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## PATIENT SAFETY CULTURE IN THE AEROMEDICAL SERVICE

*Cultura de segurança do paciente no serviço aeromédico*

*Cultura de seguridad del paciente en el servicio aeromédico*

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### RESUMO

**Objetivo:** analisar a percepção sobre a cultura de segurança do paciente para o profissional médico e enfermeiro no serviço aeromédico. **Método:** pesquisa quantitativa, exploratória-descritiva, realizada em 2024, utilizando o *Safety Attitudes Questionnaire – Emergency Medical Service* aplicado em formato eletrônico. Os dados foram analisados por estatística descritiva, teste *t*-Student e ANOVA para comparação entre variáveis. **Resultados:** participaram 37 profissionais entre enfermeiros e médicos. Foram identificadas como fortalezas: satisfação no trabalho (90,81%), reconhecimento do estresse (75,68%) e clima de trabalho em equipe (80,63%). Fragilidades foram observadas na percepção da gestão (57,66%), condições de trabalho (53,15%) e clima de segurança (64,09%), com maior criticidade no Sul e Sudeste. **Conclusão:** a satisfação no trabalho e o clima de trabalho em equipe destacam-se como fortalezas na cultura de segurança do paciente no serviço aeromédico. No entanto, há necessidade de fortalecer a gestão e o clima de segurança, considerando variações regionais e de experiência profissional.

**DESCRITORES:** Segurança do paciente; Resgate aéreo; Enfermagem; Serviços médicos de emergência.

### RESUMEN

**Objetivo:** analizar la percepción de la cultura de seguridad del paciente entre los profesionales médicos y de enfermería del servicio aeromédico. **Método:** estudio cuantitativo, exploratorio-descriptivo, realizada en 2024, utilizando el

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Cuestionario de Actitudes de Seguridad - Servicio Médico de Emergencia aplicado en formato electrónico. Los datos fueron analizados mediante estadística descriptiva, prueba t de Student y ANOVA para comparar variables. **Resultados:** participaron 37 profesionales, entre enfermeros y médicos. Se identificaron como fortalezas: satisfacción en el trabajo (90,81%), reconocimiento del estrés (75,68%) y clima de trabajo en equipo (80,63%). Se observaron debilidades en la percepción de la gestión (57,66%), condiciones laborales (53,15%) y clima de seguridad (64,09%), con mayor criticidad en las regiones Sur y Sudeste. **Conclusión:** la satisfacción laboral y el clima de trabajo en equipo se destacan como fortalezas en la cultura de seguridad del paciente en el servicio aeromédico. No obstante, es necesario fortalecer la gestión y el clima de seguridad, considerando las variaciones regionales y la experiencia profesional.

**DESCRIPTORES:** Seguridad del paciente; Ambulancias aéreas; Enfermería; Servicios médicos de urgencia.

## ABSTRACT

**Objective:** to analyze the perception of patient safety culture among medical and nursing professionals in the aeromedical service. **Method:** a quantitative exploratory-descriptive study was conducted in 2024 using the electronic Safety Attitudes Questionnaire - Emergency Medical Service. Descriptive statistics, Student's t-test, and ANOVA were used to analyze the data and compare variables. **Results:** the study included 37 medical professionals, counting nurses and doctors. Strengths identified included job satisfaction (90.81%), stress recognition (75.68%), and teamwork climate (80.63%). Weaknesses were observed in management perception (57.66%), working conditions (53.15%), and safety climate (64.09%), with greater criticality in the south and southeast regions. **Conclusion:** job satisfaction and teamwork climate are strengths of the patient safety culture in the aeromedical service. However, management and safety climate need strengthening, considering regional variations and professional experience.

**DESCRIPTORS:** Patient safety; Air ambulances; Nursing; Emergency medical services.

## INTRODUCTION

Ensuring patient safety is essential to providing quality healthcare services, preventing harm, and achieving desired clinical outcomes. However, technological advances and the growing complexity of healthcare have raised concerns, primarily due to an increase in adverse care-related events.<sup>1</sup>

The effectiveness of implementing and maintaining patient safety strategies depends on integrated actions by both the institution and the organization to improve care practices. In this context, the patient safety culture is a fundamental pillar representing health professionals' commitment to promoting safe behaviors and reducing adverse incidents.<sup>2</sup>

The aeromedical service is an advanced form of prehospital care that provides specialized life support and transports patients by air using either rotary-wing (helicopters) or fixed-wing (airplanes) aircraft.<sup>3</sup> In this field, healthcare professionals must understand the physiology of flight and how it can affect patient conditions. Additionally, they must have basic knowledge of aeronautics, including technical terms, safety measures on board, and specific protocols for boarding and disembarking patients according to Brazilian Civil Aviation regulations.<sup>4,5</sup>

The multidisciplinary team involved in the aeromedical service faces unique challenges, such as exposure to high

altitudes, which can affect the physiology of professionals and patients alike.<sup>3,5</sup> These challenges require heightened attention to safety practices and the work environment, underscoring the importance of evaluating the safety culture adopted by these professionals.

