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Development and Validation of a Patient Safety Culture Questionnaire in Acute Geriatric Units

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Key Words
Patient safety culture · Adverse events in hospitals · Quality improvement in health care

Abstract
Background: Older patients (≥65 years) are exposed to more harm resulting from adverse events in hospitals than younger patients. Theoretical considerations and empirical findings suggest that safety culture is the key to improving the quality of health care. ***Objective:*** To describe the development of a German-language instrument for assessing patient safety culture (PSC) and its reliability and validity; to verify criterion validity by means of a cross-sectional analysis of the impact of PSC on clinical quality that compares acute geriatric units with a sample from intensive care, surgery and trauma surgery departments, and to report variations in the PSC profile between these groups. ***Methodology:*** Using a review of existing safety culture surveys, multidimensional scaling procedures and expert interviews, we tested the content and convergent validity of a 158-item questionnaire completed by 508 physicians and nurses from 31 acute geriatric units and 7 comparison departments. Criterion validity was verified by various regression models with a self-reported measure of adverse events. Differences in PSC profiles were analyzed using a one-factorial ANOVA and regression models. ***Results:*** We identified 7 constructs of PSC and demonstrated substantial convergent and criterion validity. In the acute geriatric units, higher levels of 'management commitment to patient safety' and lower levels of 'error fatalism' were associated with a reduced incidence of medical errors. In the comparison group, only the variable 'active learning from mistakes' was relevant for safety performance. Our results also indicate that acute geriatric units display higher standards than the comparison group in all the aspects of patient safety examined. ***Conclusion:*** It is possible to measure salient features of PSC using a valid and reliable survey. Some aspects of PSC are more closely related to safety events than others. In acute geriatric units, patient safety appears to be influenced mainly by management's determination of how things are done whereas improvement of the system itself in a more incremental manner is required in the other high-risk ward types.

Introduction

'To err is human.' This was the conclusion reached by the Committee on Quality of Health Care in America after it had examined safety standards in a large number of US health care institutions [1]. According to studies con-

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ducted in New York [2] and Utah/Colorado [3], medical errors occur in around 3–4% of hospitalized cases. Such errors include diagnostic errors, unnecessary delays in treatment, medical malpractice in surgery, errors in therapeutic interventions, wrong-site surgeries, defects in medical technology and communication difficulties [2, 4, 5]. Research on adverse events in Australian [6], Canadian [7] and New Zealand hospitals disclose comparable figures while data from the UK [8], Denmark [9] and the Netherlands [10] show that medical errors are an issue in Europe as well [11]. A recent meta-analysis of 51 studies (including 20 from the EU) reported a mortality rate due to preventable adverse events in 0.1% of all hospital patients. For Germany this implies 17,000 deaths every year [12].

Older patients are even more exposed to the risk of medical errors than these average figures suggest. Thus, a study of iatrogenic injuries found that patients aged ≥65 accounted for 27% of the hospitalized population, but had been victims in 43% of all adverse events [13]. Another study reported the incidence of adverse drug events to be 14.8% among such patients, a proportion much higher than that reported in those of all other ages [14]. Reanalysis of data from the Utah/Colorado medical practice study revealed that older patients (≥65 years) had a relatively higher incidence of preventable adverse events (2.95% compared to 1.58% for younger patients), especially preventable adverse drug events, events related to medical procedures and falls [15]. That study also suggested that older patients were not victims of age discrimination, but rather that they suffered disproportionately due to the complexity of their treatment (e.g. more drugs, more procedures performed, longer length of stay, impaired physiological compensatory mechanisms). What makes the situation even worse is the fact that they are also more likely to experience permanent disability, or even to die, because of adverse events [15].

