceived stress, demonstrating that the professionals with less than six months of activity perceive the acknowledgement of stressful factors better.

For the variable time since graduation, significant associations were evidenced for the domains satisfaction at work (p=0.005) and perceived stress (p=0.005). Professionals with less than six months since graduation showed better perceptions in this domain when compared to the other categories.

For the variable length of experience at the institution, statistical significance was found in the domain satisfaction at work (p=0.01) and perceived stress (p=0.03). Professionals with 21 years of experience or more presented better perceptions when compared to the other professionals.

After the multivariate analysis through multiple linear regression, the sole statistically significant predictive variable (p=0.01) associated with the SAQ scores was professional activity for the domain perception of unit and hospital management. In fact, this variable already demonstrated a significant association in the preliminary bivariate analysis. This result demonstrates that the non-care professionals (mean 58.0) show a better perception of the management when compared to the care professionals (mean 53.1), according to Table 3.

Table 3 shows the multiple linear regression analysis of the statistically significant variables in the bivariate analysis associated with the SAQ scores.

Table 3 – Multiple linear regression of factors associated with SAQ scores of participating professionals (n=556). Uberaba, MG, Brazil, 2013

Variables	General Score		Score Dom. 1- Safety climate in team		Score Dom. 2- Safety climate		Score Dom.3- Satisfaction at work		Score Dom. 4- Perceived stress		Score Dom. 5- Perception of unit and hospital management		Score Dom. 6- Work conditions	
	β*	P†	β*	P†	β*	P†	β*	P†	β*	P†	β*	P†	β*	P†
Professional activity	-0.07	0.07	-0.06	0.13	-0.01	0.78	-0.03	0.39	0.05	0.23	-0.10	0.01	-0.04	0.25
Nursing team	-0.05	0.25	0.04	0.38	0.00	0.94	-0.05	0.26	-0.09	0.07	-0.06	0.23	-0.08	0.11
Medical team	0.06	0.21	0.09	0.06	-0.01	0.76	-0.01	0.83	0.02	0.69	-0.06	0.23	-0.08	0.11
Length of experience	0.03	0.51	0.00	0.91	0.02	0.73	-0.03	0.53	0.01	0.75	0.05	0.36	0.07	0.22
Length of work at institution	0.05	0.37	-0.09	0.13	-0.04	0.41	0.10	0.09	0.07	0.20	-0.03	0.55	-0.10	0.08

* β: Standardized regression coefficient; † *P*: *P* value.

Discussion

The patient safety climate score in this study obtained a mean score of 61.8 (SD=13.7) and a median score of 63.3. In the literature, studies were found whose mean scores were also inferior to the acceptable score of 75[15-18]. It is highlighted that scores inferior to 60 are considered a sign of alert for health organizations, indicating the urgent need to promote the safety climate at the institution[11].

In this research, the variable professional activity (care and non-care) was considered a predictive variable for the domain perception of unit and hospital management (p=0.01). In line with this finding, a study developed to identify the safety climate in hospitals in the USA found significant associations between care and management professionals, demonstrating that management professionals had a more positive perception than care professionals[19].

A study involving outpatient professionals in Texas, USA also found significant differences between professional activity (care and non-care) and the SAQ domains. That study demonstrated that, for the domain perception of unit and hospital management, the management (non-care) professionals obtained better scores when compared to the medical professionals[20], demonstrating the non-care professionals' better perception of management actions than patient safety issues.

The findings of a study involving health professionals at a hospitalization unit of a teaching hospital in Ireland demonstrates that the nurse managers obtained higher scores for the domains teamwork climate (p<0.05) and safety climate (p<0.01) than the care professionals[18].

Authors suggest that the better perception among management than among care professionals can be explained by the managers' sense of propriety and responsibility regarding their roles in the hospital infirmaries. In addition, the care professionals may feel excluded from administrative decision processes, besides their lack of participation in the elaboration and implementation of strategies, reducing their autonomy and generating dissatisfaction with management actions[18].

Another explanation for these findings can be related to the care professionals' experience with safety risks, making them display worse perceptions of the management, as these professionals have less contact with direct patient care. In addition, there is a culture of hiding negative information (occurrence of errors, incidents and adverse events) among the professionals, making it difficult for the safety problems to reach the hospital management. Another aspect appointed is related to the management professionals' desire to be considered as an organization committed to safety, making them display positive perceptions[19]. This situation can turn into a problem though when this positive view does not reflect the true institutional reality[20].

In the literature, however, studies were found that identified other predictors of the patient safety climate. The most mentioned predictors are the professionals' age, sex and professional category [17,21-22].

Hospitals in Cyprus, Greece found that the variables age and reported fatigue at work were considered predictors of the domains teamwork climate, safety climate and work conditions[17].

A study aimed at verifying the relation between sex and perceived safety culture found that the eldest

professionals' perceived teamwork climate was better than the youngest; and that the male sex obtained better perceptions of satisfaction at work and work conditions when compared to the female sex[21].

In a study undertaken at obstetric centers in the USA, statistically significant associations were found between the domain teamwork climate and professional category, with physicians showing better scores than nurses[22]. That study demonstrated different viewpoints and opinions among physicians and nurses regarding safety issues, with physicians demonstrating greater awareness in reports on potential damage when compared to nurses[22].

This study is limited by the fact that, although simple random sampling was used to obtain the sample size, the cross-sectional cohort to obtain the data may limit the spectrum of the analysis. Nevertheless, the proposed objectives were reached. Therefore, longitudinal studies are suggested for the future.

Conclusion

As observed, the general score was 61.8 (SD=13.7) and the median 63.3, demonstrating the professionals' negative perception of the patient safety climate.

In the bivariate analysis, the variables that showed statistically significant associations were: professional activity for the domain perception of unit and hospital management (p=0.01); professional category for the general score (p=0.02), for the domain perception of unit and hospital management (p=0.03) and for the domain work conditions (p=0.05); the variable length of professional activity for the domain perceived stress (p=0.01); the variable time since graduation for the domains satisfaction at work (p=0.005) and perceived stress (p=0.005); and the variable length of experience at the institution for the domain satisfaction at work (p=0.01) and perceived stress (p=0.03). Nevertheless, the professional activity was considered the predictive variable for the domain perception of unit and hospital management, with non-care professionals showing a better perception than care professionals.

The identification of the predictors of patient safety scores is an important tool that, linked with organizational actions, permits diagnosing, intervening and executing activities, based on the domains that need to be improved (work conditions and management actions) and the professionals' intrinsic and extrinsic factors in need of attention (stress, teamwork and satisfaction). All of these efforts contribute to implement the safety climate at the institution, with the promotion of patient safety as the final result.

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