Organizational and safety culture in Canadian intensive care units: Relationship to size of intensive care unit and physician management model

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Keywords:
Organizational culture; Safety management; Critical care; Intensive care unit

Abstract

Purpose: The objectives of this study are to describe organizational and safety culture in Canadian intensive care units (ICUs), to correlate culture with the number of beds and physician management model in each ICU, and to correlate organizational culture and safety culture.

Materials and Methods: In this cross-sectional study, surveys of organizational and safety culture were administered to 2374 clinical staff in 23 Canadian tertiary care and community ICUs. For the 1285 completed surveys, scores were calculated for each of 34 domains. Average domain scores for each ICU were correlated with number of ICU beds and with intensivist vs nonintensivist management model. Domain scores for organizational culture were correlated with domain scores for safety culture.
Results: Culture domain scores were generally favorable in all ICUs. There were moderately strong positive correlations between number of ICU beds and perceived effectiveness at recruiting/retaining physicians (r = 0.58; P < .01), relative technical quality of care (r = 0.66; P < .01), and medical director budgeting authority (r = 0.46; P = .03), and moderately strong negative correlations with frequency of events reported (r = −0.46; P = .03), and teamwork across hospital units (r = −0.51; P = .01). There were similar patterns for relationships with intensivist management. For most pairs of domains, there were weak correlations between organizational and safety culture.

Conclusion: Differences in perceptions between staff in larger and smaller ICUs highlight the importance of teamwork among units in larger ICUs.

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1. Introduction

Organizational culture has been defined as a group’s shared assumptions, values, and norms [1]. Developed through formal training or socialization, culture defines valid ways to address problems and is passed on to new team members as a resource governing internal and external stakeholder interaction. Culture is “...the invisible force behind the tangibles and observables in any organization, a social energy that moves people to act.” Culture is to an organization what personality is to the individual—a hidden, yet unifying, theme that provides meaning, direction, and mobilization” [2]. Cultures help members deal with uncertainty, on both an individual and collective basis, by defining what is important in a given situation, providing guidance on how individuals should perceive situations and interact with each other, and providing members with accepted ways of expressing and affirming beliefs, values, and norms [3]. That is, organizational culture provides its members with direction, purpose, and perspective. Safety culture is a specific form of organizational culture, which addresses the context related to achieving safe outcomes for patients [4].

Although much has been written about the relationship between organizational and safety culture and clinical outcomes in health care, there are only a few empirical studies that demonstrate this relationship [5,6]. Most of this work has focused on the value of teamwork [7]. In critical care medicine, knowledge about the relationship between organizational and safety culture and outcomes is limited [8–10] and may not be generalizable across a variety of health care settings and different types and sizes of intensive care units (ICUs).

Recently, there has been an interest in the association between size of ICU and ICU outcomes [11,12] and the association between physician management model and ICU outcomes [13–15]. These associations may be related to differences in organizational culture. Therefore, our hypothesis was that there are differences in organizational and safety culture among ICUs of different size and structure. If organizational culture is related to safety culture, then it is possible that changes in one of these measures will influence the other. Therefore, our second hypothesis was that there are relationships between domains of organizational culture and safety culture. The objectives of this study were to describe organizational and safety culture in a sample of Canadian ICUs; to investigate the relationship between culture, the number of beds, and physician management model in each ICU; and to examine the relationship between domains of organizational culture and safety culture.

2. Methods

2.1. Participating ICUs

Leaders of 23 geographically dispersed Canadian ICUs (each in a separate hospital) volunteered to participate in this study, which was part of a study of the relationship between organizational culture and family satisfaction in ICUs. This study was conducted between 2006 and 2008 in 17 ICUs in British Columbia, 5 ICUs in Ontario, and 1 ICU in Alberta.

2.2. Design and surveys

This was a cross-sectional study. Based on a review of quantitative tools that have been used to measure organizational culture in ICUs, the Organization and Management of Intensive Care Units (short form) survey [16] was used. Dimensions of organizational culture measured in the 22 domains in this survey include physician-to-physician relationships, physician-to–other health professional relationships, general relationships and communication, nursing leadership, physician leadership, teamwork, perceived effectiveness, managing disagreements among physicians or among other health professionals, managing disagreements between physicians and other health professionals, authority, and general job satisfaction. This survey instrument has been found to have adequate reliability and validity [17]. Furthermore, higher scores on domains from this survey have been shown to correlate with lower risk-adjusted length of stay, lower nurse turnover, higher perceived technical quality of care, and higher perceived ability to meet family members’ needs in ICUs [16]. Based on the original survey
nonintensivist staffing. 
176 patients were made by an ICU physician (a physician 
178 and who provides dedicated care to patients in the ICU), 
179 and the physician management model in those ICUs was 
180 called intensivist staffing. If any other model of care was 
181 used, the physician management model was called 
182 nonintensivist staffing.