On the other hand, research into high-reliability organizations, such as nuclear aircraft carriers or commercial airlines, suggests that successful operations require a reliability culture centering on safety [16]. The high-reliability organization theory was first applied to health care in 1994 [17]. Since then, there has been a widespread assumption among health care researchers of a strong relationship between safety culture and quality of treatment in health care settings [18]. Some even see safety culture as a proxy for quality in hospitals [19]. Admittedly, the relationship between patient safety culture (PSC) and safety performance in hospitals has been little researched. First results are, however, promising. For instance, a recent study reported that a 1-SD improvement in the measure of safety culture led to a 19% lower risk of experiencing a decubitus ulcer [20].

To date, there have been no empirical studies concerning the PSC of acute geriatric departments, defined as interdisciplinary departments for providing care to older adults during admission to hospital for an acute medical illness [21]. The main goal of our study is, therefore, to develop a PSC questionnaire that can be used in acute geriatric settings, and to verify its validity. In particular, it should be possible to demonstrate a relationship between questionnaire scores and the incidence of perceived adverse events affecting patient safety. In a cross-sectional assessment of content validity, we also examine variations in safety culture between acute geriatric units and other high-risk hospital departments, and the impact of such variations on clinical quality.

PSC and Its Relation to Patient Outcomes

PSC has been defined as 'the product of the shared values, attitudes, and patterns of behavior that determine the observable degree of effort with which all organizational members direct their attention and actions toward minimizing patient harm that may result from the process of care delivery' [22, p. 46]. Several instruments have been developed to evaluate PSC, the dimensions most commonly covered in them being leadership, policies and procedures, staffing, communication and reporting [23]. However, most safety questionnaires have lacked explicit theoretical underpinning with regard to psychometric criteria such as content validity, criterion-related validity and factor analysis [24]. This is particularly true for criterion-related validity, as few surveys have examined the relationship between safety culture and external parameters such as medical errors [23]. Thus, although there is now a broad spectrum of PSC questionnaires tailored to health care, the relationship between the data generated and medical errors remains unclear.

A handful of studies have started to fill this research gap only recently. Singer et al. [20], for example, analyzed both primary data from a survey of hospital personnel and secondary data from a Medicare Provider Analysis. They found that hospitals with a better PSC had a lower relative incidence of patient safety indicators (e.g. anesthesia-related complications, decubitus ulcer and iatrogenic pneumothorax). Katz-Navon et al. [25] conducted a survey of PSC in various hospitals, whose archives – as recorded in the respective risk management systems –

they reviewed to gather data on medical errors. The study indicated that according to safety a high priority was associated with lower numbers of treatment errors [25]. Hofmann and Mark [26], too, studied PSC on the basis of a questionnaire and compared the results with errors collected from archival records, while Neal and Griffin [27] applied a similar approach in Australian hospitals. All these studies reached the conclusion that PSC was indeed related to the incidence of medical errors.

Despite establishing this relation, however, existing research is unsatisfactory for two main reasons. First, research linking safety culture and medical errors in non-English-speaking countries is almost nonexistent [28] because few instruments comply with standard psychometric criteria in general [24], and even fewer are written in languages other than English. As linguistic subtleties strongly influence the subjective assessment of safety culture, translated English surveys can only be used if the translations are tested against standard psychometric criteria – and, at present, there are no validated instruments available in German-speaking countries [28]. Hence, studies of PSC in German-speaking healthcare institutions are lacking. Second, existing research linking PSC and medical errors has regarded hospitals as homogeneous organizations [25, 26–29]. In other words, the studies have not differentiated between medical fields. Yet it is perfectly possible that such fields may significantly differ in terms of complexity and risk exposure.

Measure Validation Strategy

The construct validity of survey-based measures must be empirically determined. Validity is verified when an instrument captures its intended construct in a manner consistent with the relevant theory ('content validity') and when its scales do indeed measure what they are intended to measure ('convergent validity') [30]. To date, no theoretical model has codified discrete and measurable dimensions of PSC. In this study, the two validity criteria were therefore verified as indicated below.

In a first step, we conducted an extensive literature review [31], which threw up 44 questionnaires with a total of 255 differently-named scales being employed to assess safety culture. A further look at these instruments showed that the number of dimensions captured by these questionnaires varied strongly [24]. Thus, we found questionnaires with just 1 scale [22, 32] and others with up to 28 different dimensions [33].

