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Impact of organizational culture on preventability assessment of selected adverse events in the ICU: evaluation of morbidity and mortality conferences

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Abstract Purpose: To determine whether organizational culture is associated with preventability assessment of reported adverse events (AE) in intensive care units (ICU).

Design: Blind review of time randomly distributed case notes written in the form of structured abstracts by the nurses who participated in recently implemented morbidity and mortality conferences from December 2006 to June 2010 in a 18-bed ICU in France. Ninety-five abstracts summarizing the discussions of 95 AE involving 95 patients were reviewed by two external blinded pairs (each comprised of one senior intensivist and one psychologist). **Methods:** A score for each organizational culture style was determined, with the

highest scorer being considered the dominant style present in the abstract. **Results:** Reliability of the classification and quantification of culture traits between pairs was very good or good for 13 dimensions and moderate for two others. The two pairs deemed 32/95 and 43/95 of AE preventable ($\kappa = 0.59$). Concordance was very good ($\kappa = 0.85$) between the external pairs for evaluation of the dominant culture style. The Cochran–Armitage trend test indicated an increasing trend for change of the dominant organizational culture style over time: the team-satisfaction-oriented culture took a leading role ($p = 0.02$), while the people-security-oriented culture decreased dramatically ($p < 0.001$). The task-security-oriented culture was significantly associated with a preventable judgment, while the people-security-oriented culture was significantly associated with an unpreventable judgment ($p < 0.001$). **Conclusions:** This study demonstrated a strong relationship between preventability assessment of AE reported by caregivers and their organizational culture in the ICU.

Keywords Adverse events · Medical errors · Organizational culture · Medical education · Morbidity and mortality conferences

Introduction

Morbidity and mortality conferences (MMC) could be a tool for evaluating and improving medical skills and practices, unit-management factors and team communication, especially in intensive care units (ICU) [1, 2]. During the MMC procedure, caregivers focus the discussion on the causality and preventability of adverse events (AE) or medical errors [1, 3]. The aim is to examine the care and medical management system and to find ways to prevent the recurrence of AE by assigning staff members or working groups for management and follow-up on recommendations [2, 4]. The MMC framework was described by the Harvard Medical Practice study in 1991 [1]. However, assessment of the respective accountability of the medical intervention or patient's underlying disease in AE has been questioned [3, 5]. Moreover, some studies highlighted the poor judgment reproducibility for assessing AE preventability and emphasized that determination is dependent on a precise definition of preventability, case analysis method, professional specialties of MMC attendees, numbers of cases discussed, type of AE analyzed, and rules of decision to judge preventability [4–10]. Finally, the reproducibility of the judgment for assessing AE preventability remains unknown in the ICU.

In the model of the modern healthcare organization, cultural values have been combined with the ICU's organizational performance [6]. Organizational culture is considered the normative beliefs shared by caregivers who work in a given unit. The organizational culture style has been successfully used to evaluate organizational performance in the ICU [11]. In this context, organizational culture could partly explain the poor reproducibility of the judgment assessing AE preventability because it might subconsciously influence a caregiver's decision to judge preventability. We aimed to determine whether or not organizational culture is associated with the assessment of preventability of AE reported in the ICU. To do so, we retrospectively estimated the respective weights of different organizational culture styles present in the MMC case notes of our ICU, to determine their impact on preventability judgment.

Methods

Setting and organization of MMC

The MMC were held monthly in our 18-bed ICU in a teaching hospital from December 2006 to June 2010, starting shortly after the seven-step MMC procedure had been implemented in this unit [2]. Briefly, the events retained for analysis and discussion were deaths and AE considered potentially preventable in optimal ICU

practice [2]. Before MMC, a screening session was held with a permanent group of coordinators, including a head nurse, a nurse and a senior staff physician (the MMC moderator), to screen cases more selectively for educational and/or quality improvement value. During MMC, AE were collectively analyzed to determine their severity, causality and preventability. The permanent group of coordinators was always present at every MMC. A head nurse was monthly designated to make a presentation of the MMC discussion in the form of a written structured abstract: the clinical history, the factual description of the AE and each point of the case discussion including event severity, causality and preventability were summarized (electronic supplementary material Table 1). After proofreading the report circulated to the permanent group of coordinators, the MMC abstract was then published the next weeks in an "incident book" to which caregivers always had access. Ninety-five MMC abstracts were written from December 2006 to June 2010. One event (death or AE) corresponded to one patient.

