


# Safety Culture and Attitudes Among Spine Professionals: Results of an International Survey

Global Spine Journal  
2019, Vol. 9(6) 642-649  
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DOI: 10.1177/2192568218825247  
journals.sagepub.com/home/gsj  


Pravesh S. Gadjradj, MD<sup>1</sup>  and Biswadjiet S. Harhangi, MD, PhD<sup>2</sup>

## Abstract

**Study Design:** International survey.

**Objective:** A positive safety culture has been linked to better surgical outcomes, less hospital costs and less patient harm and severity-adjusted mortality, making safety attitudes relevant for society and both patient and health care provider. The aim of the current study is to assess attitudes toward safety culture among spinal care professionals.

**Methods:** An online survey was distributed to members of AOSpine International in 2016. The survey consisted out of 3 parts: (1) demographics, (2) the Safety Attitude Questionnaire (SAQ), and (3) expectations of responsibility for improving the safety culture. The SAQ measured job satisfaction, teamwork, and safety climate, perceptions of management, stress recognition, and working conditions. Multivariate logistic regression was performed to identify factors associated with safety attitudes.

**Results:** A total of 356 respondents replied. The SAQ showed that respondents in Africa have a significant lower score (odds ratio [OR] 0.19,  $P < .05$ ) on working conditions, compared with spine professionals in Asia. Respondents in North America had the highest odds of having a higher score (OR 4.04,  $P < .05$ ) compared with respondents in Asia. Gender, continent, occupation, tenure, and the number of employees in the clinic were not associated with the dimensions of safety culture ( $P > .05$ ). The majority expected the surgeon to be mainly responsible for improving the safety culture in the operating room and at management level.

**Conclusions:** There was a lot of variety among different respondents worldwide albeit respondents in Africa scored significantly lower on working conditions, compared with spine professionals in Asia and North America, suggesting that wealthier countries have better working conditions which may lead toward better safety attitudes. Closer collaboration between hospital management and clinicians seems to be a target for improvement in safety culture. Furthermore, to show clinical relevance in this field, studies correlating safety attitudes with outcomes after spine surgery are warranted.

## Keywords

safety culture, patient safety, spinal care

## Introduction

Safety culture as a concept emerged from examining organizations that have been successful in minimization of adverse events in hazardous working conditions, such as aviation.<sup>1</sup> In medicine, safety culture is gaining more and more importance as an outcome to improve clinical practice. In 1999, for example, The Institute of Medicine published the report “To Err Is Human,” which established that improving safety culture was a crucial element in improving the quality of health care in the United States.<sup>2</sup> Vincent et al<sup>3</sup> described organizational factors (eg, safety climate), work environment factors (eg, staffing), team factors such as teamwork, and staff factors (eg, overconfidence) as factors influencing risk and safety in

clinical practice.<sup>3</sup> In their 2007 report on sentinel events, the US Joint Commission supports this conclusion by reporting team work and communication as examples of essential domains for a safe working environment in medicine.<sup>4</sup>

<sup>1</sup> Department of Neurosurgery, Leiden University Medical Center, Leiden, the Netherlands

<sup>2</sup> Department of Neurosurgery, Erasmus MC: University Medical Center Rotterdam, Rotterdam, the Netherlands

### Corresponding Author:

Pravesh S. Gadjradj, Leiden University Medical Centre, Leiden, Albinusdreef 2, 2333 ZA Leiden, The Netherlands.  
Email: p.gadjradj@erasmusmc.nl



A positive safety culture has been linked to better surgical outcomes, lower hospital costs and lower patient-harm and severity-adjusted mortality, making safety attitudes relevant for society and both patient and health care provider.<sup>5,6</sup> Previous research into safety attitudes in the fields of bariatric and orthopedic surgery have concluded that hazardous attitudes and problematic behavior among professionals is still present.<sup>7,8</sup> Little is known, however, about the attitude of spine professionals toward the level of safety in their organization and practice. By mapping out the current state of the safety culture among spine professionals, we may identify possible interventions that could allow improvement of the safety culture and, ultimately, the quality of care. Therefore, our study aims to assess the safety culture among these professionals.