Next, a multidimensional scaling procedure based on the ratings of 31 health care experts was employed to identify differences and similarities in the 255 scales. We identified 5 dimensions with a sufficient explanation of variance (74.3%) underlying the PSC construct. We also conducted 9 semi-structured qualitative interviews with health care experts. These pinpointed 3 important new dimensions, namely 'stress and workload', 'openness for patients' suggestions', and 'acceptance of errors', in addition to those already found. The results of multidimensional scaling, together with the findings of an additional literature trawl, were the starting point for a rough definition of relevant dimensions. And that, in turn, provided the basis for the preliminary phrasing of items, with those from existing questionnaires being included wherever possible. In the course of several meetings, our research team generated a total of 714 items, which were then prioritized, and those with low scores were eliminated. The result was a reduced pool of 326 items.

In the next step, this pool was used to compile an initial test questionnaire, completed by 107 physicians and designed to enable a preliminary choice of items. Their selection was based, firstly, on an explorative factor analysis and, secondly, on 3 values calculated for each item. These were: its validity index, i.e. its correlation with a scale of adverse events; its discrimination index, i.e. its correlation with the dimension of which it formed part; and its difficulty, i.e. its arithmetical mean (items with very low means are termed 'difficult', those with very high means 'easy', neither type being of help in discriminating between different safety cultures). Throughout the item selection process, we attempted to optimize the validity of each scale, Cronbach's α as a measure of reliability, and the normal distribution. Once it was complete, we were left with the 158 items included in the questionnaire applied in this study.

In order to verify 'criterion-related validity', PSC must be correlated with outcome data [30]. We assume that it is verified if higher levels of PSC are associated with lower incidences of adverse events, an assumption justified by both the theoretical and the empirical literature mentioned above. In particular, previous research supports the view that there may be variations in PSC between different medical fields and work contexts. For instance, emergency department personnel perceive a lower quality of PSC than workers in other areas, and personnel in nonclinical units a higher quality [20]. It seems reasonable to posit that these findings reflect differing levels of intrinsically hazardous activities that lead to higher levels

Table 1. Characteristics of the study population (n = 508)

	Acute geriatrics (n = 240)	Intensive care unit (n = 94)	Surgery (n = 68)	Trauma surgery (n = 106)	p
Male, %	34.2	36.2	28.4	28.9	0.713
Work experience, years	18.7 ± 9.2	14.0 ± 8.6	16.7 ± 10.2	17.7 ± 9.2	0.001
Physicians, %	26.3	41.5	38.2	25.5	0.063
Nurses, %	72.7	58.5	61.8	74.5	
Leadership function, %	31.1	18.7	30.9	14.6	0.015

of risk and complexity and to a faster pace of work. We therefore constructed and compared two samples that differed in terms of such activities, one made up of acute geriatric units, the other of intensive care, surgery and trauma surgery departments.

In this case, criterion validity will be verified if our questionnaire succeeds in discriminating across multiple hospitals of different types in terms of our hypothesis that acute geriatric units have higher levels of PSC than intensive care, surgery and trauma surgery departments. This supposition is supported by empirical studies that indicate a higher quality of treatment for older patients in acute geriatric units than in conventional care contexts. For instance, a recent clinical trial found a 19% incidence of functional deterioration in the former, as compared to a figure of 40% in the latter [34]. Likely reasons for this higher quality of treatment include the emphasis on comprehensive geriatric assessment and case management, interdisciplinary work, a more accurate use of medication, as well as special diagnostic and therapeutic procedures.

Methodology

The 158-item version of our questionnaire was sent to 42 acute geriatric units in Austria that work together in a voluntary association. The unit heads were informed about the goals of the study and asked to invite their employees to participate. Since the overall sample size was more important to us than the number of participants per unit, we set the minimum for the latter at 5. A total of 31 units met this requirement, the total number of participants being 240 and the average per unit 7. The contrastive sample consisted of 3 intensive care units, together with 2 surgery and 2 trauma surgery departments, all 7 run by a large public hospital provider in Vienna. In this group, the number of respondents to our questionnaire was 268, a response rate of 22%.

