DIMENSIONALITY AND VALIDATION OF THE 'HOSPITAL SURVEY ON PATIENT SAFETY CULTURE' QUESTIONNAIRE FOR A SWISS SAMPLE

Yvonne Pfeiffer
PhD Student
ETH Zurich / ZOA
Kreuzplatz 5, CH-8032 Zurich
+41 44 632 70 71
ypfeiffer@ethz.ch

Tanja Manser
Senior Researcher
ETH Zurich / ZOA
Kreuzplatz 5, CH-8032 Zurich
+41 44 632 84 07
tmanser@ethz.ch

Amanda van Vegten
Clin. Risk Manager
University Hospital Zurich
Raemistrasse 100, CH-8091 Zurich
+41 44 255 88 56
amanda.vanvegten@usz.ch

Theo Wehner
Professor
ETH Zurich / ZOA
Kreuzplatz 5, CH-8032 Zurich
+41 44 632 70 88
twehner@ethz.ch

TOPICS
Organizational culture/climate and patient safety.

Safety Climate assessment in healthcare, dimensionality of HSOPSC

KEYWORDS
Safety Climate, Safety Culture, Dimensionality, Factor Structure of Safety Climate, Validity, HSOPSC

1. INTRODUCTION
Safety climate is generally viewed as a "leading indicator" for safety (in contrast to "lagging indicators" identified *after* an adverse event) ([5]). Safety climate surveys diagnose the underlying safety culture ([2]) and prospectively identify safety-relevant problems in work routines or conditions in order to implement and monitor change ([3], [5]).

The need for analyzing construct and predictive validity of safety climate measures especially in health care settings has been highlighted by several authors ([1], [2], [3], [4], [5]). In this study, an existing safety climate survey was adapted to German and to organizational specifics in Swiss hospitals. As survey instruments are increasingly applied internationally, it is important to test the validity and reliability of different language versions.

1.1 Study goals
This study assessed safety climate, i.e. employees' perceptions and attitudes regarding patient safety, in a Swiss University hospital.

The scientific goal of our study was to a) investigate the psychometric properties of the survey instrument, b) compare these results to previous research, and c) test for predictive validity by analyzing relationships between safety climate measures and outcome variables.

The applied goal of this study was to support the development of a positive safety climate in the surveyed hospital. Therefore, the survey was administered to all employees (i.e. clinical and non-clinical staff such as administration, it-support, etc.), allowing for hospital-wide follow-up measures.

2. METHODOLOGY

2.1 Adaptation of the survey instrument
In this study an existing safety climate survey – the Hospital Survey on Patient Safety Culture (HSOPSC) – was adapted for application in Swiss-German hospitals. We chose the HSOPSC for two reasons: a) it has been considered the safety climate survey with the best psychometric properties documented ([5], [7]) and b) is designed for administration to all hospital employees.

The original HSOPSC consists of 12 safety climate dimensions, including 2 outcome dimensions ([7]). Due to organizational specifics in Swiss hospitals we made following changes in adapting the survey instrument:

- *New dimension "Unit Management Support":* In Swiss hospitals, the unit management (i.e. the management of the various services such as anesthesia, cardiology, and radiology) takes on many tasks that may be handled by hospital management in other hospitals. We assumed that unit management has different influences on the daily work than hospital management. Thus, we decided to cover both management levels and introduced a new dimension "Unit Management Support for Patient Safety" in addition to "Hospital Management Support for Patient Safety".
- *New dimension "Unit Handoffs and Transitions":* In Swiss hospitals handoffs and transitions are likely to occur not only *between*, but also *within* hospital units. We thus we adapted the dimension 'Hospital Handoffs and Transi-

tions' to the unit level (i.e. duplication except for two items that were specific to the hospital level).

- *Item on use of agency/temporary staff discarded:* One item of the dimension 'Staffing' (A7r=”We use more agency/temporary staff than is best for patient care”) led to misunderstandings in the pre-test. It was pointed out to us that agency/temporary staff is in fact used to *assure* patient safety when there is a high workload and that this item may be perceived as an offence to temporary staff.
- Because our aim was to survey all hospital employees and non-clinical staff was not able to answer all items in the pretest, “not applicable” was introduced as an answer category.