## Methods

In 2016, a survey was sent using SurveyMonkey (www.surveymonkey.com, Palo Alto, CA, USA). After the initial email in February, a single reminder was sent in March to increase the response rate. The survey was approved by AOSpine International, an international community of spine surgeons and other professionals, promoting education and research in spinal surgery, albeit the majority are physicians. The survey (see Appendix 1, available in the online version of the article) consisted of 3 parts: (1) demographics of the respondents, (2) the Safety Attitude Questionnaire (SAQ),<sup>9</sup> and (3) opinions on responsibility on specific (pre)operative features. The SAQ is a standardized and validated rating instrument which evaluates 6 domains of safety culture; questions were formulated in the English language. The domains are job satisfaction, teamwork climate, safety climate, perceptions of both unit and hospital management, stress recognition, and working conditions. Job satisfaction is scored by 5 items and is defined as positivity about the work experience. Team work climate is defined as the perceived quality of collaboration between work personnel and is scored by 6 items. Perceptions of a strong and proactive organizations dedication to safety is the definition of safety climate and is measured by 7 items. Perceptions of management is the approval of managerial action which is scored by 4 items at both unit and hospital level. Acknowledgment of how performance is influenced by stressors is measured by 4 items in the stress recognition dimension. Working conditions are perceived quality of the work environment and logistical support, as measured by 4 questions. All these items are scored using 36 questions (3 reverse-scaled) consisting of a 5-point Likert-type scale (strongly disagree to strongly agree).

Descriptive statistics were used to analyse the demographics and expectations of the respondents. For readability reasons, scores on the 5-point Likert-type scale were dichotomized to a 3-point Likert-type scale. All percentages depicted are based on valid responses. To show the internal consistency of the SAQ, we calculated Cronbach's  $\alpha$ . Cronbach's coefficients greater than .70 are considered acceptable while those greater than .80 are considered good.<sup>10,11</sup> All descriptive analyses were performed using SPSS software (version 21.0) for Windows.

**Table 1.** Demographics of Responders (N = 356).

Demographic	Number	Percentage
Sex (n = 352)		
Male	339	96.3
Continent (n = 356)		
Africa	13	3.7
Asia and Pacific	96	27.0
Europe	119	33.4
North America	63	17.7
South America	65	18.3
Occupation (n = 354)		
Attending/Staff physician	278	78.5
Fellow physician	26	7.3
Resident physician	23	6.5
Physician assistant/Nurse practitioner	4	1.1
Therapist (RT, PT, OT, speech)	0	0
Other	23	6.5
Time in occupation (n = 355)		
<1 year	7	2.0
1-4 years	51	14.4
5-10 years	80	22.5
>10 years	217	61.1
People working in the clinic (n = 350)		
0-50	88	25.1
51-100	47	13.4
101-500	73	20.9
>500	142	40.6

Abbreviations: RT, respiratory therapy; PT, physical therapy; OT, occupational therapy.

Scores for each dimension of the SAQ range from "0" (indicating the lowest score) to "100" (indicating the highest score). To identify factors associated with dimensions of the SAQ, a multivariate logistic regression analysis was performed using STATA version 12 (StataCorp LP, College Station, TX). *P* values <.05 were considered to be statistically significant.

## Results

### Demographics of Respondents

In total, 356 respondents representing all the continents completed the survey (Table 1). Majority of the respondents were male (96.3%) and 92.3% were physicians (neurosurgeons, orthopedic surgeons, and spine surgeons). Other respondents included nurse practitioners (1.1%) and clinical directors. Most of the respondents have been employed in their current position for more than 10 years. More than one-third of the respondents are employed in Europe, while 3.7% of the respondents work in Africa. Figure 1 depicts the 68 countries that participated in this survey, with the United States, India, and Brazil having the highest number of respondents per country.

