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Psychometric Properties of the Safety Climate Survey in Austrian Acute Care: Factor Structure, Reliability, and Usability

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Background: Hospitals are complex organizations with a potential for medical errors that can be influenced by safety culture. Safety climate, as measurable element of safety culture, illustrates the perception of safety-relevant aspects of health care staff at a certain time. The Safety Climate Survey is applied internationally to measure safety climate. However, psychometrics for the German version of the survey have yet not been evaluated. The aim of this study is to explore the factor structure, reliability, and potential usefulness of the Safety Climate Survey in Austrian acute care.

Methods: Cross-sectional surveys of physicians, therapists, and nurses/midwives were implemented. An exploratory factor analysis was carried out, both in total sample and split by 2 selected professions. After deriving a factor structure for both professions, internal consistency and scale means were calculated for the subscales. Finally, mean subscale differences between physicians and nurses/midwives were tested.

Results: Of 5160 eligible staff, 933 respondents participated. A 6-factor solution explaining 59.1% of total variance was identified. Comparison by profession illustrated that the factor structures and item loading patterns differ between physicians and nurses/midwives. To achieve an overarching solution, 5 items were excluded from consecutive subscale measures because of cross-loadings and contradictory factor loadings. Subscales demonstrated good to low internal consistency ($\alpha = 0.794\text{--}0.535$). Significant mean differences between subscales of professions were found relating to 3 factors.

Conclusions: The German Safety Climate Survey measures safety climate multidimensionally rather than unidimensionally and demonstrated some limitations in factor structures and item loadings but overall had satisfactory reliability of the 6 subscales.

Key Words: safety, climate, health care, survey, acute care, psychometrics
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Every year, an unacceptable number of patients suffer from injuries or die because of unsafe care, although most of these injuries could be avoided.¹ A literature search carried out on behalf of

the European Union came to a conclusion that adverse events occur in about 4% to 17% of patients, and 44% to 50% of those adverse events are avoidable. This resulted in excess direct costs of about 21 billion euros for the health care system in 2014.² Since 2004, the World Health Organization appeals to the member states to consider patient safety as a global challenge.³ Within the European Union, the “Luxembourg Declaration on Patient Safety” marked the beginning of sustainable activities in this area, particularly in Austria, Germany, and Switzerland. Hence, in 2008, the Austrian government established “The Austrian Platform for Patient Safety” with the goal of promoting patient safety through research, coordination of projects, networking of experts, and information dissemination. In the context of the last health care reform, Austrian policy also decided to initiate a national strategy on patient safety.⁴

Internationally, patient safety has received much attention and safety culture has been identified as a key element in health organizations.⁵ Safety culture can be considered an essential part of organizational and management factors and refers to shared beliefs, values, perceptions, attitudes, and competencies as well as behavioral patterns within an organization.⁶ Study results point to a link between a culture of high patient safety and better patient outcomes.⁷ Hence, it can be assumed that implementing a high organizational and safety culture increases quality of care.^{5,8}

The safety climate, in turn, represents a subset of the safety culture and its measurable element in health care organizations.⁸ Safety climate is seen as a leading indicator that supplies information about potential risks and can be acted upon before the occurrence of an adverse event.⁹ Thereby, it is possible to distinguish the measurable dimensions of safety climate (e.g., area of application, length, level of validation, and national context of development or validation of translation).¹⁰ In the achievement of safety climate, health care organizations need to (a) create a safe workplace by the management, (b) share perception of health care providers regarding the safety of their work environment, and (c) ensure effective dissemination of safety information.¹¹ To gain information in this regard and make an important contribution to the development of the safety culture, periodic surveys are recommended. For German-speaking countries, a review identified 11 instruments. Six of these are suitable measures that can be used to assess the safety climate in hospitals, such as the Safety Climate Survey (SCS).⁹ Internationally, this instrument is widely used in different health care settings.^{11,12} Compared with other safety climate measures, the SCS has fewer items and takes less time to complete, which makes it easier to administer and hence could increase the chance to obtain a high response rate.^{10,13} The aim of this study is to explore the factor structure, reliability, and potential usefulness of the German version of the SCS in Austrian acute care.