2.2 Sample

The study was conducted in a Swiss University Hospital (>800 beds, >6000 employees). All staff (i.e. clinical and non-clinical) was surveyed across 61 hospital services including 42 clinical services. Response rate was 46.8% overall.

The sample comprises 13.7% of physicians, 36.8% of registered nurses, 6.5% of nurse assistants, 11.5% medical & technical staff, 15% management or administration employees, 16.5% indicated “other” or did not indicate their occupation at all. The composition of our sample fits the actual composition of staff in the surveyed hospital.

2.3 Methods

In a first step, we conducted confirmatory analyses on the original items proposed by ([7]) to analyze whether safety climate in our sample is composed of dimensions comparable to those identified by ([7]).

In a second step, we ran exploratory factor analyses (including *all* items including the “new” dimensions resulting from the adaptation of the survey) and reliability analyses of the resulting new dimensions. Intercorrelations between dimensions were minimized by reassigning or discarding items to allow for subsequent regression analyses in order to identify safety climate dimensions relating to outcome variables.

From 2989 questionnaires returned, only N=568 did not have any answer in the “not applicable” category. Thus, further validation analyses (confirmatory, exploratory and regression analyses) are based on this subset of the sample.

3. RESULTS

3.1 Factor structure

Overall, confirmatory factor analyses showed that for each dimension, there are at least 2 items showing sufficient convergent validity (indicator reliability > 0.4 for 9 out of 39 items). However, for our sample discriminant validity could not be established for the dimensions proposed by ([7]) (Fornell-Larcker-Criterion < 1 for only 2 out of 12 dimensions).

Tests of *global* fit are used to determine whether the proposed factor structure can be found in a sample. Based on the indices recommended by Kline (2005), global fit was not consistently good in our sample: Three fit indices showed an adequate fit (RMSEA, PCLOSE, CMIN) while GFI, NFI and TLI took values indicating insufficient fit to confirm the proposed factor structure (see table 1).

Table 1. Global fit of the proposed factor structure

Fit Index for Swiss sample		Criterion
CMIN /*df*	2.271	< 3.0: acceptable
GFI	.878	> .90 or > .95
RMSEA	.047	< .08 or < .05
PCLOSE	.91	>.50
NFI	.859	> .90 or > .95
TLI	.901	> .90 or > .95

Note. $\chi^2 = 1444.54$, $df=636$

Tests of *local fit* are used to determine measurement quality for the items within each factor. Concerning the local fit of the items to the proposed factor structure, the following criteria indicated a good convergent validity: indicator reliability >.40 (applies to 30 items), factor reliability >.60 (applies to all factors), DEV >.50 (applies only to three out of 12 factors).

In summary, the items appeared to measure constructs adequately, whereas discrimination between the different factors was low. Table 2 illustrates the intercorrelations between dimensions, as indicated by confirmatory factor analyses.

Exploratory factor analyses were conducted to eliminate items that showed cross-loadings on different dimensions and to identify dimensions that can be merged. These analyses were conducted using the adapted version of the survey instrument: 10 of originally 14 dimensions remained. Dimensions that were merged: “Communication Openness” + “Feedback and Communication about Error”; “Supervisor, Manager Expectations & Actions Promoting Safety” + “Unit Management Support for Patient Safety”; “Teamwork Across Units” + “Hospital Handoffs and Transitions”). Due to cross-loadings on different factors, three items of the dimension “Organizational Learning” were discarded.

To sum up, the dimensionality supposed by ([7]) could not be reproduced. On the dimension-level, discrimination between the different dimensions was rather low. At the item-level we found rather good measurement properties and a good consistency.

Table 2. Intercorrelations of the dimensions

Dimension	1	2	3	4	5	6	7	8	9	10	11
1 Supervisor, Manager Expecta-											
2 Organizational Learning…	.75										
3 Teamwork within units	.63	.70									
4 Communication Openness	.70	.82	.70								
5 Feedback and Communica-	.65	.83	.60	.91							
6 Nonpunitive Response to	.74	.71	.66	.73	.65						
7 Staffing	.45	.34	.30	.22	.24	.45					
8 Hospital Management Support for	.37	.48	.36	.35	.44	.33	.38				
9 Teamwork across Hospital Units	.37	.51	.48	.43	.50	.38	.30	.56			
10 Hospital Handoffs and Transi-	.30	.40	.37	.36	.38	.32	.25	.45	.85		
11 Overall Perceptions of Safety	.68	.83	.64	.59	.63	.67	.64	.50	.51	.44	
12 Frequency of Event Reporting	.47	.63	.38	.66	.67	.45	.28	.40	.38	.34	.56

Note. $n = 568$.