Design

The MMC abstracts were retrospectively reviewed during the year 2011. Before review, the content of each MMC abstract was standardized (format, font and character size), rendered anonymous and the preventability judgment deleted, before being time randomly distributed, thereby limiting confounding and masking the learning curve. Two external blinded pairs (each comprised of one senior intensivist and one psychologist), were then designated to read and identify culture traits present in the MMC abstracts. None of these pairs had ever worked in the ICU where MMC were held.

Cultural assessment of MMC abstracts

The organizational culture inventory, a 120-item scale, is the most widely used tool for measuring these cultural traits and includes 12 dimensions. Cooke and Lafferty described 3 styles of the organizational culture, grouping together these 12 dimensions: (1) a team-satisfaction-oriented culture, in which unit norms emphasize achieving self-expression, cooperation and staff development; (2) a people-security-oriented culture, whose norms emphasize seeking self-preservation by strict acceptance of and adherence to all procedures and conventions, dependence, and avoidance of conflict; (3) a task-security-oriented culture, with unit norms emphasizing perfectionism, competition, opposition and authoritarian control [7, 11, 12]. Before duplicate review of MMC abstracts, the two external review pairs were trained together to analyze MMC records markers using a common lexicon (electronic supplementary material Table 2)

and a preprinted grid to check 12 culture traits (electronic supplementary material Table 3). Three sets of four markers characterized each of the three organizational culture styles. This organizational culture inventory has been validated in 1,000 ICU personnel from 26 ICUs located in France [11, 13, 14]. During analysis, the two external blinded pairs classified the contents of the time-randomly distributed MMC abstracts belonging to culture traits characterizing each organizational culture style. The intensity of the three basic culture styles was scored with a four-point Likert scale, ranging from “absent” to “very strong” (electronic supplementary material Table 4). The organizational culture with the highest score was considered the dominant style present in the abstract analyzed. Once the whole set of MMC abstracts in randomized order had been scored, their real sequence was recorded to test a potential change in the distribution of the three organizational culture styles over time.

Assessment of preventability

Each blinded external intensivist reviewer gave his judgment on event preventability for comparison with the judgment expressed by MMC group.

Patient data and statistical analysis

We collected the following: each patient’s age, sex and simplified acute physiology score (SAPS) II [15]. Statistical analyses were computed with SAS software (version 9.2 for Windows, SAS Institute, Cary, NC). Qualitative variables are expressed as numbers (%) and quantitative variables as their mean \pm SD. Between-groups differences were analyzed with χ^2 tests for categorical variables and Student’s *t* test for continuous variables. For each culture trait and the dominant culture style, agreement between the external reviewer pairs was evaluated with a simple κ coefficient and its 95 % confidence interval (CI). Agreement on the intensity based on the four-point Likert scales was assessed with weighted κ coefficients using Fleiss–Cohen weights. Finally, agreement of the preventability judgment between each reviewer pair and the MMC group was assessed with a simple κ . Change of the distribution of the organizational culture styles was analyzed with a Cochran–Armitage trend test. Significance was defined as $p < 0.05$.

In accordance with French Law, no authorization was needed from the local Institutional Review Board because of the observational design and the study was approved by the Commission Nationale de l’Informatique et des Libertés for use of computerized medical data with protection of patient confidentiality. Informed consent was not required for the case-note review as there was no direct contact

with participants and notes were rendered anonymous before analysis by external reviewers.