METHODS

Study Setting and Participants

This cross-sectional survey was part of a larger study to evaluate and optimize patient safety and safety culture in 8 hospitals

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Ethics and other permissions: Study design does not require the approval of an ethics committee. Participation in the survey was voluntary and anonymous. Health care staff had to approve and sign the data privacy statement. Furthermore, the consent of the workers’ council to the survey was obtained.

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from 1 hospital operator in Austria. Health professionals in part- and full-time positions, who are involved in direct patient care, were invited to participate. Staff without direct patient care (e.g., administration) was excluded. In total, 5160 physicians (MDs), therapists (THs), and registered nurses and midwives (RNMWs) participated. Under the expectation that response rates in acute care could be lower than 20% and aiming for 5 to 10 subjects for each item to be analyzed as a necessary sample size for factor analyses,¹⁴ an exhaustive survey inviting all health care professionals was pursued.

Survey Instrument

The questionnaire used in this study was the Swiss version of the SCS.¹⁰ The SCS, developed by the Center of Excellence for Patients, Safety Research and Practice at the University of Texas, is considered to be a unidimensional instrument that facilitates its transferability to other nations and cultures. The instrument consists of 19 items, whereby 1 item is divided into 3 subitems. Each item has to be rated on a 5-point Likert scale (1, do not agree at all; 5, fully agree; 0, I cannot say). Higher values in the participants’ assessment correspond to a more positive safety climate. To evaluate safety climate, calculation of item mean values, total mean values, or safety climate sum scores are recommended.¹⁵ Psychometrics in terms of internal consistency in the Swiss version¹⁰ correspond closely to those of the original SCS ($\alpha = 0.86$).¹⁵ Although the SCS was designed to be used with all types of health care professions in hospitals, an explicit and empirically tested factor structure is missing.⁹

Data Collection

Data collection was conducted online with the electronic tool Lime Survey from September to October 2019 over a period of 6 weeks and included 2 reminder e-mails every 2 weeks. The eligible population received information from their superiors as well as through the hospital organization’s internal magazine, corporate communications, and institutional Web site. To identify potential problems in practicability, comprehensibility, and technical possibilities of the online survey, a pretest in a sample

of 34 health care professionals from the hospital’s organization was performed, and minor improvements in layout and survey interface features were adapted. Anonymous survey answers were archived and imported into IBM SPSS 27 (IBM, Armonk, New York), wherein negatively poled items were recoded and data preparation, cleansing, and analyses were performed.

Statistical Analyses

We used common univariate statistics to describe the characteristics of the participants. To identify the factor structure of the German version of the instrument, an exploratory factor analysis (EFA) was carried out applying principal component analysis (PCA). After examining the suitability of the correlation matrix for factor analysis in terms of means, kurtosis, and interitem correlations,¹⁶ the Kaiser-Meyer-Olkin measure¹⁷ was used to examine the general fit and suitability of the items for EFA.

We used the Kaiser eigenvalue approach in combination with theoretical considerations regarding the interpretability of the factors¹⁶ as the predominant criterion to determine the adequate number of factors. In addition, parallel analysis¹⁸ and scree plot¹⁹ were consulted and critically compared with the results based on the Kaiser criterion.

Because correlations of the underlying factors can theoretically be assumed, we performed an oblique rotation (promax method).²⁰ Following several recommendations for item assignment procedures,²¹ items were assigned to factors according to the following strategy: (a) items were assigned to certain factors based on the highest factor loadings; (b) a cutoff of ≥ 0.40 was considered to be a relevant factor loading, and items with loads less than 0.40 were eliminated; (c) differences between factor loadings in case of cross-loading items had to be at least 0.20 and (d) based on theoretical considerations of safety culture.