Participants in the survey were required to complete all items of an internet questionnaire within a period of 2 weeks. During that time, they could log on or off as often as they pleased and could change their entries using a delete key. Total completion time was about 20 min. To increase the response rate, we sent a reminder letter and increased the response time to 4 weeks. After completing the questionnaire, participants were given detailed benchmark feedback on their safety culture profile.

Criterion validity was analyzed in various steps. The first of these involved examination of correlations with a German questionnaire [35, 36] that measures the frequencies of adverse events, such as medication errors, decubitus ulcer or delirium due to insufficient liquid supply, using a four-category rating scale (from 'I know of several incidents' to 'I know of no incidents'). In the second step, we estimated validity by means of a regression model with PSC as the independent and the number of adverse events as the dependent variable. We verified criterion validity for each sample group individually. Multiple linear regression models were used to account for the influence of the following control variables: gender (1 – male; 0 – female), work experience (years), profession (1 – physicians; 0 – nurses), leadership (1 – yes; 0 – no).

Continuous variables are expressed as mean ± SD. In order to test differences in PSC between our four types of unit, we used one-factorial ANOVAs, as the normal distribution of sample means required by such statistics is ensured for large samples such as ours by the central limit theorem. In order to avoid problems arising from heterogeneous variances, the results of a Games Howell test were included as post hoc statistics. Categorical variables were given as numbers and percentages; differences between them were calculated using χ^2 tests. In order to test for differences between acute geriatric units and the comparison group, a dummy variable (1 – geriatric; 0 – nongeriatric) was entered into the model and a second regression analysis carried out. In all analyses, a p value <0.05 was considered significant.

Results

The main characteristics of our total sample are outlined in table 1. As can be seen there, the gender distribution of respondents did not vary significantly between the four unit types. However, the variables 'work experience' and 'leadership function' both displayed significant differences, with respondents from the geriatric wards hav-

Table 2. Cronbach's α and criterion validity of the PSC questionnaire (n = 240)

Scale		
Participants recording high scores on the following dimensions ...		
(1) *Active learning from mistakes*	Items	15
... describe a safety culture where events are seen as a chance to learn. They aim for constant improvement when dealing with risks	α	0.86
	Validity	0.22
(2) *Management commitment to patient safety*	Items	15
... describe a safety culture which is supported and encouraged by management and supervisors	α	0.91
	Validity	0.36
(3) *Stress and workload*	Items	15
... highlight the safety problems resulting from workload and haste demanded in their work unit	α	0.82
	Validity	0.30
(4) *Communication and cooperation regarding patient safety*	Items	15
	α	0.89
... report an open atmosphere in which mistakes can be discussed easily	Validity	0.19
(5) *Attitudes of shared care and concern for hazards*	Items	15
... have a positive attitude towards safety management, i.e. they are certain that action on patient safety is useful	α	0.85
	Validity	0.20
(6) *Error fatalism*	Items	15
... believe that not much can be done regarding patient safety, i.e. they think that it is useless to discuss mistakes and that there are not enough procedures to cover every contingency	α	0.84
	Validity	0.31
(7) *Processes and equipment*	Items	15
... assess the processes and equipment in their hospital unit as ideal for preventing risks	α	0.84
	Validity	0.38
Adverse events	Items	23
Number of observed adverse events in their hospital unit	α	0.93

ing the most work experience and the percentage of those with leadership functions being lowest in trauma surgery. Additionally, although nurses clearly outnumbered physicians among respondents in all unit types, the degree of their dominance varied, with the highest percentage of nurses coming from the acute geriatric sample.

Table 2 gives an overview, for our geriatric units only, of the statistical properties of our safety culture questionnaire broken down into 7 dimensions of PSC, for each of which a brief description is provided.