### Psychometric Results

The SAQ attained a high completion rate with missing data of the 6 dimensions ranging from 1.7% to 3.7% (Table 2). A total of 80.5% of the surveys had no missing data at all and were

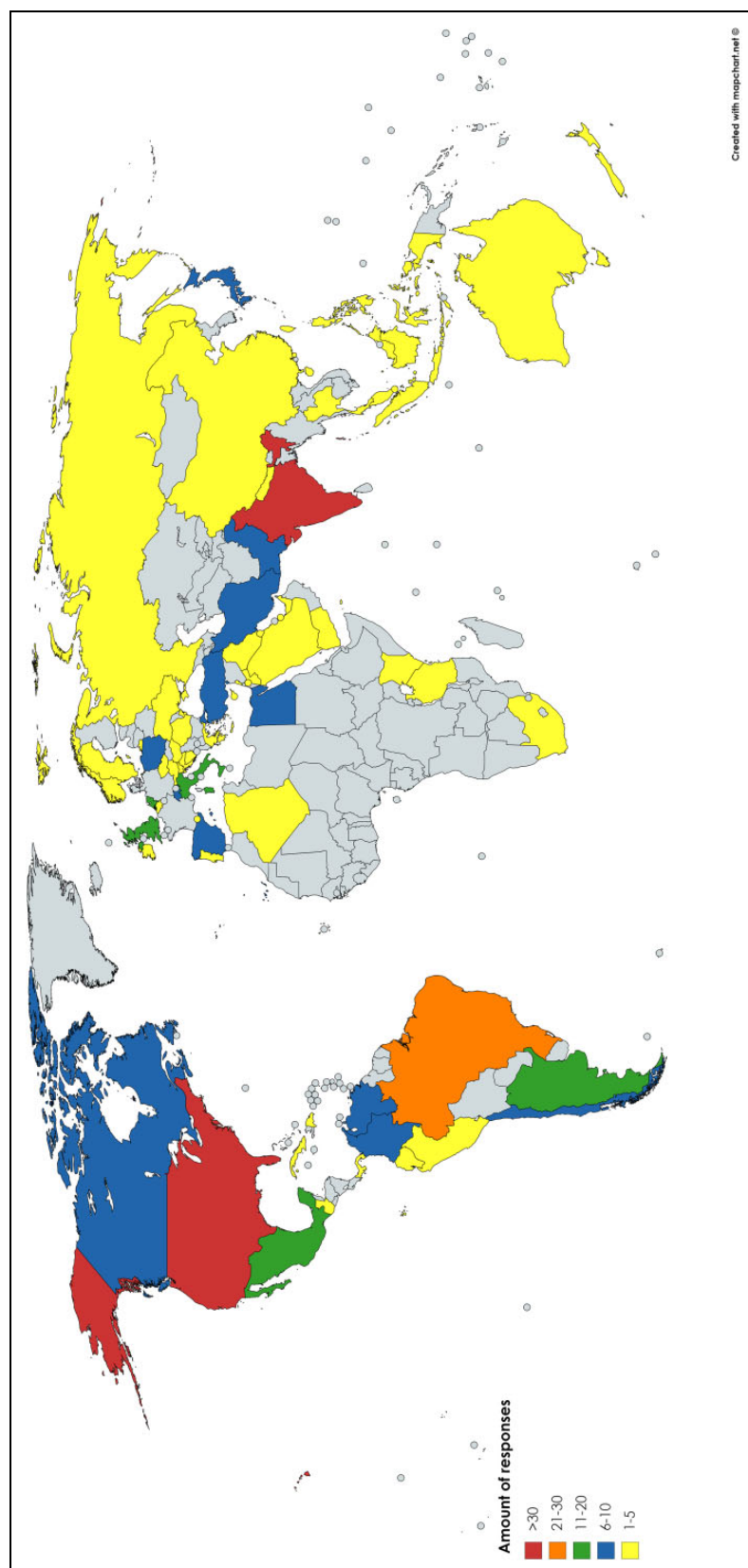


Figure 1. Number of responses per country.

**Table 2.** Mean Scores on the Dimensions of the Safety Attitude Questionnaire (SAQ) With the Internal Consistency of the Individual Items per Dimension.

SAQ Dimension	Cronbach's $\alpha$	Mean (SD)
Teamwork climate	.77	80.4 (18.2)
Job satisfaction	.87	83.4 (18.8)
Perception of unit management	.85	69.4 (22.4)
Perception of hospital management	.86	61.6 (24.7)
Safety climate	.83	75.7 (19.5)
Working conditions	.72	71.4 (21.8)
Stress recognition	.77	71.1 (22.1)

included in the multivariate logistic regression analysis. The internal consistency of the items scoring teamwork climate, stress recognition, and working conditions were acceptable, with Cronbach's  $\alpha$ s ranging from .72 to .77. The dimensions safety climate, job satisfaction and perceptions of unit and hospital management, attained higher internal consistency ( $>.83$ ).

