

## A Survey of Safety Culture in Hospitals Including Staff Attitudes about Incident Reporting

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**Abstract:** The present paper reports the results of a questionnaire-based survey of *safety culture* in hospitals including the attitudes and perceptions of medical staff's about the reporting of adverse events. Approximately 600 responses have been collected from doctors, nurses and pharmacists working in five hospitals in Japan. The questionnaire has been adapted from Helmreich's "Operating Team Resource Management Survey" and contains, in addition, questions about respondents' reporting of their own errors and their information to patients who have suffered adverse events. Doctors are significantly more willing to report in the severe outcome case than in the milder one whereas nurses' willingness to report hardly changes at all and matches that of the doctors' in the severe case. Moreover, doctors express a slightly greater willingness to inform the patient in the severe case. We have compared rates of incident reporting and questionnaire responses and have found that several safety cultural aspects, particularly acknowledgement of human errors and power distance, are correlated with the actual reporting rate of incidents. Based on these results, we suggest that realistic recognition of human errors and a small power distance are of critical importance for actual reporting behaviours and, in turn therefore, for patient safe.

**Keywords:** safety culture, patient safety, incident reporting, and questionnaire-based survey

### Introduction

It is widely recognised that human error is the predominant cause of accidents not only in human-machine system operations in industry, e.g., aviation, maritime operations, and in nuclear power plants, but also in health care and in particular in hospitals (Kohn et al., 1999). Similarly, in recent decades, organisational factors have been recognised to be of great importance for safe operations (e.g., Reason, 1993). Thus, it has been observed that organisational problems are frequently latent causal factors that contribute to the occurrence of human errors made by frontline personnel; and similarly, it has been pointed out that the dominant type of *contributing* causes of major accidents involve the organisations that themselves shape the safety culture or climate within which the employees operate (Hee et al., 1999; Reason, 1997).

In an influential publication by the IAEA, *safety culture* was defined as "..... that assembly of characteristics and attitudes in organisations which establishes that, as an overriding priority, ..... safety issues receive the attention warranted by their significance" (INSAG, 1993). This publication goes on to observe that safety culture "..... is attitudinal as well as structural, relates both to organisations and individuals, and concerns the requirements to match all safety issues with appropriate perceptions and actions". The characterisation of safety culture in terms of management policies and commitment, organisational structures and employee and group attitudes has been widely adopted. Thus, ACSNI defines the notion as "..... the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to and the style and proficiency of an organisation's health and safety management" (ACSNI, 1993). In other words, safety culture is coupled not only to management's commitment to safety, its communication style and the overt rules for reporting errors but also to employees' motivation, morale, perception of errors and attitudes towards management and factors that impact on safety, (e.g., fatigue, risk taking and violations of procedures – cf. Andersen, 2002).

To study the relationship between safety culture and operational safety, a number of projects have been conducted to uncover individual organisation's safety culture in high-tech industries such as aviation, maritime, railway and process control industries. Such studies are typically based on the assumption that the quality and safety with which operators accomplish their tasks are affected not only by their



professional technical competence and skills but also by their attitudes to and perceptions of their jobs, their organisation and management (e.g., Andersen et al., 1999; Helmreich & Merritt, 1998). For example, operators' attitudes have been found to be important indices of safety performance having been shown to correlate with incident/accident rates in railway operations (Itoh & Andersen, 1999; Itoh et al., 2000; 2001). In addition, since attitudes may be measured before accidents take place the method of measuring safety attitudes may well be an important proactive means of ascertaining risk levels, especially in domains where incidents and accidents are rare.

Moving to the hospital domain, one would expect that medical activities share many characteristics of the above-mentioned high-tech human-machine system operations, and that *patient safety* will similarly be affected by safety culture. Therefore, it would seem useful to adapt some of the research methods and survey techniques that have been developed for application in the high-tech human-machine system domains to investigating human factors aspects of patient safety.

In the present study, a *questionnaire-based survey* was performed to identify characteristics of safety culture in hospitals. The questionnaire responses have been compared with those of ship officers that have been collected in previous studies using a similar type of questionnaire. As part of the present survey, we seek to uncover doctors' and nurses' attitudes to reporting incidents and own errors and to informing patients who have been injured by medical error. These data have in turn been compared with the data on the other elements of safety culture as well as with the incident reporting rates, i.e., rates of staff's adverse incidents and rates of their informing the patient about an event, obtained independently from one of the hospitals surveyed. Based on the integrated results of the questionnaire survey, we briefly discuss some current issues of safety culture in Japanese hospitals as well as factors that jeopardise patient safety.