Criterion validity coefficients ranging from 0.3 to 0.4 can be considered to be acceptable, and those above 0.4 to be good. Values of Cronbach's α (measures scales' internal consistency or reliability) above 0.8 are also regarded as rather good results; as can be seen, this level is reached for all our scales.

In a further step, we tested criterion validity using a regression model designed to reflect connections between PSC and adverse events. Our results, reported in table 3, show a different pattern of relevance for our two comparison groups. In acute geriatric units, 'management commitment to patient safety' ($\beta = -0.376$, $p < 0.001$) is associated with a reduced number of adverse events, 'error fatalism' ($\beta = 0.350$, $p < 0.001$) with an increased number of adverse events. A third dimension, 'attitudes of shared care and concern for hazards', is also significant ($p = 0.025$), but, unexpectedly, it is associated with a higher rather than a lower number of adverse events ($\beta = 0.232$); we suspect that a suppressor effect may be at work here. In the more intrinsically hazardous contrastive sample, 'Active learning from mistakes' is the only significant dimension, being associated with a reduced incidence of medical errors ($\beta = -0.299$, $p = 0.020$). It can, therefore, be seen that our regression model partially confirms our hypothesis, but not for all PSC antecedents. Our data also indicate that PSC seems to be of greater relevance for the reduction of adverse events in acute geriatric units. Indeed, the proportion of variance it explains there is almost twice as high ($R^2 = 0.432$) as in the other department types ($R^2 = 0.234$).

Variations in PSC profile between our four unit types are shown in table 4. The differences between them are highly significant. Without adjustment for the control variables, the results for acute geriatrics show the most positive pattern. Post-hoc comparisons showed significant differences between geriatrics and both intensive care ($p < 0.001$) and trauma surgery ($p < 0.001$) for all dimensions. Between geriatrics and surgery, the only significant difference identified ($p = 0.001$) was for scale 3 ('stress and work load').

In order to control for gender, work experience, profession and leadership function, further regression analyses were performed (we do not report the results in detail due to space limitations). They revealed highly significant evidence that, in acute geriatric units and relative to the comparison group: 'active learning from mistakes' and 'management commitment to patient safety' scored higher (both $p < 0.001$); 'stress and work load' and 'error fatalism' scored lower (again, both $p < 0.001$); 'communication and cooperation regarding patient safety' was better ($p < 0.001$); 'attitudes of shared care and concern for hazards' were more positive ($p < 0.001$), and 'processes and equipment' were better adjusted to patient safety needs ($p < 0.001$). Moreover, in total, the 'number of adverse events' was significantly lower ($p < 0.001$).

Table 3. Results of regression analysis (number of perceived adverse events versus patient safety)

	Acute geriatrics (n = 240)			Comparison group (n = 268)		
	β	T	p	β	T	p
Intercept		−4.612	0.000**		−0.159	0.874
Gender (1–0)	0.103	1.897	0.059	0.117	1.789	0.075
Work experience (years)	−0.045	−0.803	0.423	−0.017	−0.268	0.789
Profession (1–0)	0.390	6.936	0.000**	0.094	1.423	0.156
Leadership function (1–0)	0.155	2.556	0.011*	0.022	0.336	0.737
(1) Active learning from mistakes	0.196	1.864	0.064	−0.299	−2.334	0.020*
(2) Management commitment to patient safety	−0.376	−3.896	0.000**	0.050	0.445	0.657
(3) Stress and work load	−0.034	−0.383	0.702	0.124	1.239	0.217
(4) Communication and cooperation regarding patient safety	−0.144	−1.579	0.116	0.142	1.422	0.156
(5) Attitudes of shared care and concern for hazards	0.232	2.250	0.025*	0.079	0.728	0.467
(6) Error fatalism	0.350	4.300	0.000**	0.155	1.823	0.070
(7) Processes and equipment	−0.119	−1.178	0.240	−0.147	−1.298	0.196
R	0.678			0.484		
Adjusted R^2	0.432			0.234		

* $p < 0.05$; ** $p < 0.01$.