### Safety Attitudes Domains

An overview of the individual scores on the 6 domains of the SAQ can be found in Table 3. Scores on the domain of teamwork climate were high in general. More than 80% of the respondents agreed that nurse input is well received and that nurses and physicians work together in well-coordinated teams. On the other hand, 19.5% of respondents agreed that speaking up in their clinical area when problems with care are perceived, is difficult. Furthermore, 68% of the respondents agreed that disagreements are resolved appropriately.

In general, job satisfaction was high with 90% of the respondents stating to like their job and 90.1% stating to be proud to work at their current hospital. Lowest scores were 75.4% agreeing that the moral is high and 75.3% agreeing that a feeling like being part of a family is present.

Scores on the stress recognition domain were more mixed. 68.8% of the respondents stated to be more likely to make errors in tense or hostile situation. 80.4% of the respondents stated to be less effective at work when fatigued, but only 211 (59.8%) reported that fatigue impairs performance during emergency situations. Furthermore, only 65.1% of the respondents believe that their performance is impaired due to excessive workload.

Regarding working conditions, 72% of the respondents stated trainees are adequately supervised and 80.4% stated information for diagnostic and therapeutic decisions is routinely available. However, only 55.5% of the respondents agreed their clinic does a good job at training new employees, and even fewer (45.2%) stated that personnel causing problems are dealt with constructively.

On the safety climate domain, the majority of respondents (85.4%) would feel safe to be treated as a patient at their own hospital and agree that medical errors are handled appropriately (80.2%). However, more than one-fourth of

the respondents stated that it is difficult to discuss errors and 16.2% even stated they are not encouraged by colleagues to report patient safety concerns.

The last domain was perception of management, which had mixed scores. A total of 58.8% of the respondents felt supported by the management, in contrast to 20.8% of the respondents who disagreed to this statement. Furthermore, 19.8% disagreed that management does not knowingly compromise the safety of patients. The majority (59.1%) thought that the staffing in their clinic is sufficient to handle the number of patients.

The results of the multivariate logistic regression analysis on predictors for the dimensions of the SAQ are reported in Table 4. Respondents in Africa had a significant lower score (odds ratio [OR] 0.19,  $P < .05$ ) on working conditions, compared with spine professionals in Asia. Respondents in North America had the highest odds of having a significantly higher score (OR 4.04,  $P < .05$ ) than respondents in Asia. Nurse practitioners scored significantly lower (OR 0.05,  $P < .05$ ) on job satisfaction compared with the "rest group," while fellow-physicians scored significantly higher (OR 4.04,  $P < 0.05$ ) than the "rest group" on working conditions. This rest group consisted mainly of other MDs and clinical directors. Gender, continent, occupation, tenure, and the number of employees in the clinic were all not significantly associated with the teamwork climate, safety climate, stress recognition, or management perceptions of the respondents ( $P > 0.05$ ).

### Responsibility of Improving Safety Culture

The surgeon was seen as the person responsible for preventing all adverse events in the operating room surveyed, with percentages ranging from 65.7% to 96.6% (Figure 2). The responsibility for the surgery assistant was higher in the prevention of retained foreign bodies, with almost a quarter of the respondents stating that they are mainly responsible. Furthermore, 15% of the respondents stated that the anesthesiologist is responsible for prevention of thromboembolic complications. Improving the safety culture on management level was also seen as the duty of the surgeon, by respondents ranging from 48% to 56.4%. Figure 3 shows that, next to the surgeon, hospital management (18.9% to 25.9%) and the head of the department (7.1% to 18.5%) were expected to have responsibilities in improving the safety culture too. Next to error reporting and involving colleagues in patient safety, the role of the surgery assistant was considered limited.

