

# Work environment influences adverse events in an emergency department

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## ABSTRACT

**INTRODUCTION:** The psychosocial work environment has been recognised as a factor that contributes to the occurrence of errors and adverse events at hospitals. There has been a strong focus on stress factors at intensive care units and emergency departments. The purpose of this study was to investigate the occurrence of adverse events and to examine the relationship between work-related stressors, safety culture and adverse events at an emergency department.

**MATERIAL AND METHODS:** A total of 98 nurses and 26 doctors working in an emergency department at a Danish regional hospital filled out a questionnaire on the occurrence and pattern of adverse events, psychosocial work environment factors, safety climate and learning culture.

**RESULTS:** The participants had experienced 742 adverse events during the previous month. The most frequent event types were lack of documents, referrals not performed, blood tests not available and lack of documentation. Problems related to reporting and learning and insufficient follow-up and feedback after serious events were the most frequent complaints. A poor patient safety climate and increased cognitive demands were significantly correlated to adverse events.

**CONCLUSION:** This study supports previous findings of severe underreporting to the mandatory national reporting system. The issue of reporting bias related to self-reported data should be born in mind. Among work environment issues, the patient safety climate and stress factors related to cognitive demands had the highest impact on the occurrence of adverse events.

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In 2001 a standardised audit of 1,000 medical records from various specialties and hospitals in Denmark was performed [1]. The main finding was that an adverse event (AE) occurred in 9% of all admittances, leading to a prolonged stay at the hospital lasting seven days. The estimation was that 40% of these events were preventable. This was the immediate reason behind the establishment of an obligatory reporting system (the Danish Patient Safety Database (DPSD) in 2004. From a cautious start, there has been a marked increase in reported

events and in 2012 a total of 155,000 AEs were registered of which 49,145 were from the hospital sector [2].

There has been an increased recognition of the psychosocial work environment as an important factor contributing to the occurrence of errors and AEs at hospitals, thereby linking work environment and patient safety [3, 4]. Emotional demands associated with diseased people, acute health crisis, constantly changing tasks, unforeseen problems, interruptions and other psychosocial work environment factors potentially affects the quality and safety of patient care. Most of the research on work environment in the health professions has focused on stress among nurses often with an emphasis on burnout or turnover [5, 6].

A number of studies have focused on intensive care and emergency departments as particularly emotionally demanding environments [7-9]. Two recent American studies found that emergency department staff were subject to a wide range of stressors, the most common being time pressure, workload, staff shortage and lack of teamwork. The studies also found that acute stress impaired performance in a simulated complex clinical setting and thereby became a potential threat to patient safety [7, 8].

Although there is some relevant literature, the association between work environment and patient safety is generally under-researched, and the work environment factors are not specified to a degree that allows operationalisation into preventive measures [3].

In Denmark there is only limited research on these patient safety issues and only a few studies from university hospitals in the capital area have looked at the importance of the work environment [10, 11]. They found that problems of communication and cooperation, busyness and a high patient load were the most important factors associated with AE [10]. A Danish study also found that cultural aspects regarding reporting and learning had an impact on reporting behaviour [11]. A recent and more comprehensive Danish study from which the present material originates showed an association between the occurrence and impact of 12 work-related stressors and involvement in AEs across four groups of doctors and nurses, with acute medical specialists being the most stressed experiencing the highest AE frequency [12].

## ORIGINAL ARTICLE

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 TABLE 1

Occurrence of adverse events during the past month. Top three of eight categories with 43 items.

Have you been involved in $\geq 1$ adverse events during the past month?	%
<i>Nurses admittance</i>	
Lack of documents/documentation/records	47
Breaks in continuity	47
Shifts of duty, patient transfer	47
$\geq 1$	73
<i>Nurses ward</i>	
Lack of documents/documentation/records	63
Referrals, blood tests not performed	60
Event at admission	59
$\geq 1$	96
<i>Medical specialists</i>	
Mishaps in communication among departments	80
Referrals, blood tests not performed	70
Lack of documents	70
$\geq 1$	100
<i>Junior doctors</i>	
Lack of documents	50
Referrals, blood tests not performed	43
Breaks in continuity	21
$\geq 1$	79

The purpose of the present study was twofold: firstly, to investigate the relationship between work environment factors and the occurrence of AEs and, secondly, to investigate the amount and nature of reported AEs.

## MATERIAL AND METHODS

The study setting was an emergency department (ED) at a Danish regional hospital, comprised by an emergency admission and an emergency bed ward. The ED had a catchment area of approximately 300,000 persons and served 16,000 patients annually. The mean number of admissions to the emergency department was approximately 60 patients per day – varying with a factor two from day to day – of whom 50% needed in-patient examination and treatment. All acute patients with a referral diagnosis covering general surgery, orthopaedic surgery and internal medicine (except cardiology) are diagnosed and treated at the ED with support from doctors from the respective special departments. Thus, a well-functioning ED is dependent upon good clinical and working relations between the cooperating departments. The nurses in the ED worked either in the admission or bed ward, whereas the medical doctors covered both wards.