Table 4. Differences in safety culture (n = 508)

	Acute geriatrics (n = 240) AM ± SD	Intensive care unit (n = 94) AM ± SD	Surgery (n = 68) AM ± SD	Trauma surgery (n = 106) AM ± SD	p
(1) Active learning from mistakes	3.175 ± 0.502	2.648 ± 0.640	3.174 ± 0.583	2.740 ± 0.594	<0.001**
(2) Management commitment to patient safety	3.322 ± 0.556	2.845 ± 0.676	3.322 ± 0.563	2.798 ± 0.696	<0.001**
(3) Stress and work load	2.336 ± 0.572	2.748 ± 0.599	2.602 ± 0.494	2.964 ± 0.571	<0.001**
(4) Communication and cooperation regarding patient safety	3.099 ± 0.579	2.719 ± 0.613	3.058 ± 0.624	2.759 ± 0.557	<0.001**
(5) Attitudes of shared care and concern for hazards	3.024 ± 0.507	2.703 ± 0.486	3.000 ± 0.457	2.635 ± 0.478	<0.001**
(6) Error fatalism	2.559 ± 0.526	2.779 ± 0.481	2.489 ± 0.467	2.853 ± 0.495	<0.001**
(7) Processes and equipment	2.893 ± 0.509	2.413 ± 0.524	2.745 ± 0.462	2.369 ± 0.523	<0.001**
(8) Number of adverse events	1.963 ± 0.616	2.656 ± 0.611	2.146 ± 0.542	2.283 ± 0.649	<0.001**

AM = Arithmetic mean; SD = standard deviation; p is based on a one-factorial ANOVA; ** $p < 0.01$.

Discussion

Our results indicate that we have succeeded in constructing 7 valid and reliable subscales to measure PSC across multiple disciplines that are substantively and methodologically consistent with expert judgment, relevant theory, and empirical literature. In addition, we have generated meaningful behavioral insights into the enactment of PSC indicating that the development of a 'safety culture' is a potential strategy for improving patient safety.

Using two contrasting samples, we differentiated between disciplines with different levels of intrinsic hazardousness (acute geriatrics – low level; intensive care, surgery and trauma surgery – high levels), the latter being characterized by greater risk and complexity and by a faster pace of work. The results provide evidence that different aspects of PSC are of relevance for patient safety in the two comparison groups. Specifically, patient safety in acute geriatric units is primarily enhanced by commitment from management that correctly understands safety issues and takes supportive action when necessary. In general, managerial safety practices that promote safety-

oriented behavior and emphasize its importance are associated with higher levels of safety performance while an attitude of error fatalism is related to higher incidences of adverse events. Here, an important role is played by generalized expectations about where the control over patient safety truly resides (do people believe that their actions determine results or rather that their own behavior is irrelevant because results are outside their control?), with expectations of internal control being associated with better safety performance than externally focused ones. In contrast to these findings for acute geriatric units, the main factor positively associated with indicators of patient safety in the other group was the enhancement of collective learning by addressing and learning from failures. This dimension also includes respondents' knowledge of their potential to learn from others in order to reduce errors.

Furthermore, our acute geriatric units displayed higher standards than the comparison group in all aspects of PSC. First, we found them to be more active learning environments and to report a more open-minded working atmosphere. Second, supervisors in such units were more likely to monitor improvements in safety culture than their counterparts in the comparison group, while also displaying a better attitude towards safety management as they tended to take action to improve patients' safety. Third, the geriatric units exhibited relatively less error fatalism as well as greater willingness to change their safety culture. Fourth, processes and equipment were assessed more positively there. Finally, and in line with the above, the reported number of adverse events was lower than in the comparison group. All these findings can be interpreted as providing further verification of our instrument's content validity.

Nevertheless, it seems desirable to find theoretical explanations for these findings, in particular those concerning the association of safety performance with different PSC dimensions in our two sample groups. In that respect, a closer look at possible differences between the contexts in which these groups operate should prove insightful. Especially relevant here is Charles Perrow's well-known organizational theory of high-risk technologies, which differentiates between two factors: interactive complexity and tight coupling [37]. The former is present in systems in which numerous steps must be taken in a specific order. Tightly coupled systems, on the other hand, are those in which each step in a process is highly dependent on the results of other steps. Such processes have to be performed within a specified time frame in order to reach intended goals. According to Perrow's theory, higher levels of complexity and coupling will lead to increased risk.

