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Moral distress in intensive care unit personnel is not consistently associated with adverse medication events and other adverse events

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ABSTRACT

Purpose: To examine the association between moral distress in ICU personnel, and medication errors and adverse events, and other adverse events.
Materials and methods: In 13 ICUs, we measured moral distress once in all ICU staff, and incidence of five explicity-defined adverse safety events over 2 years. In 10 of the ICUs, pharmacists tabulated medication errors and adverse events during 1 day in the 2-year period. Average moral distress scores for each professional group were correlated with each safety measure.
Results: In the pharmacy study, there were almost no significant correlations between moral distress and measures of medication safety. However, higher moral distress in nurses was associated with more interceptions of near misses per administration error ($r = 0.68$, $p = 0.04$), and higher moral distress in physicians was associated with more incorrect measurements for medication monitoring per recommended action for monitoring ($r = 0.68$, $p = 0.03$). For the other adverse events, the only significant association was a positive association between moral distress in physicians and bleeding while on anticoagulants (OR: 1.1; 95% CI: 1.0–1.3).
Conclusion: Moral distress in ICU personnel is generally not associated with medication errors or adverse events, or other adverse events, but it may be associated with both hyper-vigilance and distraction.

1. Introduction

Moral distress is the stress experienced when a practitioner feels certain of an ethical course of action but is constrained from taking that action [1]. This kind of distress is common in intensive care unit (ICU) personnel and is associated with many consequences for the affected individual including sadness, anger, burnout, and attrition [2,3]. Moral distress is also associated with the perception of a negative impact on patient care [3] and the perception that workplace processes which are related to moral distress are also related to medication errors [4]. It is possible that the emotional consequences of moral distress lead to distraction or inattention, which may cause errors and adverse events in patient care. However, these hypothetical associations have not been corroborated with objective measurements of errors and adverse events. The purpose of this study was to assess the relationship between moral distress and objectively-measured medication errors, adverse medication events, and other adverse safety events in ICUs.

2. Materials and methods

Between 2010 and 2011, we administered the Moral Distress Scale-Revised [5] once to all health professionals in 13 ICUs–3 tertiary, 3 large community, and 7 small community hospitals in southwest British Columbia, Canada. There were 1390 recipients—870 nurses, 452 other health professionals (including respiratory therapists, pharmacists, physiotherapists, dieticians, social workers, and spiritual care workers), and 68 attending physicians. Surveys were distributed locally at each participating ICU in a staggered fashion over the 2-year period. After about 6–8 weeks, a package of completed surveys from each ICU was sent back to the coordinating center. For each of the 21 items on the Moral Distress Scale, respondents entered a score for frequency (0–4) and a score for level of disturbance (0–4). For each item, these scores were multiplied together and the sum of these products was the Moral Distress Score. At each hospital, we calculated the average score for each professional group (physicians, nurses, other health

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professionals). We have previously reported the distribution of these scores and the associations between moral distress and demographic characteristics [6].

During one day within a 2–3 week period when the moral distress survey was being administered, the dedicated ICU pharmacists in each of 10 of the participating ICUs tabulated medication errors and adverse events for all patients resident in their ICU on that day. These errors and adverse events related to all new prescriptions written (4 measures), prescriptions dispensed (4 measures), medication doses administered (11 measures), and recommendations for monitoring drug toxicities (6 measures), each defined explicitly with a numerator and denominator (Supplemental Table 1). This list of errors and events was developed based on parameters of the drug prescribing and administration process and reflected current policy and practice in each ICU.

Each of the 13 participating ICUs also participated in data collection into a Provincial ICU database [7] for routine quality measurement—this measurement includes the tabulation of explicitly-defined adverse safety events. For the prospective analysis of these adverse safety events, we included all patients admitted to the participating ICUs during the 2-year period when moral distress was being measured (2010–2011; total patients: 14,671). These incident events and their units of measurement were: unplanned extubations (events/ventilator-hours; 8697 patients at risk), hypoglycemia (episodes of blood glucose concentration less than 3.5 mmol/l divided by hours receiving intravenous insulin; 4927 patients at risk), central venous line (catheter)-associated bloodstream infections (CLABSI; defined according to the Canadian Nosocomial Infection Surveillance Program [8]; events/central line-days plus 2, because patients may have been at risk for up to 2 days after the central line was removed; 9135 patients at risk), *Clostridium difficile* infection ([9]; events/ICU-hours; only the 9 sites that had at least 7 events were included for analysis; 12,337 patients at risk), severe bleeding while receiving anticoagulants ([10]; events/anticoagulant-days; 3124 patients at risk).

3. Analysis

To examine the association between the average moral distress score for each of nurses, physicians, and other health professionals and each measure of medication safety errors and events, we used the Spearman correlation (rho). Only the medication safety events that occurred at least once (3 prescription, 3 dispensing, 9 administration, and 2 monitoring measures; Tables 1a and 1b) were related to the moral distress scores.

For the other adverse safety events, we used a Cox proportional hazards model to determine the relationship between moral distress score (per 10 points; one analysis per professional group) and time to the first event in each patient. Patients who did not have an event were censored at ICU discharge. Sites were treated as clusters to account for correlation between patients at the same site. All of the models were adjusted for number of ICU beds at the site level, and for age, sex, and Acute Physiology and Chronic Health Evaluation (APACHE) II score at the patient level. In a sensitivity analysis to exclude moral distress that might have been due to adverse safety events, we examined these associations using the moral distress score composed only of scores for the 10 non-patient safety items in the moral distress scale.