#### Questionnaire and Respondents

The questionnaire comprises five parts and has an additional demographic section where respondents fill in their department or ward specialty, position, experience and age group. Four of the five parts of the questionnaire have been adapted from Helmreich's "Operating Team Resource Management Survey" (Helmreich & Merritt, 1998). The Helmreich questionnaire has several derivatives focusing on specific domains and allows us to compare the results with ones derived from other domains, e.g., maritime operations and aviation (e.g., Andersen et al., 1999; Helmreich & Merritt, 1998; Itoh & Andersen, 1999). We have transformed terms and statements from the original "Operating Team Resource Management Questionnaire" to fit the working situation of doctors, nurses and pharmacists working not only in the operating room but also in other types of departments and wards, keeping the same meaning and intention for each question. Finally, the questionnaire has been translated into Japanese.

The present paper focuses on results from only the first two parts of the questionnaire. Part I contains 57 questions about perceptions of hospital management as well as general questions (e.g., training) that may have a correlation with safety performance. Respondents are asked to rate each question on a five-point Likert scale between 1 and 5 (from 'strongly disagree' to 'strongly agree'). These question items can be largely classified into several groups in terms of organisational and human aspects that form safety culture. In this study, with reference to the original classification by Helmreich & Merritt (1998), we arranged all the items into nine categories of distinct "safety culture aspects": (1) power distance, (2) communication, (3) teamwork, (4) recognition of own performance under high stress, (5) stress management for team members, (6) morale and motivation, (7) satisfaction with management, (8) recognition of human error, and (9) awareness of own competence.

Each category includes several items. For example, the category, power distance comprises twelve items among which the following examples illustrate the format and style of the questions: "The senior person should take over and make all the decisions in life-threatening emergencies"; "Senior staff deserve extra benefits and privileges"; and "Doctors who encourage suggestions from team members are weak leaders."

In the second part of the questionnaire, respondents are asked about their behaviour and actions in terms of reporting own errors and in terms of interaction with patients that have been victims of such errors. Respondents' reactions are elicited as responses to two fictitious adverse events – one in which the patient the patient suffers a relatively severe outcome and the other a relatively mild outcome. The respondents are asked to read each case and subsequently to rate his or her certainty likelihood of engaging in various actions described in the questionnaire. The likelihood rating is made on a five point Likert-type scale ranging from 'definitely yes' to 'definitely no'. The cases and questions have been adapted from items used in the Danish survey of doctors' and nurses' attitudes also reported at this workshop (Andersen et al., 2002). The two fictitious cases were the following:



**Case A:** A cancer patient is hospitalised in order to receive chemotherapy. When preparing the infusion liquid you become distracted and you mistakenly mix a dosage that has a concentration ten-times greater than the prescribed level. You discover the error several hours later when you administer the same drug to another patient. By this time the patient has received all of the high concentration infusion liquid. You know that the patient now has a risk of developing heart problems later.

**Case B:** [doctor's version; a slightly modified version was made for nurses adapting to differences in their professional tasks] A patient is hospitalised for planned elective surgery. Before his operation the patient will as a matter of routine for an elder or middle-aged patient receive an anticoagulant injection as a prophylactic against thrombosis. When dictating to the case notes, you are interrupted several times due to patients suddenly getting ill, and you forget to include the anticoagulant for the patient. He develops a thrombosis in a vein in his left leg. He therefore has to remain hospitalised an additional week. It is very unlikely that he will have permanent impairment from the thrombosis.

For each case, respondents received five questions about their attitudes to reporting. They were asked to state the likelihood of the following actions:

- Keep it to myself that I had a mistake,
- Talk in confidence with a close colleague to get support,
- Enter this event into patient's case record,
- Inform my leader about the incident, and
- Report the event to the local reporting system.

There were six additional questions about their possible actions with respect to patients:

- Inform the patient about the adverse event,
- Explain to the patient about the future risk,
- Explain to the patient that the event was caused by your mistake,
- Encourage the patient to apply for compensation from hospital's insurance,
- Explain event to the patient's family, and
- Express regrets about the event to the patient.

The questionnaire was distributed to doctors, nurses and pharmacists working in five hospitals located in different areas in Japan. A total of 66, and 486 and 43 responses were obtained from doctors, nurses and pharmacists, respectively. The mean response rate was 90.7% across the three groups. Among doctors, 33 respondents were heads of department, 22 consultants or doctors after residents, and 9 residents. In the nurse group, responses were collected from 32 matrons and 97 deputy leaders while 354 were from ordinary nurses. In the pharmacist group, samples came from two leaders, 11 deputy leaders and 30 from staff.