Geriatric units would seem to have a lower level of both Perrow's factors than those in the comparison group. Fewer multiple and unexpected interactions occur there than in intensive care units, surgery and trauma surgery departments. Geriatric units are also dominated by human-to-human interactions whereas human-to-system and system-to-system work flows are more often observed in the other types, where more people and systems have to interact in highly structured, ad hoc and dynamic ways to complete transactions. One reason for this difference is the almost complete absence of emergency treatment in acute geriatric units. Moreover, fewer decisions must be made and implemented within a given time span there, and patient admissions can be planned early so that the danger of system overload is reduced.

Extremely specialized cross-functional interaction is also responsible for the higher level of tight coupling in the comparison sample. The medical functions performed in those departments limit their practice to problems of a single organ system or to a particular area of medical knowledge. In contrast, geriatric units can take a more holistic view of the patient. This may help to overcome the narrow-mindedness often found in highly specialized professions, as well as making for flatter structures that encourage more cooperative and more process-oriented work flows. Moreover, risk in nongeriatric units is essentially inherent to the processes used there whereas in acute geriatric units, on the whole, it is the patients themselves who are the main risk carriers. Thus, older patients might increase the alertness of treatment teams regarding patient safety errors.

This allows us to formulate the following post-hoc hypothesis: in systems with higher complexity and tighter coupling, patient safety is promoted by learning; in less complex and coupled systems, it is increased by social influences and proactive attitudes. In other words, patient safety in acute geriatric units is influenced mainly by management's determination of how things are to be done whereas improvement of the system itself in a more incremental manner is required in the other high-risk ward types. It is, therefore, probable that management will have a less direct and immediate impact on PSC in the latter.

Finally, acute geriatric units have a precisely defined target group and a common superordinate goal. For patients with chronic conditions, it is the quality of life that matters, rather than a cure or the regeneration of organic functions. Not only the physical well-being, but also the

psychosocial, cultural and family life of the patient is at stake. Organizational research shows that cross-functional cooperation between members of interdisciplinary work groups is increased by such superordinate targets [38]. We therefore posit that employees in acute geriatric units experience a higher level of 'sense of oneness' with their organization than those in the comparison group.

Taken together, all these factors may make the members of acute geriatric units more sensitive to the needs of their patients. As a result, they may continue to improve individuals' practice and the systems within which they work, thereby contributing to a higher standard of safety culture. Ensuring that such a culture actually emerges would seem to be management's prime task. In our view, this insight has a special relevance for postgraduate medical training in geriatrics, which must transmit the idea that patient safety is a major leadership concern.

We should note that the usefulness of our study is limited by the fact that we cannot guarantee the representative nature of our samples. In trying to gather information from as many geriatric units as possible, we accepted a relatively low rate of response per unit. As a result, bias may have been introduced in this group since it may be that only those members with more interest in the topic, or those more involved in it, actually responded. (In the comparison group, the number of participants per unit was significantly higher.) In further studies, it would be desirable to increase the number of participants per unit in order to give our results a sounder footing. The comparison sample should also be enlarged and broadened; internal departments would offer a promising opportunity in the latter respect because they also treat older patients with multiple medical disorders.

It is also important to put our results into perspective. It is true that different scores in the PSC profile enable us to identify the differences between acute geriatric units and other high-risk units. We are unable, however, to quantify these differences (e.g. to say that a score of 4 would be twice as good as a score of 2), or to identify the score corresponding to an adequate standard of safety culture. All we can do is draw a relative picture.

Finally, the level of aggregation used in this study is an important point for reflection. For it is questionable whether profiles constructed by aggregating individuals' data at the level of organizational units can be taken as evidence that a common attitude actually exists.

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