All nurses and doctors working in the ED were asked to fill out a questionnaire on patient safety and several work environment factors, as well as their individual involvement in an AE. Patient safety climate and

 TABLE 2

Comparison of adverse events during one month, reported in the questionnaire, the diary and to The Danish Patient Safety Database (DPSD). The values are n (%).

	Questionnaire	Diary	DPSD
Clinical processes	121 (16)	72 (34)	13 (48)
Administrative processes	227 (31)	57 (27)	5 (19)
Communication and documentation	228 (31)	47 (22)	5 (19)
Medication	91 (12)	30 (14)	4 (15)
Medical equipment	19 (3)	1 (0)	0 (0)
Other	56 (8)	7 (3)	0 (0)
Total	742 (100)	214 (100)	27 (100)

team work were measured using the Safety Attitude Questionnaire (SAQ) [10]. Reporting behaviour – and learning culture – was measured by a validated Danish scale [11]. Furthermore, individual involvement in an AE during the preceding month was reported using 43 items covering the classification of AEs from the DPSD.

The work environment factors were measured using the scales of job demands and influence from the Copenhagen Psychosocial Questionnaire [13].

A total of 98 nurses from the admission and bed ward, 11 medical specialists and 15 junior doctors worked at the emergency department during the study period. The response rate was 91%.

All the officially reported AEs from the ED during the study period were collected from the DPSD and compared with the AEs reported in both the questionnaire and in a diary (described in a separate article) [12].

## Statistical analyses

The associations between each of the psychosocial work environment and safety climate scales on one hand and the number of AEs (based on individual data) on the other were analysed using linear regression analyses. All analyses were controlled for job group. All analyses were performed in STATA 12.1.

*Trial registration:* not relevant.

## RESULTS

The participants reported involvement in 742 AEs during the past month. The AEs were reported in the eight categories and 43 items covered by the DPSD. The inter-individual variation in the number of AEs varied from zero to 20 with nurses in the bed ward reporting a mean of 9.1 events, nurses in the admission ward 5.4 events and doctors 5.3 events during this month. The types of AEs reported by the four groups are shown in **Table 1**. The

most frequently reported type of AEs was lack of documents (e.g. written records from the junior doctor were not available at the time of examination by the medical specialist), referrals not performed or blood tests not available for clinical decision or lack of documentation of administered medicine. For the medical specialists, the most prevalent AEs experienced were mishaps in communication between doctors and nurses, either inside their own department or with doctors from the other wards - 80% had experienced such an event during the past month. Differences in work tasks across professional groups might be reflected in these occurrences.

**Table 2** compares the 742 AEs reported in the questionnaire to the 27 AEs that were reported to the obligatory national database during the same month and the 214 AEs identified in the same month using a diary method [12]. The difference in numbers obviously reflects the different methods of data collection.

Issues of reporting behaviour and degree of learning from AEs were compared between the study department and five university hospitals in Copenhagen [11] (**Table 3**). The most remarkable differences were a more positive management attitude, supporting reporting at the regional hospital at the AE, whereas there seemed to be a better setting for learning sessions following reported incidents at the university hospitals.

To assess the relationship between patient safety climate and work environment factors and involvement in AEs, we performed a linear regression analysis (**Table 4**). In uni-variate analyses, there were significant relations between the number of reported AEs and four of the five scales included in the questionnaire, i.e., poor safety climate, poor team climate and poor inter-departmental working relationships. Similarly, increased cognitive demands were related to an increased reporting of AEs. In a multi-variable analysis with backward deletion of insignificant scales, only safety climate and cognitive demands were significantly associated with occurrence of AEs. The coefficients of association are directly comparable as standardised scales were used in the regression.

## DISCUSSION

This study shows that clinical information such as medical records and results from blood tests were among the most frequently occurring AEs. This type of information is necessary when the doctors have to sum up the single clinical case into a diagnosis in order to start the initial treatment. Such AEs could lead to more severe failures than e.g. lack of documentation of medication which is often stated as the main problem [14].

The reporting of AEs is an important issue as the whole idea of reporting is to improve learning, the potential of which depends on uncovering a valid picture of the types of failures in routines and procedures in the



**TABLE 3**

Reporting and learning – regional hospital compared to all hospitals in the Copenhagen area: negative answers (i.e. disagree + totally disagree). The values are %.

	Regional hospital (n = 121)	University hospitals (n = 10,615)
We are getting good feedback after serious AEs	35.9	14.8
We discuss causes after serious events	19.3	10.6
We discuss safety problems after AEs	11.0	10.8
Reporting leads to changes	4.6	8.4
Management encourages reporting	3.7	9.0

AE = adverse event.