Results

Sample and patient characteristics

Forty MMC were held during the study period and 95 abstracts summarizing 95 AE and involving 95 patients (62 men and 33 women, mean age 65 ± 16 years, mean SAPS II 70 ± 22) were analyzed. Demographic data and disease severity at ICU admission were similar for the different AE types (Table 1).

Reliability

Data on reproducibility of the classification and quantification of culture traits are presented in Table 2. For 13 dimensions (10 culture traits and three overall intensity scores) the κ coefficient was very good or good (0.62–0.89). It was moderate (0.43–0.45) for two culture traits. There was very good agreement ($\kappa = 0.85$) between the external reviewer pairs for evaluation of the dominant culture style (Table 2). The two external pairs judged 32/95 (33.7 %) and 43/95 (45.3 %) events preventable ($\kappa = 0.59$, 95 % CI [0.43–0.75]). The MMC group judged 46 (48.4 %) AE preventable and 49 (51.6 %) unpreventable. Therefore, the reliability of the preventability judgment between each intensivist of the pair and the MMC group was moderate: $\kappa = 0.49$, 95 % CI [0.32–0.66] and $\kappa = 0.51$, 95 % CI [0.34–0.69].

Evolution of the organizational culture styles over time

As shown in Fig. 1a, after regular MMC implementation, the Cochran–Armitage trend test found an increasing trend for modification of the dominant organizational culture style over time, with the team-satisfaction-oriented culture assuming an increasing role ($p = 0.02$), while the people-security-oriented culture declined markedly ($p < 0.001$) and the task-security-oriented culture remained relatively stable ($p = 0.1$).

Organizational culture, AE and preventability judgment

Figure 1b illustrates the effects of the types of AE on the organizational culture style. Notably, the AE type was not associated with any particular organizational culture. Moreover, the dominant organizational culture style influenced the preventability judgment expressed by

caregivers during MMC (Fig. 1c), showing the task-security-oriented culture to be significantly associated with a preventable AE judgment, while the people-security-oriented culture was significantly associated with an unpreventable AE judgment ($\chi^2 = 22.31$, $p < 0.001$).

Discussion

To our knowledge, this is the first study aimed at examining the associations between ICU organizational culture styles and AE-preventability judgment in MMC. In this way, our approach is complementary to some other works

Table 1 Characteristics of the 95 patients according to type of event analyzed during mortality and morbidity conferences

Type of event	n (%)	Age, years	Women (%)	SAPS II
Unexpected cardiac arrest	36 (37.9)	65 ± 16	8 (22.2)	70 ± 22
Death	44 (46.3)	65 ± 16	16 (36.3)	70 ± 22
Others*	15 (15.8)	66 ± 16	7 (46)	69 ± 22

SAPS II Simplified Acute Physiology Score II

* Distribution: reintubation within 48 h after planned extubation, $n = 4$; readmission to the unit within 48 h after intensive care unit discharge, $n = 3$; patient-to-patient *Acinetobacter baumannii* transmission, $n = 3$; complications of central venous or arterial catheterization, $n = 3$; unplanned extubation, $n = 1$; undiagnosed tuberculosis, $n = 1$

measuring the impact of the safety culture of the organization on the AE and ICU outcomes [16, 17]. The very high reliability coefficients of culture traits assessment between two independent, external reviewer pairs, blinded to the preventability judgment of MMC-group originally associated with the abstracts indicate that the criteria used for evaluation of the ICU organizational culture style were understandable and reproducible. The effectiveness of MMC is not evidence-based because studies dealing with MMC in the ICU are scarce. Indeed, the variety of safety or quality indicators make the analysis of MMC effectiveness difficult and the patient's characteristics may influence morbidity and mortality in the ICU [14, 18]. However, recent data are consistent for their positive impact on quality of care and patient safety in the ICU [19, 20]. Since organisational culture is a determinant of health care performance [14, 21], the present study represents a first step towards the understanding of the relationship between MMC and quality of care or patients safety in the ICU.