2.3. Analysis

The response rate for each ICU was expressed as the 
183 number of culture surveys returned divided by the number of 
184 surveys distributed in each ICU. Responses to each item 
185 were in the form of a Likert scale: strongly disagree, 
186 disagree, neutral, agree, and strongly agree. The frame of 
187 each question was aligned, and scores for each domain 
188 in each culture survey were calculated using the methods 
189 described by the respective survey developers [16,21] such 
190 that a score of 1 was the lowest (most negative perspective) 
191 and a score of 5 was the highest (most positive perspective). 
192 Median and interquartile ranges for each domain score for 
193 each ICU were plotted from smallest to largest ICU.

To assess whether responses differed between physicians 
194 and other health professionals, the mean scores for each domain 
195 for each ICU separately for physician-respondents and for other 
196 health professionals were calculated. Then, for each domain, 
197 the physician mean scores were compared with the other health 
198 professional mean scores using a paired t test \( (n = 23, ICUs) \). 
199 Mean scores for each domain for each ICU were related to the 
200 number of ICU beds for that ICU using the Pearson correlation 
201 coefficient, and mean domain scores for ICUs that had 
202 intensivist staffing were compared with those for ICUs that 
203 had nonintensivist staffing using an unpaired \( t \) test. To assess 
204 the relationship between each domain score in the organiza-
205 tional culture survey and each domain score in the safety 
206 culture survey, for each pair of domains and within each ICU, 
207 the Pearson correlation coefficient was calculated based on the 
208 individual (respondent-level) domain scores. Then, box plots 
209 of these correlation coefficients by ICU ordered by the number of 
210 ICU beds in each site were constructed and visually inspected 
211 to assess: (1) the strength of the correlations (as depicted by the 
212 median in each box plot) and (2) whether the strength of the correlation might vary with the number of ICU beds. In 
213 adherence to convention, \( P < .05 \) is reported as statistically 
214 significant. However, because of the large number of com-
215 parisons explored in this work, the \( P \) values presented are not 
216 interpretable as probability statements in the hypothesis testing 
217 framework but serve as a convenient measure for ranking, 
218 which observed associations are more likely to be nonzero.

This study was approved by the research ethics board of 
219 each participating institution. Formal written consent was 
220 not required because consent was implied by completion of the 
221 surveys.

3. Results

3.1. Description of ICUs and respondents

A total of 2374 surveys were distributed at the 23 
227 participating ICUs; 1285 surveys were returned for an 
228 overall response rate of 54%. These ICUs were in 9 tertiary 
229 care hospitals and 14 community hospitals. Eight of the ICUs 
230
Correlations between all pairs of domain scores in the organizational and safety culture surveys showed that there are weak but consistently positive relationships between domains that are specific to patient safety and all domains of organizational culture (Appendix E2). There were stronger correlations between related constructs from the 2 surveys, for example, teamwork across hospital units. None of the plots of the correlation coefficients against the number of ICU beds exhibited any pattern suggesting that the strength of the correlation varied with the number of ICU beds.

4. Discussion

We found that organizational and safety culture scores reported by the staff from a cross section of community and teaching ICUs in Canada were generally favorable. Furthermore, physicians differed from other health professionals in their perceptions of some of these culture domains, especially related to communication and leadership characteristics of physicians. For example, physicians rated between-group communication openness and physician leadership higher than did nonphysicians. Staff from larger ICUs and ICUs with intensivist staffing perceived their ICUs to have a higher quality of care, greater ability to recruit and retain staff, and more budgeting authority of their medical director. However, staff in larger ICUs and those with intensivist staffing also reported fewer adverse events and perceived less teamwork across hospital units than did the staff from smaller ICUs and those that did not have intensive staffing. This finding highlights the potential importance of a focus on teamwork as a quality improvement initiative for larger ICUs. The similar findings for large ICUs and those that have intensivist staffing are likely related to the fact that most of the ICUs that have intensivist staffing are large. The weak correlations between most of the domain scores in the organizational culture and safety culture surveys suggest that these surveys each measure unique domains and are not interchangeable. However, stronger correlations between similar domains (e.g., teamwork across hospital units) suggest that for some domains, these surveys are measuring similar constructs. These findings also indicate that organizational culture may influence safety culture or vice versa.