In this context, the Safety Attitudes Questionnaire - Emergency Medical Service (SAQ-EMS) is the preferred instrument for assessing the patient's safety culture. It allows professionals to clearly and objectively measure their perception of the patient's safety climate.<sup>6,7</sup> This tool facilitates identifying gaps and strengths in the air medical service's approach to safety.

The goal of this study is to strengthen the safety culture in the aeromedical service, which is an environment with operational particularities and high risks due to the complexity of aeromedical care. Identifying areas of vulnerability and appreciating good practices are essential to promoting interventions aimed at patient safety and reducing adverse events. Therefore, the research seeks to answer the following question: How do nurses and physicians who work in the aeromedical service perceive the patient safety culture? Understanding these perceptions is essential to supporting actions that improve care quality in this setting. Thus, this study aims to analyze the perception of patient safety

culture among medical professionals and nurses in the aeromedical service.

## METHOD

This exploratory-descriptive research study employed a quantitative approach and was conducted in 2024 through an electronic questionnaire on the Google Forms® platform. The study covered the entire Brazilian territory without specific geographical delimitation and included public and private institutions. The sample consisted of physicians and nurses who work in aeromedical services in different regions of Brazil.

The inclusion criteria were: medical professionals or nurses working in healthcare on board fixed-wing and/or rotary-wing aircraft with at least six months of experience in this role in public or private institutions. Those who work exclusively in land-based prehospital care services (ambulances) were excluded. The minimum work experience requirement of six months was based on a consensus considering the time necessary for professionals to become familiar with the operational routines of the aeromedical service. The sampling was non-probabilistic and based on convenience. The survey was disseminated through social networks, including Facebook®, Instagram®, WhatsApp®, and LinkedIn®, and was sent to representative bodies of aeromedical services to increase reach and participation.

Participants received a link with an introductory message explaining the survey's purpose and estimated completion time. After reading the informed consent form, those who agreed to participate were given access to the questionnaire. The questionnaire was completed individually and voluntarily.

The Safety Attitudes Questionnaire – Emergency Medical Service (SAQ-EMS)<sup>6</sup> was used to collect data. The SAQ-EMS assesses attitudes related to safety on an individual level. It is derived from the original SAQ, which has been validated and translated into Portuguese<sup>7</sup> while maintaining the dimensions addressed in the original instrument. The SAQ-EMS was chosen as the most appropriate instrument for assessing safety culture in the prehospital environment.

The questionnaire is structured in two parts. The first part collected sociodemographic data, including gender, age, years of experience working in the aeromedical service, geographic region, and professional category. The second part administered the SAQ-EMS, consisting of six domains of patient safety culture: Teamwork Climate (TWC), with six questions; Security Climate (SC), with seven questions; Job Satisfaction (JS), with five questions; Stress Recognition