**TABLE 4**

Associations between the psychosocial work environment and safety climate & adverse events. Results from a linear regression analysis (controlled for job group).

Scale	Coefficient (95% CI)
<i>Uni-variable regression</i>	
Safety climate	1.85 (0.27-3.42)
Team climate	1.74 (0.21-3.26)
Quantitative demands	-0.75 (-1.99-0.49)
Cognitive demands	1.57 (0.31-2.83)
Inter-departmental cooperation	1.43 (0.11-2.74)
<i>Multi-variable regression</i>	
Safety climate	2.27 (0.73-3.82)
Cognitive demands	1.90 (0.66-3.14)

CI = confidence interval

clinical setting. Our questionnaire data can be compared to the 27 AEs officially reported to the DPSD comprise only a small part of the 742 AEs reported in the questionnaire. This corresponds to a 3.6% reporting rate. Previous results from this research group which were based on daily registration during a month showed that only 5% of AEs were reported to the obligatory national reporting system, the DPSD, and that there were no differences in the severity of AEs reported to the two systems using the Severity Adverse Category (SAC) scale [12]. The SAC was used as it is the internationally most prevalent severity scoring system, which made it possible to compare our data with the previous five-year period in the DPSD. The reason behind the remarkable range of 0-20 reported AEs is basically unknown. We suspect that it primarily reflects differences in attitude and reporting behaviour rather than involvement in AEs. Furthermore, we found great variance between professions in other parts of this study. Among a doctor and a nurse reviewing 300 medical records, there was a rate of concordance of only 12% in identifying AEs. Reporting culture is often mentioned as the leading factor behind



Cooperation and work environment are complex factors in the emergency department.

differences in reporting. On the other hand, actual differences in exposure, i.e. risky working tasks, might be a decisive factor.

The perceived risk of becoming involved in patient errors is strongly related to intention to leave the job among health-care workers [11]. We found that 37% at least occasionally considered giving up their job due to patient safety issues, and 33% considered leaving risky and difficult tasks to their colleagues. A Danish study among doctors and nurses from the capital region and three rural counties found comparable figures [15]. Furthermore, this study showed that doctors were far more reluctant to talk about AEs because of lack of tradition, fear of the press or the risk of getting reprimanded. Some literature supports this finding [16].

As shown in Table 3, the doctors and nurses do experience managerial encouragement to report events at the local department management level especially at the regional hospital, but actual changes demand support and contribution from the hospital management. Data from the Capital Region were collected five years before this study, and the issue of patient safety has been highly debated since then, which might affect reporting behaviour, and this should be born in mind when interpreting the findings summarised in Table 3.

We found that patient safety climate and cognitive demands were independently associated with the occurrence of AEs. The patient safety questions reflect reporting culture, the tradition for actively dealing with patient safety problems and the global question: “feeling safe being a patient here yourself”. This SAQ scale has been extensively used and our results were in line with part of this literature [10]. The cognitive demand questions covered psychosocial stressors such as “taking difficult decisions” and “coping with many tasks at the same time”.

These issues have been investigated more extensively in other parts of this study showing a significant association between emotional impact of 12 work-related stressors and involvement in AEs [12]. We found a high variability of stressors and emotional impact among the various participants. This might be a consequence of the unpredictable and shifting working conditions in an emergency department. Similar observations were made in a comparable study [9]. One general trend across the four professional groups, was that the most frequent stressor was being interrupted frequently [12]. However, the emotional impact of interruptions was not very high, which might be because interruptions are so frequent in EDs that they are seen as a normal part of the job [17, 18]. Furthermore, our findings point to medical specialists as the group exposed to the highest occurrence and emotional impact of work-related stressors. These doctors play a key role in the functioning of the emergency department, and communication, cooperation and access to clinical support was a big and stressing problem [19]. Furthermore, a study from the US concluded that these issues are of crucial importance [20].

The present study has a number of limitations. The data reported here are purely cross-sectional which does not allow for causal inference, but only for identification of associations. The data in this study are self-reported and therefore potentially affected by reporting bias, where employees experiencing a bad safety culture might be particularly motivated to report AEs. The new emergency departments in Danish hospitals are organised quite differently, so external validity should be interpreted cautiously.

Summing up, the present study showed that health personnel are often involved in AEs and that this is an important element in the staff’s considerations about quitting. Many staff experience that the reporting of AEs does not lead to learning and this might be a factor contributing to the low level of reporting to the official database. Work environment factors such as patient safety climate and cognitive demands were significantly related to the occurrence of AEs.

This and other studies have found underreporting rates exceeding 90% in combination with great variance between the various types of AEs depending on the measurement methods used and on individual subjective judgements of what incidents amount to an AE. We simply have not found valid methods for monitoring AEs. Research based methods should be preferred.

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