### Professional Culture of Medical Staff

*Category-based responses:* Percentage agreement and disagreement as well as mean scores for each of the safety culture aspects mentioned in the last section are shown in Table 1 across the three professional groups. The percentage [dis]agreement is defined as the following rate: the nominator represents 5 and 4 responses, i.e., "strongly agree" and "slightly agree" [the 1 and 2 responses, i.e., "strongly disagree" and "slightly disagree"]; and the denominator represents the total number of responses for the specific items of each aspect. Before calculation of these indices, items that represent negative meaning in terms of the aspect have their ratings of agreement reversed, i.e., 5 and 4 responses, reversed to 1 and 2, and vice versa. This table includes significance levels (chi-square value) of differences between the professional groups.

We have performed similar surveys in the maritime domain using an earlier, derivative version of the questionnaire of the present study, the SMAQ (Andersen et al., 1999; Itoh & Andersen, 1998). Integrating the data collected from seafarers using the SMAQ, we have compared responses concerning safety culture aspects between medical staff and ship crew. In the SMAQ survey, we collected samples from Scandinavian and Japanese ship companies (7 in total, comprising 2,600 responses). The SMAQ samples included 444 Japanese officer responses, 667 Danish and 387 Asian (non-Japanese) officer responses. Table 2 shows comparison results between medical staff and ship officers as well as percentage [dis]agreements of these professional groups. In these comparisons, only the same items between the SMAQ and the present questionnaire were used for each safety culture aspect, and therefore its set of representative items is somewhat different from the one behind Table 1. There were no shared items for the aspects of teamwork, satisfaction with management, and awareness of own competence.



The main general results show that hospital staff as well as ship officers have a relatively high morale and motivation, they exhibit good awareness of communication among teams, members and their organisation. Their satisfaction with teamwork is also relatively high; and in particular, nurses' perception of the value of teamwork is the highest, two thirds of nurses having a positive attitude to this aspect. Compared to these three aspects, percentage agreement in terms of satisfaction with management is not high, and doctors' satisfaction is significantly the lowest of the three professional groups in health care.

One of the safety culture aspects is *power distance*: this refers to the psychological distance between leaders or superiors and subordinate members: A smaller distance reflects, for example, that leaders and their subordinates have open communication initiated not only from leaders but also, more critically, from juniors. The results shown in Table 1 indicate that a relatively small power distance seems to exist in Japanese hospitals; in addition, there is no significant difference in perception of this aspect between doctors, nurses and pharmacists. This result does not match intuitive expectations however. Thus, in Japan, the medical field is widely regarded as having one of the most authoritative and bureaucratic professional cultures in the country. At the same time it is well known from several studies (e.g., Spector et al., 2001) that the Japanese are around the "upper middle" when compared with other nations in terms of power distance – so, while not at the extreme high end (with, e.g., Arab countries and Malaysia) the Japanese are not at the extreme low end either (with, e.g., Denmark and Ireland). Why do we then obtain this result where the measured power distance is relatively low? We offer the following tentative explanation of the data: In Japan there are two contrary concepts covering the expression of values and attitudes: one is the tacit (non-verbalised) disposition for behaviour – which one might call the "real" or unedited meaning – and the other is the "official principle" which is a somewhat idealised stereotype. We are inclined to believe that the results on the power distance measure may include a portion of such an "official" representation.

Table 1 – Percentage (dis)agreement and mean scores for safety culture aspects

Safety culture aspects	Doctors	Nurses	Pharma.	Total	$\chi^2$
I. Power distance					
% agree.: 30.4%	21.8%	27.6%	23.2%		
% disagree.: 59.7%	60.4%	59.2%	60.3%	0.88	
Mean score: 2.54	2.43	2.44	2.45		
II. Communication	88.1%	85.9%	89.4%	86.4%	
	4.9%	3.8%	2.9%	3.9%	14.75**
	4.37	4.27	4.41	4.29	
III. Teamwork	57.6%	65.0%	55.2%	63.5%	
	26.0%	15.7%	24.8%	17.5%	16.17**
	3.44	3.68	3.43	3.64	
IV. Own performance under high stress	49.2%	41.0%	42.6%	42.0%	
	38.1%	35.7%	32.9%	35.8%	3.92
	3.14	3.07	3.15	3.08	
V. Stress management for team member	69.5%	69.4%	66.8%	69.2%	
	19.8%	15.8%	21.6%	16.6%	5.12
	3.73	3.75	3.55	3.73	
VI. Morale & motivation	72.9%	65.7%	65.9%	66.5%	
	16.0%	15.1%	18.5%	15.4%	14.75**
	3.91	3.73	3.73	3.75	
VII. Satisfaction with management	45.5%	51.3%	51.7%	50.7%	
	39.6%	28.8%	31.7%	30.1%	10.40**
	3.07	3.30	3.31	3.28	
VIII. Recognition of human error	60.6%	60.7%	55.4%	60.3%	
	26.3%	21.3%	28.6%	22.4%	2.32
	3.56	3.64	3.49	3.62	
IX. Awareness of own competence	58.2%	44.8%	40.2%	46.0%	
	27.1%	24.8%	30.9%	25.5%	17.52**
	3.46	3.28	3.12	3.29	