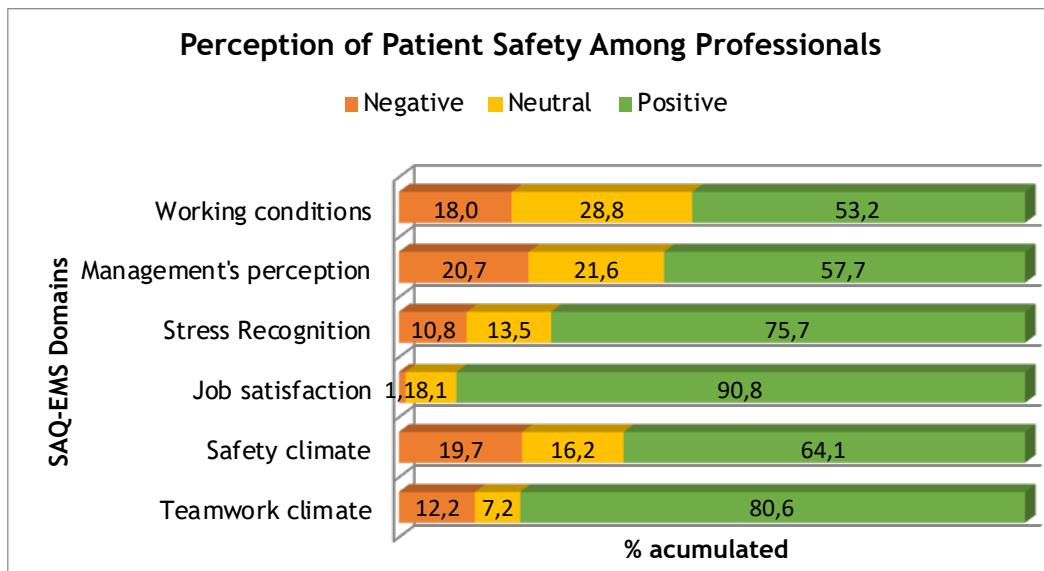
(SR), with four questions; Management Perceptions (MP), with five questions; and Working Conditions (WC), with three questions. Each question was rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The score for each domain was calculated by averaging the items within it. Responses marked as "totally agree" or "agree" were considered positive, and responses marked as "strongly disagree" or "disagree" were considered negative. Responses marked as "neither agree nor disagree" were considered neutral. The dimensions of the patient safety culture were considered strengthened if the percentage of positive responses was greater than or equal to 75%. Conversely, scores below 75% were considered indicative of weaknesses in the patient safety culture.<sup>6,7</sup>

The collected data was organized in a Microsoft Excel® spreadsheet. To present the results, we used graphs and tables with absolute numbers, percentages, means, and standard deviations to portray the distribution of frequencies and the central tendency of the responses. To compare the dimensions of the SAQ-EMS instrument in relation to independent variables with two categories, a Student's t-test was applied. For variables with more than two categories, an analysis of variance (ANOVA) was used. A p-value of less than 0.05 and a 95% confidence interval were adopted.

The project was submitted to and approved by the institution's Research Ethics Committee (CEP) under opinion no. 5,560,783. The study was carried out in accordance with ethical standards, and informed consent was obtained from all participants.

## RESULTS

A total of 37 healthcare professionals participated in the study: 30 nurses (81.08%) and seven physicians (18.92%). Of the participants, 15 (40.54%) were female and 22 (59.56%) were male. The mean age of the participants was 43 years, with a standard deviation of 7.93 years. On average, professionals had eight years of experience working in the aeromedical service. Most participants worked in the public network (28, or 75.68%), while three worked in the private network (8.11%), and six worked in both networks (16.21%). Geographically, 20 participants were from the south (54.05%), eight were from the southeast (21.62%), five were from the northeast (13.51%), three were from the midwest (8.11%), and one was from the north (2.70%) of the country. Figure 1 shows professionals' perceptions of various domains of patient safety culture in the aeromedical service.

**Graph I** - Perception of Patient Safety Among Professionals. Florianópolis, Brazil, 2024

**Source:** Research data (2024).

The results of the SAQ-SEM domains show that job satisfaction, stress recognition, and teamwork strengthen the patient safety culture in the aeromedical environment. Table 1

shows how participants responded to questions about patient safety culture, indicating their perceptions and how often they experienced each item in the six domains.

**Table I** – Perception of the patient safety culture in the aeromedical service in different domains. Florianópolis, SC, Brazil, 2024 (n=37)

Domain	Perception		
	Negative n (%)	Neutral n (%)	Positive n (%)
<b>Teamwork climate</b>			
Suggestions from nurses and doctors are well received in this area.	2 (5,4%)	-	35 (94,6%)
Although it is difficult to speak openly, disagreements are resolved.	19 (51,4%)	2 (5,4%)	16 (43,2%)
Disagreements are resolved appropriately in this area.	3 (8,1%)	4 (10,8%)	30 (81,1%)
I receive the necessary support from the team to care for patients.	1 (2,7%)	2 (5,4%)	34 (91,9%)
Professionals feel comfortable asking questions when they don't understand something.	2 (5,4%)	5 (13,5%)	30 (81,1%)
Doctors and nurses work together as a coordinated team.	-	3 (8,1%)	34 (91,9%)
<b>Security climate</b>			
I would feel safe being served by this service.	-	5 (13,5%)	32 (86,5%)
Errors are handled appropriately in this area.	2 (5,4%)	6 (16,2%)	29 (78,4%)
I know how to address patient safety issues.	6 (16,2%)	4 (10,8%)	27 (73,0%)
I receive appropriate feedback on my performance.	11 (29,7%)	8 (21,6%)	18 (48,7%)
It is difficult to argue about mistakes in this area.	20 (54,1%)	7 (18,9%)	10 (27,0%)
I am encouraged to report concerns on patient safety.	4 (10,8%)	7 (18,9%)	26 (70,3%)
The culture in this area makes it easy to learn from others' mistakes.	8 (21,6%)	5 (13,5%)	24 (64,9%)