The results of this study demonstrated a strong relationship between preventability assessment of caregiver reported AE and their organizational culture. We showed herein that the people-security-oriented culture was positively associated with the judgment of an AE as unpreventable, while the task-security culture was negatively associated with the judgment of an AE as unpreventable. The organizational culture styles seemed to play a major role in the opinion that the caregivers had of their own practices, by influencing their judgment. Indeed, in some studies on behavior at work, the organizational

Table 2 Reliability of the classification and quantification of culture traits present in 95 mortality and morbidity conferences abstracts

Organizational culture*	Kappa statistics		
	κ	Standard error	95 % Confidence interval
Task security-oriented			
Perfectionist	0.43	0.09	0.25–0.61
Competitive	0.78	0.06	0.65–0.91
Power	0.82	0.05	0.71–0.94
Oppositional	0.79	0.06	0.67–0.91
Overall intensity	0.79	0.04	0.71–0.87
People security-oriented			
Avoidance	0.89	0.04	0.80–0.98
Dependent	0.75	0.06	0.61–0.88
Conventional	0.77	0.06	0.64–0.89
Approval	0.77	0.06	0.65–0.91
Overall intensity	0.69	0.05	0.58–0.79
Team satisfaction-oriented			
Affiliative	0.73	0.07	0.58–0.87
Humanistic encouraging	0.82	0.06	0.70–0.94
Self-actualizing	0.45	0.16	0.13–0.77
Achievement	0.62	0.09	0.44–0.81
Overall intensity	0.64	0.05	0.52–0.76
Dominant culture style	0.85	0.04	0.76–0.94

MMC Mortality and morbidity conferences

* Culture styles are driven from the COMIC questionnaire [11] and detailed in electronic supplementary material Table 2