Exploratory factor analysis was performed within the total sample as well as separately for the different health professional subgroups of MDs and RNMWs. Separate analysis for the sample of THs was not feasible because of the rather small valid sample size in EFA. An optimal, both MDs and RNMWs, overarching

TABLE 1. Sample Characteristics

Characteristic	Total (n = 933)	RNMW (n = 713)	MD (n = 124)	TH (n = 96)
Age, mean (SD), y	41.91 (10.4)	41.41 (10.4)	44.77 (10.7)	41.94 (9.5)
Sex, % (n)				
Female	78.4 (698)	84.4 (573)	44.1 (52)	78.5 (73)
Male	20.6 (192)	15.6 (106)	55.9 (66)	21.5 (20)
Work/subject area, % (n)				
Surgical ward	28.0 (261)	30.3 (216)	25.8 (32)	13.5 (13)
Operation room	10.4 (97)	9.8 (70)	21.0 (26)	1.0 (1)
Internal medicine ward	61.6 (575)	59.9 (427)	53.2 (66)	85.5 (82)
Managerial function, % (n)				
Yes	17.3 (157)	15.9 (110)	30.6 (37)	10.5 (10)
No	82.7 (751)	84.1 (582)	69.4 (84)	89.5 (85)
Professional experience, % (n)				
<5 y	14.8 (135)	15.3 (107)	10.8 (13)	16.1 (15)
5–<10 y	14.1 (130)	13.5 (95)	19.2 (23)	12.9 (12)
10–<15 y	14.8 (135)	13.1 (92)	19.2 (23)	21.5 (20)
15–<20 y	14.0 (128)	13.8 (97)	14.2 (17)	15.1 (14)
≥ 20 y	42.3 (387)	44.3 (311)	36.7 (44)	34.4 (32)