Measures of organizational culture are important because they have been linked to measures of organizational performance outside the critical care setting. For example, cultures that convey beliefs, values, and norms suggesting that members of the group are respected and fairly treated have been known to impact specific attitudes and behaviors of those members, including increasing helping behaviors, performance, and lowering absenteeism [22,23]. Such cultural effects can affect individuals by providing an opportunity for social comparisons. Lind et al [24] argued that when evaluating whether someone is treated fairly, individuals often incorporate others’ treatment into their judgments, such that when others are treated fairly, individuals are more likely to deem their own treatment to be fair, whereas when others

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Table 1  Respondents to organizational/safety culture surveys

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<thead>
<tr>
<th>Position</th>
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<tr>
<td>Registered nurse</td>
<td>777</td>
<td>60.5</td>
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<tr>
<td>Respiratory therapist</td>
<td>134</td>
<td>10.4</td>
</tr>
<tr>
<td>Physician</td>
<td>104</td>
<td>8.1</td>
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<tr>
<td>Unit assistant/clerk/secretary</td>
<td>39</td>
<td>3.5</td>
</tr>
<tr>
<td>Other</td>
<td>169</td>
<td>13.2</td>
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<tr>
<td>Missing</td>
<td>24</td>
<td>1.9</td>
</tr>
<tr>
<td>Total</td>
<td>1285</td>
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3.2. Relationship between culture scores and respondent or type of ICU

Organizational and safety culture domain scores for each ICU were generally favorable (Appendix E1), but scores were generally higher for communication and perceived effectiveness and generally lower for problem solving, teamwork or relations between units, and for staffing adequacy. The lowest scores were for hospital management support for patient safety. Physicians’ scores for the domains of between-group communication accuracy, medical director budgeting authority, and staffing adequacy were lower than those of other health professionals, but physicians’ scores for the domains of between-group communication openness, communication timeliness, and physician leadership were higher than those of other health professionals (Table 2). Correlations between domain scores and number of ICU beds showed positive relationships between perceived relative technical quality of care, effectiveness at recruitment and retention of staff, and medical director budgeting authority and size of ICU—higher scores in larger ICUs (Table 2). These same relationships were found for ICUs that had intensivist staffing (Table 2). Conversely, scores for frequency of adverse events reported and teamwork across hospital units were inversely related to the size of the ICU and intensivist staffing—lower scores in larger ICUs or those that had intensivist staffing (Table 2). There were no other statistically significant relationships between any culture domain score and ICU size or staffing model.

3.3. Correlation between organizational and safety culture

Correlations between all pairs of domain scores in the organizational and safety culture surveys showed that there were in teaching hospitals, and 15 were in nonteaching hospitals. The number of ICU beds across sites ranged from 4 to 29 with a mean of 13. In the 16 intensivist-staffed ICUs, the mean number of beds was 15, whereas in the 7 nonintensivist-staffed ICUs, the mean number of beds was 7. Most of the respondents were nurses, but respondents included all ICU professionals (Table 1).
are treated unfairly, individuals may incorporate these negative experiences into their own judgments. This phenomenon has been termed the common knowledge effect. In health care, there are emerging data to show that positive aspects of organizational culture, especially teamwork, are linked to improved clinical outcomes, especially related to patient safety [6,7].

Organizational culture has also been linked to performance of ICUs. For example, a before-after study of introducing a “culture of improvement” in 1 ICU was associated with improvements in processes, outcomes, and costs of critical care [25]. A study of introducing a “senior executive adopt-a-work unit program” in another ICU [26] was associated with an improvement in patient safety and in staff perceptions about the “culture of safety.” In a study of 13 ICUs, differences in standardized mortality rates among these ICUs were more strongly related to interaction and coordination among the staff of each ICU than to administrative structure, amount of specialized treatment, or teaching status of the hospital [27]. Another cross-sectional survey of 42 ICUs showed that caregiver interaction (a term that includes culture, leadership, coordination, communication, and conflict management ability) is related to lower risk-adjusted length of ICU stay, lower nurse turnover, and a greater perceived ability to meet family members’ needs [16]. A recent multicenter study found that a
higher perception of management by ICU staff correlates with lower hospital mortality [10]. A cross-sectional survey in 3 hospitals documented that ICU nursing’ reports of collaboration were correlated positively with improved patient outcomes [28]. Interestingly, nurse ratings of collaboration and teamwork are lower than those of physicians working in the same ICUs [29]. Although we did not find any differences between physicians and other professionals in their perceptions related to teamwork, we did find differences in their perceptions of communication, leadership, and adequacy of staffing.