### Discussion

This is the first study that investigated worldwide professional opinions on the safety attitude in spinal practice using the SAQ. The SAQ showed good internal consistency and the mean scores on the different dimensions ranged from 61.6 for perception of hospital management to 83.4 for job satisfaction. Linear regression analysis showed that gender of the respondent, continent of employment, tenure, and position were all

**Table 3.** Scores per Domain on the Safety Attitudes Questionnaire (SAQ).

SAQ Domain	Agree	Neutral	Disagree
<b>Teamwork climate</b>			
Nurse input is well received in my clinical area	29 (83.4)	40 (11.3)	17 (4.7)
In my clinical area, it is difficult to speak up if I perceive a problem with patient care	69 (19.5)	38 (10.8)	243 (68.8)
Disagreements in my clinical area are resolved appropriately	240 (68)	56 (15.9)	50 (14.1)
I have the support I need from other personnel to care for patients	275 (77.6)	40 (11.3)	37 (10.4)
It is easy for personnel here to ask questions when there is something they don't understand	283 (79.5)	32 (9.0)	32 (9.0)
The physicians and nurses here work together as a well-coordinated team	299 (83.9)	30 (8.4)	27 (7.6)
<b>Job satisfaction</b>			
I like my job	314 (90)	15 (4.2)	11 (3.2)
Working in this hospital is like being part of a large family	258 (73.3)	57 (16.2)	35 (9.9)
This hospital is a good place to work	293 (83.2)	36 (10.2)	22 (6.3)
I am proud to work at this hospital	317 (90.1)	23 (6.5)	10 (2.9)
Moral in this clinical area is high	264 (75.4)	47 (13.4)	37 (10.5)
<b>Stress recognition</b>			
When my workload becomes excessive, my performance is impaired	229 (65.1)	65 (18.5)	54 (15.3)
I am less effective at work when fatigued	284 (80.4)	33 (9.3)	36 (10.2)
I am more likely to make errors in tense or hostile situations	243 (68.8)	52 (14.7)	56 (15.9)
Fatigue impairs my performance during emergency situations	211 (59.8)	53 (15.0)	80 (22.7)
<b>Working conditions</b>			
Problem personnel are dealt constructively in hospital	160 (45.2)	96 (27.1)	91 (25.9)
This hospital does a good job of training new personnel	193 (55)	70 (19.9)	84 (24.0)
All necessary information for diagnostic and therapeutic decisions is routinely available to me	284 (80.4)	29 (8.2)	38 (10.8)
Trainees in my discipline are adequately supervised	255 (72)	40 (11.3)	42 (11.9)
<b>Safety climate</b>			
I would feel safe being treated here as a patient	302 (85.4)	25 (7.1)	25 (7.1)
Medical errors are handled appropriately in this clinical area	284 (80.2)	39 (11.0)	31 (8.7)
I know the proper channels to direct questions regarding patient safety in this clinical area	285 (81)	32 (9.1)	30 (8.6)
I receive appropriate feedback about my performance	215 (61.4)	68 (19.4)	64 (18.3)
In this clinical area, it is difficult to discuss errors	93 (26.4)	37 (10.5)	221 (62.6)
I am encouraged by my colleagues to report any patient safety concerns I may have	238 (67.7)	54 (15.3)	57 (16.2)
The culture in this clinical area makes it easy to learn from the errors of others	238 (67.4)	54 (15.3)	58 (16.4)
<b>Perception of hospital management</b>			
Management supports my daily efforts	207 (58.8)	69 (19.7)	73 (20.8)
Management does not knowingly compromise the safety of patients	197 (55.7)	82 (23.2)	70 (19.8)
I am provided with adequate, timely information about events in the hospital that might affect my work	175 (49.5)	79 (22.3)	96 (27.1)
Hospital management is doing a good job	197 (55.7)	84 (23.7)	70 (19.8)
The levels of staffing in this clinical area are sufficient to handle the number of patients	208 (59.1)	58 (16.5)	85 (24.1)

not significant factors in determining the score on any of the dimensions of the SAQ. We found that respondents in Africa (3.7%) have a significant lower score on working conditions, compared with spine professionals in Asia and North America.

In general, the surgeon was expected to carry the most responsibility in preventing adverse events in the operating room or for improving the safety culture in the aspect of pre-operative management. The hierarchical central role of the surgeons as leader in the operating theatre has grown historically through time in different cultures. This central role might be an explanation for our findings. This perception could work positively because surgeons in those working environments may be more cautious. On the other hand, this attitude might also have the adverse effect leading to only the surgeon being cautious while awareness should be present amongst all members in the operating theatre.