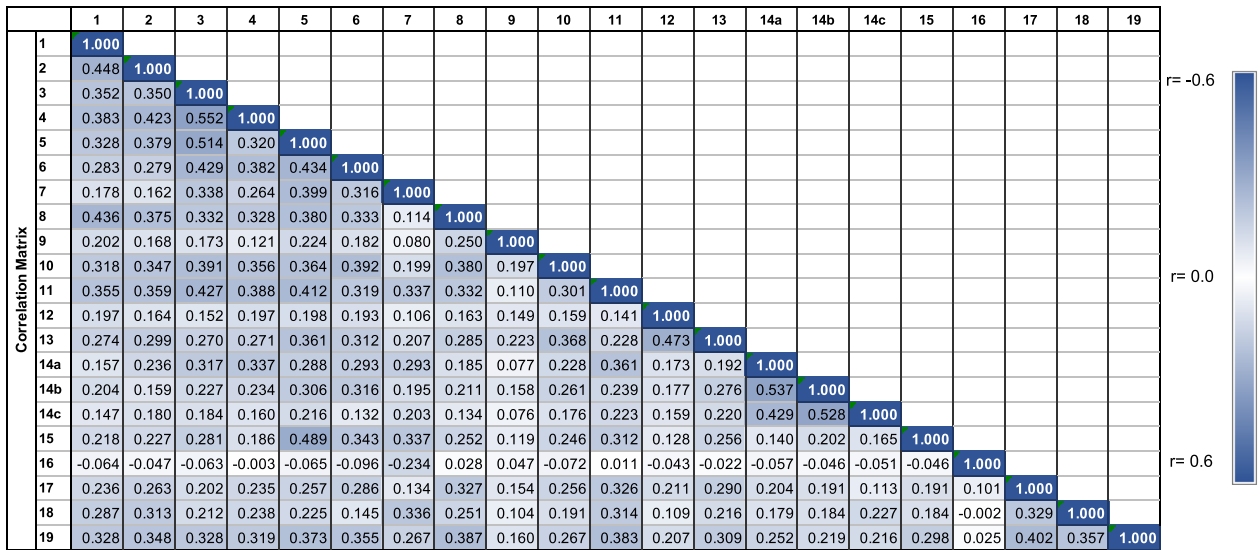


FIGURE 1. Scree diagram to compare the methods for determining the number of components to be retained. The scree test uses the eigenvalues from the PCA, where the threshold value is the point where this line divides from the line of eigenvalues (decision: 2 factors). The threshold value of the parallel analysis is present if the eigenvalues from the parallel analysis are greater than those from the PCA (decision: 2 factors). The Kaiser’s rule retains all components with eigenvalues >1 and would retain 6 factors.

factor structure was identified by aligning the respective factor structures. Ambiguous items or items loading on different factors in the 2 subsamples were excluded from further analyses. After reducing to an unambiguous factor structure valid and suitable for both professions, subscale mean indices using the original item values were computed. Following this instrument’s final structure, internal consistency was assessed by calculating Cronbach α as an indicator of the correlation between the individual elements and the factors.²² Finally, we calculated possible differences in mean subscale scores between MDs and RNMWs using Student *t* tests for independent samples. Statistical significance was set at $P < 0.05$ (2-sided).

RESULTS

Response Rates and Demographics

A total of 933 questionnaires (response rate $n = 18.1\%$) were completed, including 713 RNMWs, 124 MDs, and 96 THs. The average age of the participants ranges between 41 and 45 years in all professions, and with the exception of MDs, more women than men participated (78.4%). In all professions, the majority of participants worked in internal medicine wards (61.6%) and did not hold a managerial position (82.7%; Table 1).

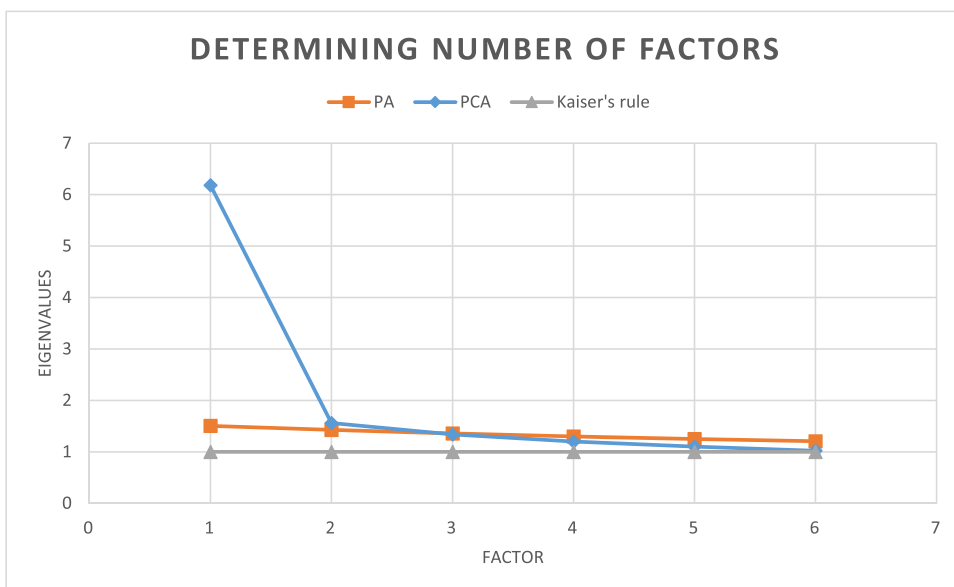


FIGURE 2. Determining number of factors.

EFA in Total Sample

To examine the underlying structure of SCS, a PCA with oblique rotation was performed. The correlation matrix was evaluated for substantial correlations (Fig. 1). The Kaiser-Meyer-Olkin measure amounts to 0.889, which indicates that the sample is suitable for factor analysis.²³ Bartlett test of sphericity also proved to be significant ($\chi^2_{210} = 3505.53; P < 0.001$). Following Cattell’s guidelines for including the component at the point where the scree plot flattens out,²⁴ this approach would suggest that 2 factors should be retained. A parallel analysis¹⁸ also pointed toward a 2-factor solution. Although reaching significance, only 38.2% of the total variance could be explained in each respected PCA (Fig. 2).