Domain	Perception		
Teamwork climate	Negative n (%)	Neutral n (%)	Positive n (%)
<b>Management's perception</b>			
The administration supports my daily efforts.	5 (13,5%)	8 (21,6%)	24 (64,9%)
The administration does not knowingly compromise patient safety.	14 (37,8%)	9 (24,3%)	14 (37,8%)
The administration is doing a good job.	7 (18,9%)	8 (21,6%)	22 (59,5%)
Problematic staff members are dealt with constructively.	8 (21,6%)	12 (32,4%)	17 (46,0%)
If I were to express my suggestions on security to the administration, they would be taken into consideration.	10 (27,0%)	7 (18,9%)	20 (54,1%)
I receive adequate and timely information about events that may affect my work.	5 (13,5%)	7 (18,9%)	25 (67,6%)
<b>Job satisfaction</b>			
I like my job.	-	3 (8,1%)	34 (91,9%)
It's like being part of a big family here.	2 (5,4%)	6 (16,2%)	29 (78,4%)
It's a great place to work.	-	-	37 (100%)
I am proud to work in this field.	-	2 (5,4%)	35 (94,6%)
Morale is high here.	-	4 (10,8%)	33 (89,2%)
<b>Stress recognition</b>			
My performance suffers when my workload is excessive.	2 (5,4%)	5 (13,5%)	30 (81,1%)
I'm less efficient at work when I'm tired.	1 (2,7%)	4 (10,8%)	32 (86,5%)
I am also more likely to make mistakes in tense or hostile situations.	7 (18,9%)	6 (16,2%)	24 (64,9%)
Fatigue impairs my performance in emergency situations.	6 (16,2%)	5 (13,5%)	26 (70,3%)
<b>Working conditions</b>			
There are enough qualified professionals to handle the number of patients.	7 (18,9%)	4 (10,8%)	26 (70,3%)
All the necessary information for making diagnostic and therapeutic decisions is available to me.	4 (10,8%)	6 (16,2%)	27 (73,0%)
Internships in my field are adequately supervised.	6 (16,2%)	19 (51,4%)	12 (32,4%)

**Source:** Research data (2024).

Table 2 shows the means and standard deviations of the SAQ-EMS according to the following independent variables: gender, function, time of experience, and geographic region.

**Table 2** – Means and standard deviation of the SAQ-EMS by independent variables. Florianópolis SC, Brazil, 2024 (n=37)

Independent variable	n	Instrument Dimensions					
		TWC Mean (SD)	SC Mean (SD)	JS Mean (SD)	SR Mean (SD)	MP Mean (SD)	WC Mean (SD)
<b>Gender</b>							
Male	22	4,2 (1,2)	3,8 (1,4)	4,7 (0,7)	4,0 (1,2)	3,6 (1,3)	3,6 (1,3)
Female	15	4,1 (1,6)	3,7 (1,6)	4,6 (1,3)	4,1 (1,4)	3,5 (1,5)	3,4 (1,4)