\*\* :  $p < 0.01$ , \* :  $p < 0.05$

Table 2 – Comparisons with ship officers in percentage (dis)agreement for each safety culture aspect

Safety culture aspects	Medical staff			Ship officers		
	Doctors	Nurses	Pharma.	Japan.	Asian	Danish
I. Power distance						
% agree.: 5.7%	8.6%	4.8%	8.3%	17.3%	8.2%	
% disagree.: 89.3%	79.2%	87.5%	81.4%	63.1%	81.7%	
$\chi^2$ : 11.72**	10.58**					
II. Communication	86.4%	85.4%	85.7%	98.8%	80.1%	95.5%
	6.1%	3.8%	7.1%	0.7%	6.1%	1.2%
	21.83**	163.69**				
IV. Own performance under high stress	48.6%	42.5%	44.1%	38.3%	23.9%	42.7%
	38.4%	34.7%	31.5%	43.1%	53.9%	37.7%
	16.92**	53.73**				
V. Stress management for team member	71.6%	67.4%	68.4%	91.5%	67.7%	82.3%
	18.7%	17.7%	19.9%	3.0%	5.9%	3.7%
	48.16**	294.18**				
VI. Morale & motivation	80.5%	73.9%	71.7%	82.3%	80.3%	65.7%
	11.3%	9.5%	12.6%	7.8%	4.0%	11.8%
	0.002	61.04**				
VIII. Recognition of human error	36.2%	53.3%	39.3%	50.8%	62.9%	51.4%
	47.7%	33.6%	45.2%	36.2%	17.7%	28.5%
	17.11**	0.63				

No Japanese officers are included in the Asian officer group.

Bottom row : Chi square: between doctors/nurses and Japanese ship officers

\*\* :  $p < 0.01$ , \* :  $p < 0.05$

A large part of medical staff has realistic attitudes to and a *realistic* recognition of human error. That is, they recognise that "human error is inevitable," and they do not agree with the question "errors are a sign of incompetence". However, as will be discussed below when we compare the hospital staff data with ship officers' responses, there is a difference in agreement between items comprising this aspect. In contrast to the above two items, there was a large difference in responses to the item "I am encouraged by my leaders and co-workers to report any incidents that I may observe" between the three professional groups. More than 85% of nurses agreed with this question while the percentage agreement of doctors was less than 45%. Regarding attitudes to stress, most medical staff recognise the need for monitoring colleagues' levels of stress and workload. For example, more than 90% of respondents agreed that team members should be



monitored for signs of stress and fatigue during task. In contrast, respondents do exhibit any great awareness of the effects of stress on their own performance. More than half of doctors, and one third of the nurses disagreed with the item "I am more likely to make errors or mistakes in tense or hostile situations". Similarly, only 5% of doctors agreed that their performance is reduced in a stressed or fatigued situation (89 percent disagreement). Percentage disagreement – and a bit lower at 78% for nurse. Additional results, including comparisons between Danish and Japanese doctors and nurses as well as position and department-based analyses of questionnaire responses, will be reported in subsequent papers.

### Doctors' and Nurses' Attitudes to Error Reporting

Doctors' and nurse responses about error reporting for the two fictitious cases quoted above are depicted in Figure 1. It can be seen from this figure that both doctors and nurses have very positive attitudes to reporting an event to a leader or the doctor in charge of the patient. Similarly, only a few respondents agreed that they would keep the event secret. In particular, nurses' attitudes to error reporting are extremely positive. Their percentage agreements about both submitting the event to the local reporting system and reporting it to their leader was more than 95% for both cases.