The consideration of the Kaiser eigenvalue criterion²⁵ greater than 1 identified 6 factors. This model explains 59.1% of the total variance and was chosen based on additional theoretical considerations regarding the interpretability of the factors. Therefore, the SCS final solution includes 6 factors ($\alpha = 0.859$), with Eigenvalues ranging from 6.184 to 1.021. Two items (item 9, item 11) demonstrated loadings less than 0.30. Six items

loaded on the first factor (eigenvalue = 6.184), 4 items on factor 2 (eigenvalue = 1.559), 3 items on factor 3 (eigenvalue = 1.340), 2 items on factor 4 (eigenvalue = 1.202), 3 items on factor 5 (eigenvalue = 1.102), and 1 item on factor 6 (eigenvalue = 1.021). With the exception of 2 items with insufficient cross-loadings (item 9, item 11), a consistent factor structure could be identified (Table 2).

Overarching Factor Structure for Both MDs and RNMWs

Results demonstrate differences in the factor loadings of the individual items between the professions. In summary, 4 items (item 3, item 8, item 9, and item 11) demonstrate ambiguous factor loadings (cross-loadings) or different loadings in comparison between the samples of MD and RNMW. The final 6-factor structure for SCS is presented in Table 3. The number of items per factor ranges from 1 to 4 items, and factors were interpreted as representing the following underlying 6 themes: the first factor deals with accessing communication culture and support (4 items), the

TABLE 2. EFA: PCA in Total Sample

Items	Factor Loading*						Communality
	F1	F2	F3	F4	F5	F6	
4. The doctor and nurse leaders in my area listen to me and care about my concerns.	0.837						0.596
1. The culture of this clinical area makes it easy to learn from the mistakes of others.	0.748						0.540
2. Medical errors are handled appropriately in this clinical area.	0.744						0.548
3. The senior leaders in my hospital listen to me and care about my concerns.	0.648						0.617
8. I am encouraged by my colleagues to report any safety concerns I may have.	0.544						0.505
10. I receive appropriate feedback about my performance.	0.539						0.458
15. This institution is doing more for patient safety now than it did 1 year ago.		0.920					0.632
5. Leadership is driving us to be a safety-centered institution.		0.706					0.643
7. Management/leadership does not knowingly compromise safety concerns for productivity.		0.621					0.668
6. My suggestions about safety would be acted upon if I expressed them to management.		0.531					0.526
14. a. I am satisfied with the availability of clinical leadership: Physicians			0.786				0.673
14. b. I am satisfied with the availability of clinical leadership: Nursing			0.841				0.723
14. c. I am satisfied with the availability of clinical leadership: Pharmacy			0.823				0.648
18. Personnel frequently disregard rules or guidelines that are established for this clinical area.				0.800			0.668
17. The personnel in this clinical area take responsibility for patient safety.				0.539			0.529
19. Patient safety is constantly reinforced as the priority in this clinical area.				0.491			0.524
12. Briefing personnel before the start of a shift is an important part of patient safety.					0.847		0.660
13. Briefings are common here.					0.730		0.660
16. Adverse events occur as result of system failures/not attributable to one individual’s actions.†						0.878	0.714
9. I know the proper channels to direct questions regarding patient safety.					0.335	0.273	0.355
11. I would feel safe being treated here as a patient.	0.347			0.321			0.522
Eigenvalue	6.184	1.559	1.340	1.202	1.102	1.021	
% of explanatory variance	29.449	36.872	43.256	48.978	54.227	59.089	
Kaiser-Meyer-Olkin			0.889				

Italic font indicates items with ambiguous and low factor loadings.