Our study adds to the body of knowledge about organizational and safety culture by demonstrating the relative consistency of domain scores across a variety of ICUs. In addition, we showed that certain scores are related to size of the ICU or to the type of physician management model—size and physician management model are likely correlated to each other and to other features of large ICUs (eg, complexity of patients). Interestingly, the same (larger and intensivist physician staffing) ICUs that had high scores for perception of technical quality of care had low scores for frequency of reporting adverse events and for teamwork between units. It is not known whether the lower score for frequency of reporting adverse events reflects a lower incidence of adverse events or simply a lower frequency of reporting these events. It is also not known if there is any relationship between the findings of low perceived teamwork between units and low frequency of reporting adverse events. Although the relationship between volume of admissions and quality of care has been reported previously [12], we are not aware of any previous reports regarding the relationship between ICU size and reporting of adverse events or measures of organizational culture. Our finding that there are differences in frequency of reporting events among ICUs of different size contrasts with the observation that there are no differences in this domain by size of hospital when the unit of analysis is the entire hospital [20]. Perhaps smaller ICUs could improve their performance by addressing quality-of-care issues, and larger ICUs could improve their performance by facilitating the reporting of adverse events and by developing teamwork with other units in the hospital [6,7]. Furthermore, our finding that there are correlations between some domains of organizational culture and safety culture builds on the finding that specific types of organizational culture correlate with safety climate in hospitals [30].

Strengths of this study include the use of validated survey tools, the number and variety of participating ICUs, the absolute number of health care professionals who responded, and the consistency of responses for similar domains in the 2 surveys. Limitations include the nonrandom sample of ICUs because participation in this project was voluntary and the 54% response rate. Because of the anonymous nature of the survey, we did not capture any descriptors about nonresponders, so we were unable to compare responders to nonresponders. The survey design of this study precluded capturing details about safety programs and actual error or complications rates within hospitals; therefore, we could not validate opinions of the respondents about safety. In addition, we did not capture information about tacit knowledge of how work is done. The cross-sectional design also precluded observations of changes in culture scores over time. Finally, as in any observational study, confounding may be a cause of the associations that we observed. For instance, larger ICUs are usually located in larger hospitals and may be systematically different from smaller ICUs (eg, care for more complex patients and provide technical and other services such as hemodialysis not available in smaller ICUs). Given the likely strong correlations between size of ICU and these additional descriptors, it may be difficult to tease out the independent effect of ICU size.

In summary, we found that staff from 23 tertiary and community ICUs generally report a favorable organizational and safety culture. However, differences in perceptions between staff in larger and smaller ICUs highlight the importance of improving teamwork among units in larger ICUs.

Supplementary materials related to this article can be found online at doi:10.1016/j.jcrc.2011.07.078.

Acknowledgments

This study was sponsored by the Canadian Institutes of Health Research, the Michael Smith Foundation for Health Research, and the Canadian Researchers at the End of Life Network (CARENET). The CARENET is supported by a grant from the Canadian Institutes of Health Research and Heart and Stroke Foundation of Canada. None of the funding agencies had any role in the study design, collection of data, analysis and interpretation of data, writing of the manuscript, or the decision to submit the manuscript for publication. The authors thank all members of CARENET who have contributed to the evolution and development of this work. The authors also thank Drs Sandra Robinson and John Millar for their input into the design of this project, Carol Honeyman and Mahi Etminan for coordinating the dissemination and collection of surveys, and Monica Norena and Hong Wang for their statistical work. The authors also thank the medical directors and research coordinators at each of the participating sites. Dr Fowler is a clinician-scientist of the Heart and Stroke Foundation (Ontario). Dr Deborah Cook holds a Canada Research Chair with the Canadian Institutes of Health Research.

References

Relationship to size of ICU and physician management model


Appendix E1. Domain scores for organizational and safety culture (median and interquartile range) by hospital, according to number of ICU beds.

Appendix E2. Correlations between domain scores for safety culture and domain scores for organizational culture (median and interquartile range for correlation coefficients).
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