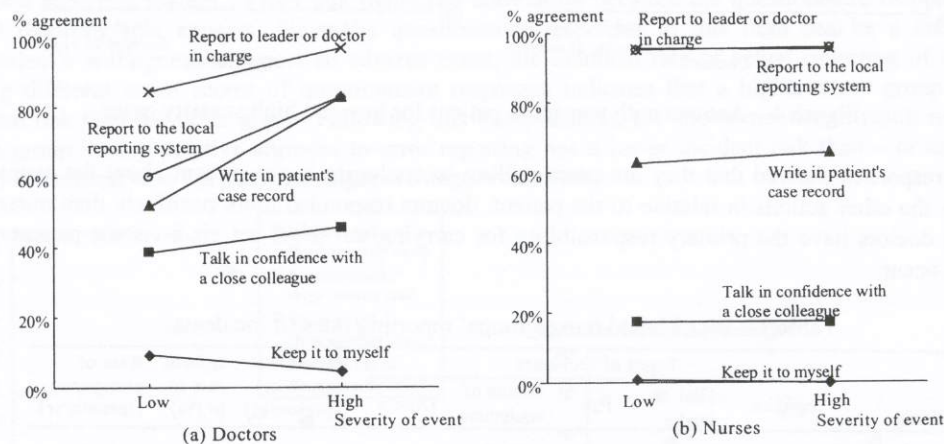


Figure 1 – Willingness to report incident for low and high severity cases

As mentioned above, the attitudes of the nurses to error reporting are significantly more positive than those of the doctors for nearly all items. For the severe outcome case (Case A), there is no significant difference between the groups in their willingness to enter the event into the patient case record ( $\chi^2=2.64$ ). Only in terms of reporting to one's leader or doctor in charge for the severe case is the doctors' attitude significantly more positive than that of the nurses ( $\chi^2=10.18$ ) although the absolute difference is small. The reason why doctors are more willing to report the case to their leader or the doctor in charge may have to do with the fact that doctors are responsible for treatment and nurses for care. For the rest of items in the severe case, the nurses' responses were much more positive than those of the doctors. For the milder outcome case (Case B), responses to all the items on incident/error reporting are significantly different between the two professional groups: Nurses had much more positive attitudes to the error reporting than doctors.

Both doctors and nurses agreed that they would take significantly more positive actions for the severe case. Only in terms of the item, "talking in confidence with a close colleague to get support", is there no significant difference between the two cases for both doctors ( $\chi^2=0.23$ ) and nurses ( $\chi^2=1.77$ ).

Responses to actions with respect to the patient show a similar trend across the two cases, as shown in Figure 2. For almost all the proposed actions about interaction with the patient, both doctors and nurses have provided more positive responses for the severe case than for the mild outcome case. The more severe the outcome of an error, the more likely it is that the consequence will be explained to the patient, that the patient will be told that the event was caused by the doctor's or nurse's own mistake, that the event will be explained to the patient's family, and that the doctor or nurse will express regrets to the patient about the event. However, a reverse effect was found in nurses' response to informing the patient about the adverse event ( $\chi^2=10.20$ ), where their willingness to inform was highest in the milder outcome case. No significant



difference was identified between the levels of severity for the doctors' informing the patient ( $\chi^2=0.48$ ) although a reverse trend was observed but below the level of significance.

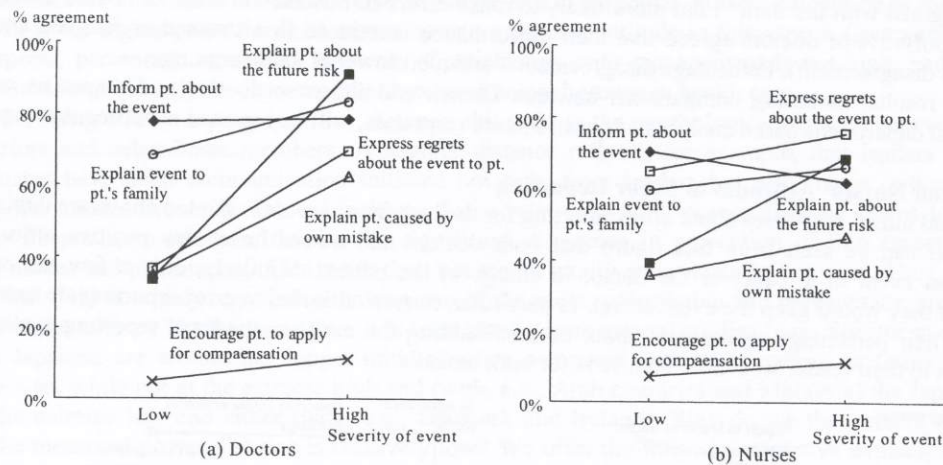


Figure 2 – Actions with respect to patient for low and high severity cases

Nurse responses showed that they are more willing to apologise to the patient about the event than doctors. For the other actions in relation to the patient, doctors responded more positively than nurses, no doubt since doctors have the primary responsibility for carrying out these act vis-à-vis the patient when such events occur.