*F1–F6 numbers the identified factors.

†Wording of item 16 was shortened in favor of layout features.

TABLE 3. Final 6-Factor Structure for SCS (Shared Factor Structure for RNMW and MD)

Factor Structure (Reduced, Unambiguous, RNMW and MD)

Factor 1: Communication culture and support

- 1. The culture of this clinical area makes it easy to learn from the mistakes of others.
- 2. Medical errors are handled appropriately in this clinical area.
- 3. *The senior leaders in my hospital listen to me and care about my concerns.**
- 4. The doctor and nurse leaders in my area listen to me and care about my concerns.
- 8. *I am encouraged by my colleagues to report any safety concerns I may have.*,†,‡*
- 10. I receive appropriate feedback about my performance.
- 11. I would feel safe being treated here as a patient.*,‡

Factor 2: Organizational safety concerns

- 5. Leadership is driving us to be a safety-centered institution.
- 6. My suggestions about safety would be acted upon if I expressed them to management.
- 7. Management/leadership does not knowingly compromise safety concerns for productivity.§
- 15. This institution is doing more for patient safety now than it did 1 year ago.

Factor 3: Clinical leadership

- 14. a. I am satisfied with the availability of clinical leadership: Physician
- 14. b. I am satisfied with the availability of clinical leadership: Nursing
- 14. c. I am satisfied with the availability of clinical leadership: Pharmacy

Factor 4: Briefings

- 9. *I know the proper channels to direct questions regarding patient safety.†,‡,§*
- 12. Briefing personnel before the start of a shift is an important part of patient safety.
- 13. Briefings are common here.

Factor 5: Patient safety promotion

- 17. The personnel in this clinical area take responsibility for patient safety.
- 18. Personnel frequently disregard rules or guidelines that are established for this clinical area.
- 19. Patient safety is constantly reinforced as the priority in this clinical area.

Factor 6: Adverse events

- 9. *I know the proper channels to direct questions regarding patient safety.§,‡*
- 16. Adverse events occur as a result of system failures/not attributable to one individual's actions.

Italic font indicates excluded items (items 3, 8, 9, and 11).

*Item loads on a different factor in RNMW and MD samples.

†Ambiguous factor loadings (cross-loadings).

‡Factor loading <0.40.

§Theoretically assigned despite cross-loadings.

second factor is about organizational safety concerns (4 items), the third factor is about the access to clinical leadership (3 items), the fourth factor has the aim to measure briefings (2 items), the fifth factor deals with patient safety promotion (3 items), and the sixth factor represents adverse events (1 item).

Psychometric Properties

Subscale means and internal consistency measures were calculated, both for the total sample and separately by professions. Cronbach α for the subscales varies from $\alpha = 0.752$ to $\alpha = 0.595$ in the total sample, from $\alpha = 0.794$ to $\alpha = 0.535$ in the sample of MD, and from $\alpha = 0.747$ to $\alpha = 0.593$ in the sample of RNMW. Differences in item means between professions were calculated using Student *t* tests. Registered nurses and midwives rated communication culture and support ($P < 0.05$) as well as organizational safety concerns ($P < 0.001$) significantly higher than did MDs. In contrast, MDs considered clinical leadership to be more efficient than did RNMWs ($P < 0.05$). No differences were found relating to the subscales briefings, patient safety promotion, and adverse events (Table 4).

DISCUSSION

Statement of Principal Findings

The results in our Austrian sample demonstrate that the SCS is not a unidimensional instrument as originally assumed.^{10,15} The EFA for the total sample of MDs, RNMWs, and THs illustrates a multidimensional instrument—irrelevant which factor extraction method was applied. Factor extraction using the scree test and the parallel analysis indicated a 2-factor instrument explaining only about 38% of variance. The recognition of the Kaiser eigenvalue criterion greater than 1 identified a solid 6-factor solution explaining almost 60% of variance. Under the premise that more than 50% of variance explanation should be reached, this 6-factor solution seems to be appropriate. Mean subscale scores and Cronbach α were then calculated for the adapted and reduced instrument with the final 6-factor structure. Although good ($\alpha = 0.794$) to low ($\alpha = 0.535$) internal consistencies were observed, both for the total sample and separately by professions, there is potential for optimizing the reliability of the instrument. The rather low measures of internal consistency are to be expected owing to a small number of items per factor; hence, no reliability calculation is necessary.