<b>Independent variable</b>	<b>n</b>	<b>Instrument Dimensions</b>					
		<b>TWC Mean (SD)</b>	<b>SC Mean (SD)</b>	<b>JS Mean (SD)</b>	<b>SR Mean (SD)</b>	<b>MP Mean (SD)</b>	<b>WC Mean (SD)</b>
<i>p*</i>		0,829	0,842	0,764	0,817	0,830	0,659
<b>Function</b>							
Nurse	30	4,1 (1,4)	3,7 (1,5)	4,7 (1,1)	4,1 (1,1)	3,7 (1,2)	3,6 (1,3)
Doctor	07	4,2 (1,2)	3,7 (1,5)	4,5 (0,7)	4,0 (1,2)	3,1 (1,4)	3,2 (1,4)
<i>p*</i>		0,823	1,000	0,538	0,795	0,172	0,379
<b>Time of experience</b>							
< 5 years	10	4,3 (1,2)	3,8 (1,3)	4,8 (0,5)	3,9 (1,2)	3,8 (1,1)	3,1 (1,4)
5 to 10 years	14	4,1 (1,2)	3,7 (1,4)	4,6 (0,7)	4,1 (1,1)	3,7 (1,2)	3,8 (1,2)
> 10 years	13	4,1 (1,3)	3,8 (1,4)	4,6 (0,8)	4,1 (1,0)	3,3 (1,4)	3,5 (1,2)
<i>p**</i>		0,774	0,425	0,105	<b>0,049</b>	0,381	0,056
<b>Geographic Region</b>							
South	20	4,2 (1,2)	3,7 (1,4)	4,5 (0,8)	3,9 (1,2)	3,4 (1,3)	3,2 (1,2)
Southeast	08	4,2 (1,2)	3,8 (1,5)	4,8 (0,7)	4,4 (0,7)	3,4 (1,4)	3,4 (1,4)
Midwest	03	4,5 (1,3)	4,1 (1,5)	4,9 (0,4)	4,1 (1,1)	4,4 (0,9)	4,6 (0,7)
Northeast	05	4,3 (1,3)	3,8 (1,3)	4,8 (0,5)	4,0 (1,4)	4,3 (0,8)	4,2 (1,1)
<i>p**</i>		0,847	<b>0,026</b>	0,097	0,521	0,680	<b>0,001</b>

TWC=Teamwork Climate; SC=Safety Climate; JS=Job Satisfaction; SR=Stress Recognition; MP=Management Perceptions; WC=Working Conditions.

n=number; Sd = Standard deviation; \*t-estudent test; \*\*ANOVA. The p-value in bold indicates a statistical difference in the means at the level of 5% of significance.

**Source:** Research data (2024).

No statistically significant differences were observed in the comparisons of gender and function. However, a significant difference in stress recognition was observed with respect to time of experience, suggesting that time of experience affects stress perception. The Working Conditions dimension

showed a trend toward significance. Regarding the geographic region variable, the Safety Climate and Working Conditions dimensions showed statistically significant differences, suggesting contextual variations. The North region was excluded due to an insufficient number of respondents.

## DISCUSSION

The analysis of this research results in the aeromedical service reveals areas in need of improvement and areas of strength, offering insight into the various facets of this organizational culture.

Regarding the perception of the patient safety culture, the results indicate the need for improvements in areas such as management perception, working conditions, and safety climate. These results highlight organizational weaknesses and the need for approaches aimed at leadership and safety

reliability in the aeromedical environment. Conversely, positive areas were identified, particularly in job satisfaction and teamwork climate. These results suggest that professionals in the aeromedical service are satisfied with their work environment and perceive strong collaboration between nurses and physicians. Similar results were observed in national studies conducted in different contexts, such as the Mobile Emergency Care Service in São Paulo<sup>8</sup> and a public emergency hospital in Goiás.<sup>9</sup> These studies suggest that although there

are areas demanding attention and improvement, a sense of belonging and cooperation exists that can be enhanced to promote a safer environment.<sup>8-9</sup>

The analysis of management perception revealed weaknesses in areas such as supporting team performance and addressing safety-related issues. This data corroborates research highlighting the importance of effective, participatory leadership that promotes open dialogue, values the team, and provides constructive feedback. Such leadership can significantly improve the perception of safety among professionals and promote a solid safety culture.<sup>10</sup> Thus, strategies including training for managers and policies encouraging team participation in safety decisions are essential to reducing the identified weaknesses.

In the Safety Climate domain, difficulties were identified in openly discussing mistakes, pointing to the need for cultural change within the organization. A multicenter study in Poland<sup>11</sup> focused on prehospital emergency care found a negative safety climate, with a mean score of less than 75—a result similar to that found in the present study. The dynamic and challenging environment, characterized by a significant workload, can justify the lower safety climate among these professionals.<sup>12</sup> Additional factors, such as the severity and complexity of the patients treated, can also directly interfere with this perception.<sup>9</sup>

It is important to note that the safety climate is influenced not only by management and institutional policies, but also by the individual perceptions of healthcare professionals. Each professional's subjectivity, their personal view of care, and their life circumstances must be considered.<sup>13</sup> In the aeromedical context, where quick and accurate decision-making is essential, an environment that does not encourage open discussion of errors can hinder organizational learning and the continuous improvement of care processes.<sup>3-5</sup> Creating spaces dedicated to sharing experiences, such as debriefing meetings after consultations, could effectively encourage collective learning and reduce the occurrence of security incidents.