Table 3 – Ward-based nurse groups' reporting rates of incidents

Wards	Types of incidents					Report rate to system (/person/yr)	Inform. rate to pt.(%)	Rate of annoyance (/person/yr)
	Injection	Oral intake	Fall	Misuse of equipment	Others			
Internal medicine	40.4%	22.9%	12.8%	25.7%	-	1.79	36.7%	0.13
Surgery	35.5%	14.5%	27.6%	22.4%	-	1.27	47.4%	0.00
Outpatient	23.6%	4.2%	4.2%	61.1%	6.9%	0.97	44.4%	0.05
Operating room	10.9%	-	-	48.9%	40.2%	4.60	6.5%	0.20
Mixed ward	31.7%	18.7%	24.5%	25.2%	-	1.62	48.2%	0.08
Total	28.7%	13.3%	14.8%	34.6%	8.6%	1.62	37.9%	0.08

### Investigation of Incident Reporting

**Incident Statistics:** A statistical summary of incident reports submitted from nurses only was obtained from one of the hospitals surveyed in this study. The summary includes the number of incidents reported during the previous year (April 2000 – March 2001) based on incident types as well as the number of cases that have involved some types of "annoyance" or "trouble" to the patient. The "annoyance" or "trouble" cases include not only injuries caused by errors but also minor events undesirable to the patients such as a pain, feeling worse, temporary variation in vital signs or lost belongings, e.g., artificial teeth. In only a single case of the reported incidents did a patient suffer an injury, namely a fracture of the clavicle after falling down from a bed with free railing – a nurse had forgotten to put up the railing. All the other "annoyance" cases were small incidents with no injuries. Table 3 shows the summary of ward-based reporting rates that includes three indices on incident reporting as well as the percentage of each type of incident: (1) reporting rate to the system, i.e., the rate of incidents of the given type submitted to the hospital's reporting system per nurse in a year, (2) the rate of informing the patient, i.e., calculated by dividing the number of acts of informing the patient about the event by the total number of reported cases, and (3) the rate of annoyance cases, i.e., the rate of reported "annoyance" cases per nurse in a given year.

As can be seen in Table 3, the reporting rate to the system varies across the wards. The reporting rate from the operating room was the highest of all the wards in this hospital. Nurses working in the outpatient and



surgery wards submitted incident reports less frequently than those in the other wards. This may suggest that the likelihood of incident occurrence basically depends on the type of medical treatments and nurses' activities. The rank of the ward in this index is smaller than the former. The informing rate to the patient seems to have reversed trend compared with the two indices in terms of differences between the wards in which nurses work. The rate of the operating room nurse was much smaller than the others.

*Correlation between questionnaire responses and reporting rates:* We examined correlations between the informing to the patient, questionnaire response to error reporting and the actual rates of reporting for nurses in the hospital from which we obtained the summary of incident reports. The percentage agreements and mean scores were calculated based both on the ward and on the position for each safety cultural aspect derived from the safety culture related questions and for each question item under the fictitious adverse event cases. Figure 3 shows the graph plotting all the ward- and the position-based nurse groups in terms of the reporting rate to the system and mean score of questionnaire responses to the item "reporting to the event to the local reporting system". From this figure, no correlation between the questionnaire response and the actual reporting rate appears. Since the questionnaire responses to this item can be a measure of a respondent's willingness to report an adverse event, the identical rate of actual reporting of two groups having different mean scores of questionnaire responses indicates that a higher score group has lower incident risk than the other group. Following this interpretation, the above-mentioned result may suggest that a group having positive attitudes to error reporting has a lower incident risk than – or at worst one which is identical with – a group having more negative attitudes.

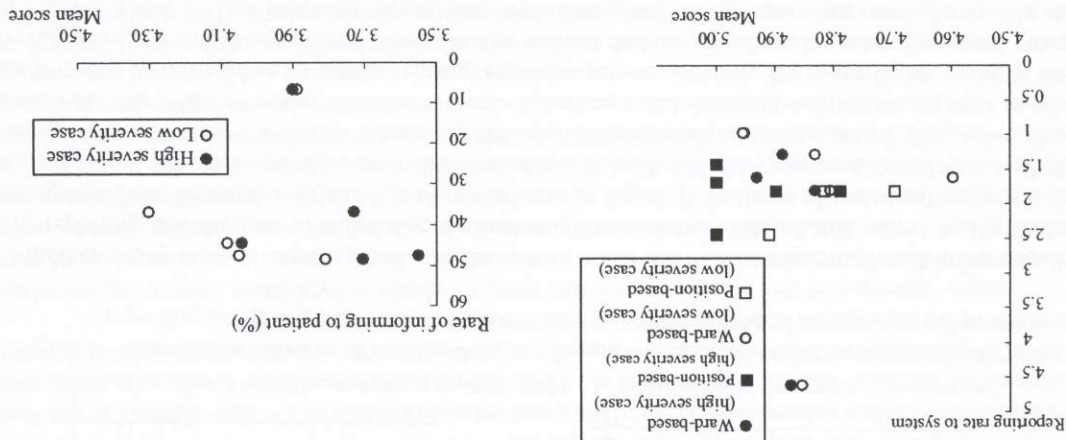
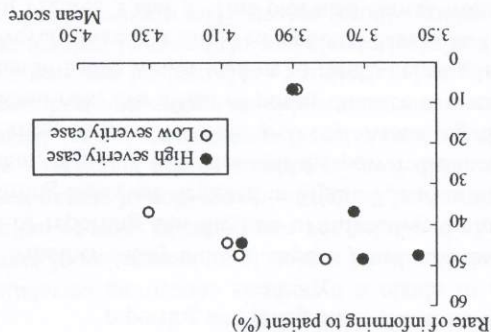