TABLE 4. Psychometric Properties

Psychometric Properties and Differences by Profession	Sample RNMW	Sample MD	Total Sample
Factor 1: Communication culture and support, 1 (do not agree at all) to 5 (fully agree), 4 items			
Mean (SD)	3.97 (0.75)	3.78 (0.87)	3.94 (0.76)
Cronbach α	0.691	0.794	0.710
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> < 0.05 5 (−2.33, 156), −0.35 to −0.29		
Factor 2: Organizational safety concerns, 1 (do not agree at all) to 5 (fully agree), 4 items			
Mean (SD)	3.94 (0.86)	3.67 (0.95)	3.90 (0.88)
Cronbach α	0.700	0.768	0.712
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> < 0.001 (−3.25, 828), −0.45 to −0.11		
Factor 3: Clinical leadership, 1 (do not agree at all) to 5 (fully agree), 3 items			
Mean (SD)	4.13 (0.83)	4.29 (0.73)	4.15 (0.81)
Cronbach α	0.747	0.766	0.752
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> < 0.05 (1.98, 817), 0.01 to 0.31		
Factor 4: Briefings, 1 (do not agree at all) to 5 (fully agree), 2 items			
Mean (SD)	4.33 (0.87)	4.34 (0.86)	4.31 (0.87)
Cronbach α	0.639	0.535	0.613
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> > 0.05 (0.16, 806), −0.15 to 0.18		
Factor 5: Patient safety promotion, 1 (do not agree at all) to 5 (fully agree), 3 items			
Mean (SD)	4.34 (0.67)	4.21 (0.68)	4.32 (0.66)
Cronbach α	0.593	0.614	0.595
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> > 0.05 (−1.93, 835), −0.25 to 0.01		
Factor 6: Adverse events, 1 (do not agree at all) to 5 (fully agree), 1 item			
Mean (SD)	3.51 (1.13)	3.56 (1.08)	3.48 (1.13)
Cronbach α	n.a.	n.a.	n.a.
<i>P</i> value (<i>T</i> statistic, <i>df</i>), 95% CI	<i>P</i> > 0.05 (0.93, 685), −0.18 to 0.27		

n.a., not applicable.

Assuming that there are different perceptions of the safety climate among health professionals, the factor structure per profession was also taken into account, which differs to a relevant extent.

These findings may suggest that different health care professionals do not quite share the same basic concepts of the safety climate, that they ultimately perceive or understand SCS issues in a different way, or that the safety climate itself is a predominantly profession-specific rather than hospital organization-specific construct.

Finally, we identified a 6-factor solution (communication culture and support, organizational safety concerns, clinical leadership, briefings, safety promotion, adverse events) that proved compatible with both professional groups of MDs' and RNMWs' factor structures; however, in favor of an overarching factor structure of the SCS, 5 items had to be excluded from the final factor solution.

Strengths and Limitations

This study has several limitations in terms of small response rate and study design. Although the e-mail addresses of the health professionals were obtained in advance, there is some risk that not everyone read the invitation to the survey or had access to a computer or mobile device. Another reason may be the generally low willingness to participate in online surveys and concerns about the anonymity of participation. As a consequence, rather low numbers in subsample size may limit the results of EFA. However, taking into account variables with limited commonalities and factors with a small number of variables, a sample of at least 300 participants is often recommended for the implementation of multivariate procedures.²⁶ Other scholars have cautiously stated that a sample size of at least 100 participants may be poor but sufficient.²¹ Although the total sample size and the subsample size