Another important aspect of the study was the evaluation of working conditions, which revealed challenges related to work overload and inadequate resources. These problems are common in high-complexity services<sup>2</sup> and are even more critical in the emergency environment of the aeromedical service. Inadequate working conditions increase the likelihood of errors and negatively impact the quality of care provided.<sup>14</sup> To improve this situation, investments in infrastructure, continuous training, and policies that support professional well-being are necessary. These policies should include psychological support and burnout prevention programs.

The goal is to improve working conditions and consequently, patient safety.<sup>14,15</sup> Additionally, many professionals had a neutral perception of internship supervision. This can be explained by the nature of the aeromedical service. There are only a few professionals on board, so it is impossible for interns to be present during consultations.

The regional differences observed in perceptions of working conditions and safety climate suggest that local contexts directly influence service quality. Safety culture in prehospital emergencies can vary significantly across regions.<sup>16</sup> While regions such as the Midwest and Northeast had more positive perceptions, the South and Southeast had a more critical view of working conditions. This may be related to regions with less structure more often accepting unfavorable conditions as part of their routine.<sup>16</sup> To address these disparities, it is essential to develop regional policies that consider each locality's particularities, promoting equitable emergency service provision.

Furthermore, the job satisfaction domain stood out due to the positive perceptions of the professionals, reflecting their commitment and personal fulfillment, even in the face of weaknesses observed in other domains. This high level of satisfaction suggests that professionals value the work environment, which is essential for service efficiency.<sup>17</sup> The literature indicates that job satisfaction is directly related to factors such as workers' health, interpersonal relationships, and opportunities for professional growth.<sup>13</sup> Previous studies also indicate that job satisfaction is often associated with a positive attitude toward safety. For example, in hospitals in Ceará and São Paulo, this domain had the highest scores in the safety culture evaluation,<sup>8,17</sup> a result similar to that found in the present study. In the present study, job satisfaction also obtained the highest score.

The teamwork dimension stood out with predominantly positive responses and was characterized as a strength for patient safety in the aeromedical service. In this context, where collaboration is essential for patient safety, integrating professionals into the work environment can strengthen team bonds, promoting more cohesive performance.<sup>18</sup> A positive organizational climate encourages teamwork, while a disharmonious environment can compromise the quality of care provided.<sup>18</sup> A study carried out in Rio Grande do Sul<sup>13</sup> corroborates the findings of this study, highlighting this dimension as a key factor for patient safety.

The Stress Recognition domain revealed that a significant proportion of aeromedical professionals recognize that fatigue and workload negatively impact their performance. These findings reinforce the need to improve stress management

in the aeromedical service, which is characterized by quick decisions and high risks. Inadequate stress management is a global challenge, especially in developing countries such as Brazil.<sup>19</sup>

Additionally, a statistically significant difference was observed related to length of service: professionals with less than five years of experience demonstrated greater sensitivity to stress. Lack of familiarity with the aeromedical environment may explain this vulnerability, whereas experience contributes to better adaptation to stress. Another study in the context of prehospital care negatively evaluated the stress recognition domain,<sup>8</sup> in contrast to the present study's findings. Factors such as an imbalance between demands and resources, occupational accidents, and adverse conditions were identified as influencing this domain.<sup>8</sup>

One limitation of this study is the small number of respondents, which may restrict the generalizability of the results to all aeromedical service professionals in Brazil. Additionally, the SAQ-EMS tool relies heavily on self-reported behavior. The information obtained may be biased and may not accurately reflect the current situation. These factors should be considered when interpreting the results. Future studies should include larger, more representative samples and employ complementary data collection methods to validate and expand upon the findings of this research.

## CONCLUSION

Aeromedical service professionals reported high job satisfaction and a positive teamwork climate, with strong collaboration between physicians and nurses, indicating a positive perception of the patient safety culture. However, their perceptions of management and working conditions suggest room for improvement, particularly in incident management and team communication, as evidenced by the challenges of openly discussing mistakes.

No significant differences were identified in comparisons of gender and function regarding the perception of patient safety. In the analysis by time of experience, however, the "Stress Recognition" dimension showed a significant difference between groups, suggesting that professionals with less experience perceive less stress in the work environment. The regional analysis revealed statistically significant differences in "Safety Climate" and "Working Conditions," suggesting operational differences between regions.

While the overall perception of the patient safety culture is positive among aeromedical professionals, there is a need to improve management and the safety climate, particularly in

areas involving error management and institutional support. The variations observed among the different groups highlight the importance of considering regional factors and professional experience when developing strategies to improve patient safety in the aeromedical service.

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