3.2 Safety Climate Dimensions Predicting Reporting Behavior and Perceptions of Safety

To test which safety dimensions best predict the two outcome dimensions "Frequency of Event Reporting" and "Overall Perceptions of Safety" regression analyses were applied.

"Frequency of Event Reporting": For this outcome measure, "Feedback and Communication about Errors" was the best predictor (ß=.45, p=.00), followed by "Hospital Management Support for Patient Safety" (ß=.12, p=.00) and "Unit Handoffs and Transitions" (ß=.11, p=.00).

"Overall Perceptions of Safety": The best predictors for this outcome measure were "Support by Management in the Unit" (ß=.27, p=.00) and "Staffing" (ß=.27, p=.00) followed by "Hospital Management Support for Patient Safety" (ß=.10, p=.01) and "Nonpunitive Response to Error" (ß=.10, p=.01).

When distinguishing between professional groups, we found similar relationships between safety climate dimensions and "Frequency of Event Reporting". Concerning "Overall Perceptions of Safety", we found that for physicians "Nonpunitive Response to Error" and "Unit Management Support" showed the strongest influence, whereas for nurses "Staffing", "Hospital Management Support", and "Unit Transitions and Handoffs" were the best predictors.

These results indicate that building a safety climate that supports event reporting can be positively influenced by openness of communication and information in the unit and by the hospital management support. Moreover, physicians perceive a higher level of patient safety when they experience non-punitive responses to error whereas nurses do this, when they have enough staff in the unit.

4. CONCLUSIONS

For our Swiss sample, the factor structure proposed by ([7]) could not be supported. This is in line with results from other European countries ([6]). These results point to the need to explore possible cultural specificities. In addition, it is possible that revising the assignment of items to scales can ameliorate the discrimination between the scales.

Our results also highlight the need to consider and further investigate differences concerning the relationship of safety climate dimensions and subjective outcome ratings for different professional groups.

As event reporting is a core prerequisite of effective clinical risk management, it is important to know that it might be influenced mainly by enhancing information and communication in the unit – for nurses and physicians alike. In contrast, physicians' perception of patient safety depends on other safety climate dimensions than nurses' perceptions. This result points to the different needs for these professional groups when designing, implementing, and evaluating safety relevant intervention.

5. ACKNOWLEDGMENTS

F. Giuliani (University Hospital Zurich) as member of the project team and Prof. Steurer (University Hospital Zurich, Horten-Zentrum) as part of the advisory board helped us in conducting the survey in their hospital.

6. REFERENCES

[1] Colla, J.B., Bracken, A.C., Kinney, A.C., Weeks, W.B., Measuring Patient Safety Climate: a review of surveys. *Quality and Safety in Healthcare* 2005; 14: 364-366.

[2] Flin, R., Burns, C., Mearns, K., Yule, S., Robertson, E.M., Measuring safety climate in health care. *Quality and Safety in Healthcare* 2006; 15: 109-115

[3] Flin, R., Measuring safety culture in healthcare: A case for accurate diagnosis. *Safety Science* 2007; 45: 653-667.

[4] Hutchinson, A., Cooper, K.L., Dean, J.E., McIntosh, A., Patterson, M., Stride, C.B., Laurence, B.E., Smith, C.M., Use of a safety climate questionnaire in UK health care: factor structure, reliability and usability. *Quality and Safety in Healthcare* 2006; 15: 347-353;

[5] Nieva, V. F., Sorra, J., Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Quality and Safety in Healthcare* 2003; 12: 17-23.

[6] Smits, M., Christiaans-Dingelhoff, I., Wagner, C., Van der Wal, G., Groenewegen, P., De validiteit van COMPaZ: een vergelijking tussen een Nederlandse en Amerikaanse vragenlijst naar patiëntveiligheidscultuur in ziekenhuizen. *TSG: Tijdschrift voor Gezondheidswetenschappen* 2007; 2: 105-114.

[7] Sorra, J., Nieva, V.F., Psychometric Analysis of the hospital survey on patient safety. *Final Report to Agency for Health Care Research and Quality.* AHRQ, Washington, 2003.