regarding RNMWs prove sufficient, this was not the case for the subsamples of MDs and especially THs. Thus, it was not possible to include data from THs in the analysis owing to the low response rate. Focusing on the limitation in sample size, a sensitivity analysis—that is, decreasing the data by 10% at random and repeating all factor analysis procedures—was performed. The 6-factor structure was replicated in the total and subgroups' random sample, and all 6 factors were represented by the same set of items. Slightly differing factor loadings and Kaiser eigenvalue measures were observed in the subsample of MDs. Although the findings do not indicate any substantial changes to the initial results, the sensitivity analysis adds a further argument for a rather cautious interpretation as well as for the need for future replication regarding the MD's results. Additional limitation relates to the data collection in one hospital organization at a single point in time, which is why no retest reliabilities could be calculated. Statements on the safety climate represent a snapshot and should be assessed on a regular basis.

Interpretation Within the Context of the Wider Literature

A comparison with other instruments makes it clear that different dimensions are used to assess the construct of safety climate. For example, the Hospital Survey on Patient Culture covers main topics such as teamwork, communication and feedback culture, staffing, handoffs/transitions, support by management, patient safety concerns and overall perceptions of patient safety, and organizational learning as well as dealing with errors.²⁷ Other study results demonstrated that leadership factors like communication, commitment to safety and executive rounds, safeguarding mental

and physical health, support of staff and empowerment, and organizational processes and individual factors are influencing safety climate.²⁸ Furthermore, the organizational culture, which is the starting point in the assessment of safety culture and subsequently safety climate, is generally considered to be a multidimensional construct.¹² In the factor structure of SCS, aspects of communication culture and support, organizational safety concerns, clinical management, measures to promote patient safety, and the handling of adverse events, and therefore, to some extent similar to the aforementioned themes were identified. Building upon the results of our EFAs, it becomes quite clear that future studies with SCS should refrain from interpreting safety climate as a unidimensional construct.

Another point of interest is the specific cultural characteristics of the study population and the local health care system. These influence the participants' response behavior as well as the perception and understanding of the questions, which ultimately changes the factor structure and the interpretation of the results.²⁹ The SCS was originally developed in the United States in Texas, but is also used in Europe. Because of the unidimensionality, a better comparability of the results between the countries is pointed out.^{10,15} However, our results illustrate a multidimensional instrument, which may well indicate a differentiated perception of safety climate. It is possible that there is no transferability here because of the different health systems. In addition, no theoretical basis can be found for the SCS, which makes further development in Austrian acute care even more difficult. Moreover, a "one size fits all" principle seems to be inappropriate when examining safety climate in all health care staff even in the same hospital organization. Results from other studies also point to different predictors of nurses and MDs in their perception of the safety climate.³⁰

Because of a growing understanding of the importance and the relationship between safety culture, patient safety, and the role of the safety climate as a key component, more health organizations should systematically conduct safety climate surveys on a regular basis.⁷ International measures are available, but only few have been validated for acute care settings in the German-speaking countries. Because surveys are often the basis for subsequent interventions, measures examining psychometric properties in the regarded specific context must be evaluated. Although there is a need for further replication of our study's findings, the demonstrated 6-factor structure must be considered, and safety climate subscale mean scores rather than total safety climate sum scores should be calculated and used for description and interpretation.

CONCLUSIONS

It can be stated that there is a lack of evidence to support the theoretical basis of the surveys and limited understanding of the concept for safety climate.¹² Different dimensions must be acknowledged, which should at least take into account communication and team culture, organizational safety concerns, leadership skills, promotion of patient safety measures, and dealing with adverse events. Referring to the SCS, future efforts should focus on testing the identified 6-factor structure applying confirmatory factor analyses in a large-scale study involving different health care professions. Without a thorough psychometric analysis of translated surveys, interpretation of the results and comparisons between professions in the local context may be flawed.

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