Figure 3 – Relationship in incident reporting between questionnaire responses and its actual rate

Figure 4 – Relationship in informing to patient between questionnaire responses and its actual rate



Regarding the nurses' attitudes to informing the patient about an adverse event, each ward group – no position-based mapping in this figure – is mapped on the geometric plane of mean scores of questionnaire responses and the actual rate, as shown in Figure 4. As in Figure 3, each ward has two marks having an identical value to the vertical axis for two fictitious cases in this figure. In both cases, there seems to be no correlation between the questionnaire response and the actual rate. However, when we exclude single-ward marks that have an exceptional plot, e.g., the marks having the lowest actual rate (i.e., from the operating room), it can be seen that the nurse's willingness to inform the patient is negatively correlated with its rate of occurrence for both cases. It may be hypothesised that the mismatch between nurses' willingness and the actual rate obtains because the likelihood of the event being conveyed to the patient is determined primarily by other factors rather than the nurse's willingness, for example, by organisational factors such as the policy of the hospital or the department or the organisational climate.

To discuss such effects of safety climate or organisational aspects on the actual reporting behaviour, a correlation of the reporting rate to the system with one of the safety culture aspects, *recognition of human error* is depicted in Figure 5 based on the ward and the position. As can be seen in this figure, the actual rate of incident reporting is negatively correlated with the recognition level of human error ( $r=-0.944$ ;



$p < 0.01$ ). This indicates that the more realistic nurses' recognition towards human errors becomes, the less frequently an incident report is brought up. As remarked previously when discussing the relationship between the nurse's willingness to report errors and the actual rate of incident reporting, higher rate of reporting cannot be taken in itself to indicate a higher level of safety. Rather, one may speculate that this index serves to measure accident risk. According to this view, it may be suggested that realistic recognition of human error contributes to a lower risk of adverse events in a hospital.

Figure 6 shows a ward-based correlation between the informing rate to the patient and recognition of human error. As can be seen in this figure, this safety cultural aspect is also correlated with the nurse's willingness to explain an event to the patient ( $r = 0.983$ ,  $p < 0.01$ ). It is natural to interpret this result as indicating that a realistic recognition of human errors facilitates the willingness to inform the patient about the event.

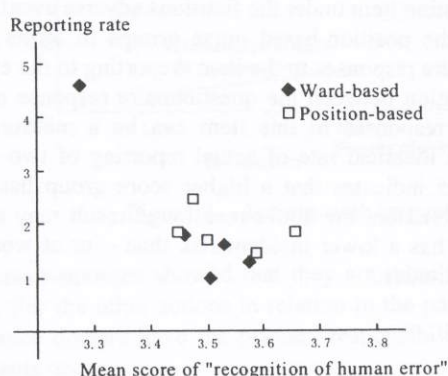


Figure 5 – Correlation between rate of incident reporting and recognition of human error

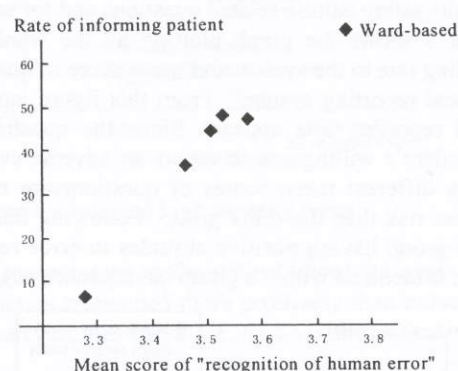


Figure 6 – Correlation between rate of informing the patient and recognition of human error