This study was not the first to use the SAQ to assess safety attitudes among health care professionals. Previous research

used the SAQ to evaluate attitudes among intensive care units, nursing and residential homes, pharmacies, medical oncology units, the operating room and the neonatal intensive care unit.<sup>9,12-17</sup> The general finding of these studies is that the SAQ is a valid tool with good internal consistency. In the current study, Cronbach's  $\alpha$  for the different dimensions ranged from .72 to .89, confirming these findings from previous studies. Furthermore, higher mean scores for the different dimensions were found with the current survey.

In the past years, job satisfaction and burnout rates among physicians have gained attention in recent literature.<sup>18-20</sup> Prior research showed that 80% of US neurosurgeons reported to be at least somewhat satisfied with their career and 52% believed their professional lives would worsen in the future. According to their survey, 56.7% of these surgeons had a burnout. Another study among surgeons treating musculoskeletal conditions showed that greater symptoms of burnout was the only factor independently associated with lower job satisfaction. Even

**Table 4.** Linear Regression on Predictors for Safety Attitudes.<sup>a</sup>

	Dependent Variable						
	Team Climate	Safety Climate	Job Satisfaction	Stress Recognition	Working conditions	Unit Management Perception	Hospital Management Perception
Sex							
Female	−6.70 (5.49)	−8.53 (5.70)	2.53 (6.81)	−3.45 (7.50)	−9.33 (5.88)	−9.01 (6.45)	−6.39 (6.63)
Continent							
Africa	1.37 (6.51)	−5.68 (6.76)	−3.65 (8.07)	0.30 (8.89)	−2.89 (6.98)	−11.89 (7.65)	2.75 (7.86)
Europe	3.10 (2.93)	−2.48 (3.04)	−4.74 (3.63)	−6.69* (4.00)	1.51 (3.14)	−1.05 (3.44)	1.98 (3.54)
North America	0.33 (3.32)	−1.41 (3.45)	−1.45 (4.12)	0.49 (4.54)	1.34 (3.56)	7.52* (3.91)	−1.56 (4.01)
South America	0.02 (3.42)	2.71 (3.55)	−4.60 (4.24)	−1.24 (4.67)	0.46 (3.66)	1.90 (4.02)	6.51 (4.13)
Occupation							
Attending/Staff physician	−0.22 (4.31)	−0.57 (4.47)	6.75 (5.35)	0.87 (5.89)	−1.55 (4.62)	0.12 (5.07)	−5.53 (5.20)
Fellow physician	3.38 (5.59)	1.50 (5.80)	12.20* (6.93)	0.78 (7.63)	0.89 (5.99)	12.11* (6.57)	−5.80 (6.75)
Resident physician	−2.03 (6.21)	−3.81 (6.45)	−1.29 (7.70)	−8.24 (8.49)	3.37 (6.66)	0.95 (7.30)	0.97 (7.50)
Tenure							
3-10 years	−5.32 (4.87)	−6.46 (5.06)	−0.26 (6.04)	−6.60 (6.66)	−4.28 (5.22)	−0.18 (5.73)	−1.70 (5.88)
>10 years	0.13 (4.69)	−2.56 (4.87)	0.84 (5.82)	−3.14 (6.42)	4.10 (5.03)	7.71 (5.52)	3.97 (5.67)
People affiliated with clinic							
51-100 employees	0.38 (3.72)	3.83 (3.86)	2.52 (4.61)	4.63 (5.08)	1.07 (3.99)	6.13 (4.37)	3.35 (4.49)
101-500 employees	−2.74 (3.28)	1.43 (3.41)	3.51 (4.07)	1.32 (4.48)	−1.50 (3.52)	2.21 (3.86)	−5.65 (3.96)
>500 employees	−4.76* (2.88)	−0.73 (2.99)	3.24 (3.57)	0.75 (3.94)	−1.44 (3.09)	4.64 (3.39)	1.79 (3.48)
Constant	90.38*** (8.65)	96.81*** (8.98)	60.50*** (10.73)	70.16*** (11.82)	85.13*** (9.27)	70.80*** (10.17)	79.23*** (10.44)
R <sup>2</sup>	0.05	0.04	0.03	0.04	0.05	0.08	0.05
Adjusted R <sup>2</sup>	0.0004	−0.01	−0.02	−0.01	0.005	0.04	0.01

<sup>a</sup> The estimates are  $\beta$ s with standard errors in parentheses. For sex, male is the reference category; for continent, Asia is the reference category; for occupation, paramedical staff is the reference category; for tenure, 0-2 years is the reference category, for people affiliated with the clinic, 0-50 employees is the reference category. We found no evidence for multicollinearity as the variance inflation factors (VIFs) in all models were well less than 5 (VIF < 2).