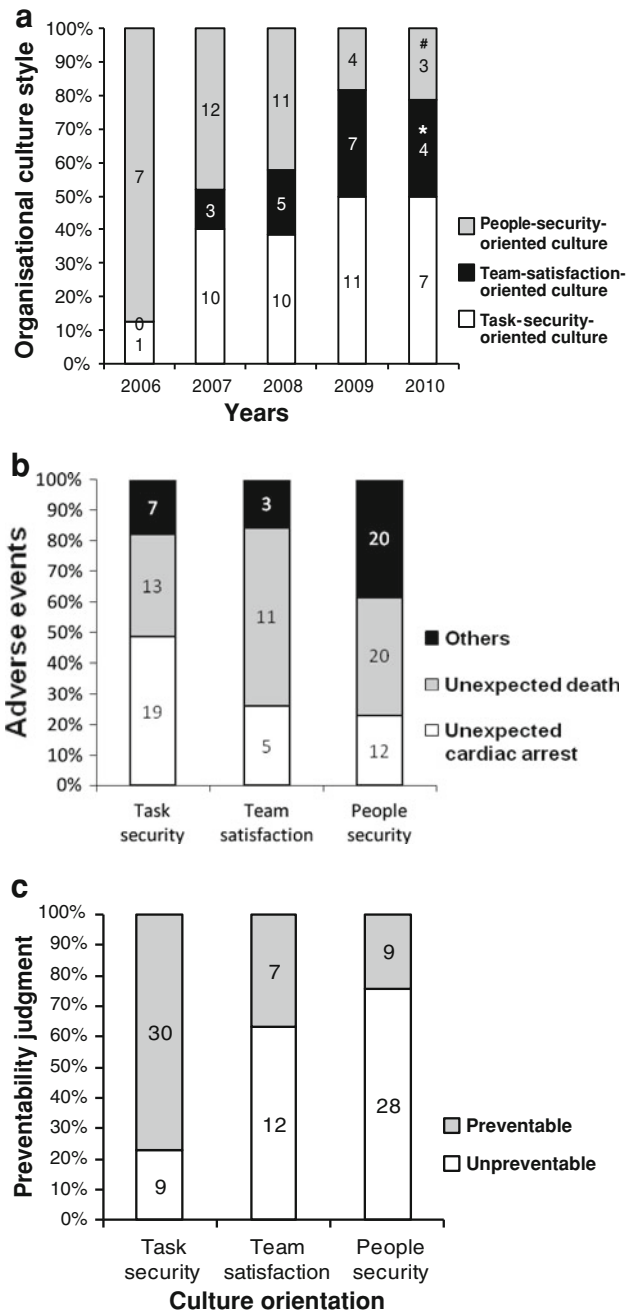


Fig. 1 Impacts of **a** the time after implementation of regular mortality and morbidity conferences on the organizational culture styles (* $p < 0.05$, # $p < 0.001$ with Cochran-Armitage trend test); **b** the types of adverse events analyzed during mortality and morbidity conferences on the organizational culture styles (differences not significant); and **c** the dominant organizational culture style on the preventability judgment expressed by caregivers during mortality and morbidity conferences (organizational culture influenced preventability judgment: $\chi^2 = 22.31$, $p < 0.001$)

culture could explain some antisocial workplace behaviors [22, 23]. Furthermore, it was shown that the cultural values shared by an ICU team played a key role in improving

performance [13, 14]. Indeed, it has been suggested that the team-satisfaction-oriented culture was positively associated with organizational performance and can also be compared with a type of culture of team protection and ease within the group [14]. Conversely, the team-satisfaction-oriented culture is negatively associated in the psycho-social and medical literature with chronic work stress and positively associated with member satisfaction [14, 24]. This observation highlights the broad impact of the organizational culture styles on group behaviors and may have managerial implications.

Strengths of this study include random analysis of the standardized MMC abstracts, characterization and quantification of culture traits by the use of defined lexical domains and Likert scales that achieved good or very good reliability between the two blinded external reviewer pairs. One study limitation is that MMC abstracts from a single center were analyzed and caution is needed in extrapolating our results beyond our patient recruitment and standard MMC procedures. It is also known that higher rates of adverse events are associated with increased disease severity at admission [6, 25, 26]. However, our setting is representative of an ICU ward in a teaching hospital with disease severity, mortality and medical error rates similar to those reported elsewhere [10, 27]. One could argue that the change in culture style observed in our local setting results from any other organizational initiatives which may have coincided with the MMC implementation. Indeed, multiple factors may influence organizational culture [14]. However, the sole organizational initiative in our local setting during this period was the implementation of structured and regular MMC. The difference in opinions of the external intensivists versus the MMC group could have an impact on the results of this study. Indeed, the moderate reliability of the preventability judgment observed between the two blinded intensivist reviewers and the MMC group should be interpreted as confirmation that organizational culture is dependent on a variety of managerial styles explaining differences in the way to assess the preventable character of an event, as it is logical that different cultures should yield moderated κ values. Lack of definition of preventability and low reproducibility of preventability favor the concept that humans behaviors interfere with the classification of an AE as preventable or not. Furthermore, culture traits present in the MMC case notes reflect a part of the organizational culture style of a staff at work. AE preventability judgment can be explained by factors other than the organizational culture, such as individual factors related to the personality and history of each member of the ICU staff, and we cannot know the respective effects of these idiosyncrasies and the way they are linked. In this way, time and experience could have allowed the group of MMC coordinators to select a larger number of preventable AE. Finally, this study demonstrated what is well known about the difficulty of preventability.

Conclusion

A strong relationship was found between the preventability assessment of AE reported by caregivers and the expression of the organizational ICU culture within the abstracts summarizing the discussions of the AE during the MMCs. Our findings also raise the question of the relevance of the preventability judgement to analyse an AE. Finally, the “acceptable” definition of preventability would be the decrease of adverse events following procedures or programs. Our study suggests that education and changes induced by the communication of errors are the first step for improving performances in the ICU.

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Conflicts of interest The authors have not disclosed any potential conflicts of interest.

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