Another safety cultural aspect, *power distance*, was examined to ascertain whether it influences the rate of reporting and the rate of informing the patient. Thus, relationships of this aspect to the former reporting index are depicted in Figure 7, and to the latter in Figure 8. In terms of the reporting rate to the system, Figure 7 indicates that the power distance seems to have a slightly negative correlation with the reporting index ( $r = -0.568$ ,  $p < 0.10$ ). Assuming the above-mentioned interpretation of this index about accident risk, this effect of power distance is somewhat unexpected, being in a direction opposite to what common sense would lead us to think, i.e., the larger the power distance, the lower is the accident risk. However, there is a single exceptional data point (an outlier) that deviates from the other four ward groups as in Figures 3 and 5. This plot also comes from the nurse group of the operating room. Excluding this group from the geometric plane, the graph plot indicates that there may be a positive correlation between the reporting rate and the power distance. Thus, it may be suggested that a small power distance (i.e., open communication between team members and leaders and a small psychological distance between leaders and subordinates) contributes to good organisational culture and in turn to patient safety. At the same time, these results may suggest that the actual reporting rate is affected not only by the professional activities, e.g., operating room vs. others, but also by the power distance in the workplace although it is impossible to derive a sound conclusion only from these results.

On the other hand, the actual rate of informing the patient seems to be positively correlated with the level of power distance ( $r = 0.647$ ,  $p < 0.10$ ), as shown in Figure 8. This may suggest that the larger the power distance is in a ward according to nurses' perception, the greater is the likelihood that a given event will be reported to the patient. This result may support the above-mentioned hypothesis on the effect of an organisational factor. However, this effect of power distance on interaction with the patient may also be in an opposite direction to our common sense. It is true that there may be several organisational factors confounded with the type of ward in this type of data, and therefore it is reasonable to consider that such unknown organisational factors contribute to the informing rate to the patient.



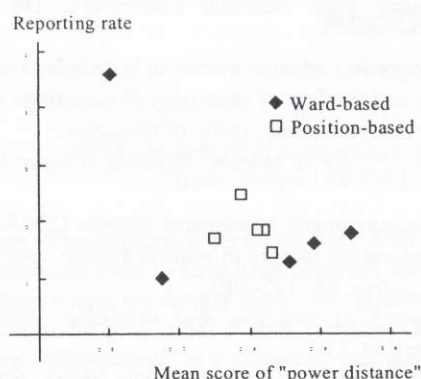


Figure 7 – Correlation between rate of incident reporting and power distance

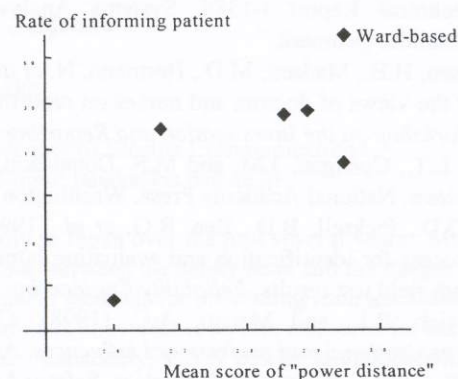


Figure 8 – Correlation between rate of informing the patient and power distance

### Conclusion

This paper reported the integrated results from a questionnaire-based survey of safety culture related attitudes among hospital staff and analysis of the rates of incident reporting. The aim of this investigation was to identify safety cultural perceptions and attitudes among medical staff and to elicit their willingness to reporting errors and interacting with the patient who fall victims to adverse events. To elicit characteristics of safety culture, we compared the questionnaire results with the data obtained in our former studies of the maritime domain (Andersen et al., 1999; Itoh & Andersen, 1999). Finally, the actual rate of incidents reported in one of the hospitals surveyed was compared with respondents' attitudes and views as identified in the survey with a view to assessing their connection to patient safety.

A major outcome of the present survey has been to obtain a hypothesis concerning correlations between the actual reporting statistics and some of the safety cultural aspects, e.g., recognition of human fallibility, and power distance, for further investigations. In particular, the survey results seem to indicate that a nurse group who has a relatively larger power distance and unrealistic recognition of human errors will be liable to produce a greater number of incidents. Therefore, in addition to the importance of a realistic recognition of human error potentials, we hypothesise that a relatively small psychological distance between superiors and subordinate members and open communications within an organisation and among team members may be one of the key factors for establishing and maintaining a safe medical organisation. Finally, we suggest that efforts be devoted to examining statistical correlations of the actual incident rates with the perceptions and views of medical staff about safety cultural aspects. The questionnaire-based method may be a useful supplement to accident/incident data in order to identify high and low risk work units in the medical domain. This is of importance whenever incident reporting is incomplete or when reporting criteria are heterogeneous. Equally, while incident reporting is a retrospective index of safety levels, the survey data may be used prospectively.

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