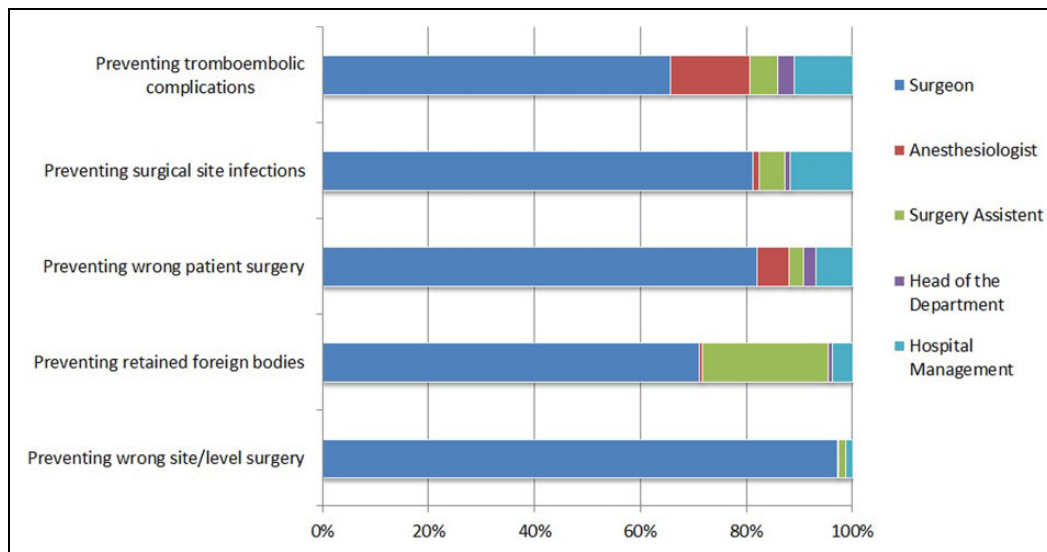
\* $P < .1$ , \*\* $P < .05$ , \*\*\* $P < .001$ .

though the SAQ was not designed to focus on career satisfaction, our study seems to sketch a more positive image with 90% of the respondents stating to like their job and to be proud to work at the current hospital. Our study, however, shows that the majority of the respondents stated to underperform due to fatigue and excessive workload, while the levels of staffing to handle the number of patients is considered insufficient. Both are hazardous to job satisfaction and could contribute to a burnout.

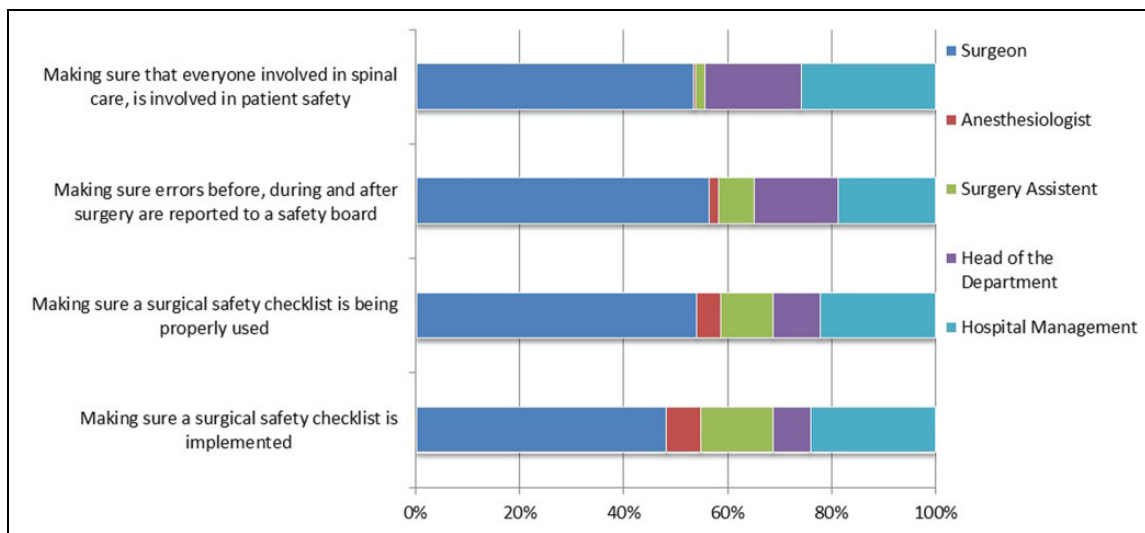
Recently, Morello et al<sup>21</sup> performed a systematic review to identify strategies for improving patient safety culture in hospitals. Different strategies to improve the safety culture were assessed: leadership walk rounds, structured educational programs, team-based strategies, stimulation-based training programs, multifaceted unit-based programs, and multicomponent organizational interventions. Of all these strategies, only leadership walk rounds was investigated by means of a (cluster) randomized controlled trial.<sup>22</sup> Leadership walk rounds consisted of visits by executives (eg, head of department) who discuss potential adverse events or general processes that may be harmful to patients and take subsequent actions. This trial however, found no effect on patient safety reported by clinicians and nurses. Nurses participating in leadership walk rounds did, however, lead to a positive effect on patient safety climate. Other

strategies were investigated by historically controlled studies or controlled before and after studies with limited evidence in support for the strategies. Our study showed that the perception of hospital management scores lower than other domains in matters such as support in daily efforts, compromising patient safety and with providing adequate information. Perhaps these leadership walks shorten the gap between clinicians and executives, which leads to more collaboration on safety protocols.

Some limitations need to be mentioned. First is the use of the SAQ without prior validation for both this target group and the distribution of this group. Previous research used the SAQ to target multiple healthcare workers from one unit of one institution. In the current sample, professionals, mostly spine surgeons, were almost all spread over different institutions. Even though we did not perform extensive validity analysis of the SAQ, we did perform an internal consistency analysis. Cronbach's  $\alpha$  scores ranged from .72 to .87, which is good compared with internal consistencies measured in literature.<sup>12,16</sup> Another limitation is the response rate. AOSpine International had 6179 members in July 2016, which would result in a response rate of 5.8% in the described survey.<sup>23</sup> A limited response rate is more frequently stated as a limitation in research using the SAQ. Finally, the choice to target members of AOSpine International may have led to biased results.



**Figure 2.** Responsibility for preventing adverse events in the operating room.



**Figure 3.** Responsibility for improving the safety culture.

Members of AOSpine International are, in general, health care professionals who have a special interest in surgical and non-surgical care of spinal diseases. It is possible that targeting these members may not reflect the general population of professionals. Furthermore, most AO Spine members are mostly spine surgeons, so their answers might reflect their attitudes regarding care confined to spine care.

## Conclusions

The safety attitudes of professionals working in the field of spine care was assessed using the SAQ. There was a lot of variety among different respondents worldwide albeit that respondents in Africa have a significantly lower score on working conditions, compared with spine professionals in Asia and North America, suggesting more wealthy countries have better

working conditions, which may lead toward better safety attitudes. Tenure, continent of employment, position, gender, and number of people affiliated with the clinic did not seem to play a role in the safety attitudes. Closer collaboration between hospital management and clinicians seems to be a target for improvement in safety culture. Furthermore, to show clinical relevance in this field, studies correlating safety attitudes with outcomes after spine surgery are warranted.

## Authors' Note

Portions of this work were presented orally at the Global Spine Congress 2017, Milan, Italy.

## Acknowledgments

The authors would like to acknowledge the respondents who completed the survey and AOSpine International for facilitating the



distribution of the survey. Furthermore, the authors are grateful for the administrative contribution of Ms Sadaf Soloukey and the statistical contribution of Wim Rietdijk, PhD.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors would like to acknowledge the financial contribution of AOSpine International.

### ORCID iD

Pravesh S. Gadjradj, MD  <https://orcid.org/0000-0001-9672-4238>

### Supplemental Material

The supplemental material is available in the online version of the article.

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