This study was approved by the UBC/Providence Health Care Research Ethics Board. The STROBE checklist for observational studies was followed as appropriate, in the writing of this report.

4. Results

The response rate to the Moral Distress Scale was: Nurses—428 (49%); Other health professionals—211 (47%); Physicians—30 (44%). We have reported previously that the average moral distress score was higher in nurses and other health professionals than in physicians [6].

During the 1-day observation period for medication transactions in 10 ICUs, there were 728 new prescriptions written, 606 prescriptions processed, 3011 medication doses administered, and 621 recommendations for monitoring drug toxicities provided. There was a very low event rate, especially for dispensing and administration errors (Tables 1a and 1b). For nearly all associations, there was no significant correlation between moral distress and measures of medication safety (Fig. 1). However, higher moral distress in nurses was associated with more interceptions of near misses per administration error ($r = 0.68$, $p = 0.04$), and higher moral distress in physicians was associated with more incorrect measurements for medication monitoring per recommended action for monitoring ($r = 0.68$, $p = 0.03$; Fig. 1).

During the 2-year period of observation for other adverse events, the total number of first events were: 268 unplanned extubations, 413 episodes of hypoglycemia, 468 confirmed CLABSIs, 135 episodes of *Clostridium difficile* infection, and 190 episodes of bleeding while receiving anticoagulants. In the main analysis, there was only one significant association between moral distress score and adverse event rates: a positive association between moral distress in physicians and bleeding while on anticoagulants (OR: 1.1 (95% CI: 1.0–1.3; Fig. 2). In the sensitivity analysis that examined only moral distress related to non-safety situations, this association remained and there was a negative association between moral distress in nurses and CLABSIs (Fig. 3). For all of the other associations, there were no significant relationships.

Table 1a
Medication prescription and dispensing errors.

SITE	Prescription errors:			Dispensing errors:		
	Prescription errors/New prescriptions	Intercepted near misses/prescription errors	Non-Intercepted near misses/prescription errors	Dispensing errors/[a]	Intercepted near misses/dispensing errors	Non-Intercepted near misses/dispensing errors
	P1	P2	P3	D1	D2	D3
A	1/12	1/1	0/1	2/12	2/2	0/0
B	0/27	0/0	0/0	1/18	1/1	0/0
C	10/41	9/10	91/10	1/56	1/1	0/0
D	1/6	1/1	0/1	0/6	0/0	0/0
E	1/110	1/1	0/1	1/12	1/1	0/0
F	2/62	2/2	0/2	0/24	0/0	0/0
G	2/23	2/2	0/2	1/47	1/1	0/0
H	18/156	13/18	5/18	6/140	5/6	1/0
I	6/115	2/6	4/6	0/63	0/0	0/0
J	8/176	2/8	6/8	17/228	17/17	0/0

[a] Number of prescriptions processed by hospital pharmacy in the 24 h period.

Table 1b
Medication administration and monitoring errors.

SITE	Administration errors:									Monitoring of toxicity errors:	
	Incorrect patient error/[a]	Incorrect route error/[a]	Timing error/[a]	Interval error/[a]	Wrong drug error/[a]	Interaction error/[a]	Missed dose error/[a]	Intercepted near misses/all admin. Errors	No. of Non-Intercepted near misses/all admin. Errors	Omitted/[b]	Incorrectly measured/[b]
	A1	A2	A3	A4	A5	A6	A7	A8	A9	T1	T2
A	0/115	0/115	1/115	1/115	0/115	0/115	1/115	0/3	3/3	0/27	0/27
B	0/150	0/150	0/150	0/150	1/150	0/150	0/150	1/1	0/1	0/61	0/61
C	0/144	0/144	0/144	0/144	0/144	0/144	0/144	0/0	0/0	0/18	0/18
D	0/53	0/53	0/53	1/53	0/53	0/53	0/53	0/1	1/1	0/7	0/7
E	1/589	0/589	0/589	4/589	0/589	0/589	6/589	0/11	11/11	1/109	1/109
F	0/123	0/123	17/123	3/123	0/123	0/123	0/123	0/20	20/20	0/21	0/21
G	0/68	0/68	0/68	0/68	0/68	1/68	2/68	2/3	1/3	2/6	0/6
H	0/326	0/326	3/326	3/326	0/326	0/326	4/326	0/10	10/10	0/247	0/247
I	0/378	0/378	5/378	0/378	0/378	0/378	8/378	0/13	13/13	0/62	0/62
J	0/1065	1/1065	3/1065	0/1065	0/1065	0/1065	34/1065	3/38	35/38	2/63	2/63

[a] Total number of drug doses (old and new) administered in the 24 h period.
[b] Number of recommended actions to monitor for toxicities.

5. Discussion

In this study of up to 13 ICUs of varying size and complexity, we found no consistent relationships between moral distress in ICU personnel and either medication errors/events or 5 other adverse safety events. For most of the associations examined, there was no significant relationship. For only 2 of the medication safety items and for 2 of the other adverse events, there were disparate associations, one positive and one negative in each case. For these associations, it is possible that moral distress could have led to either hyper-vigilance (fewer adverse events) or distraction (more adverse events).

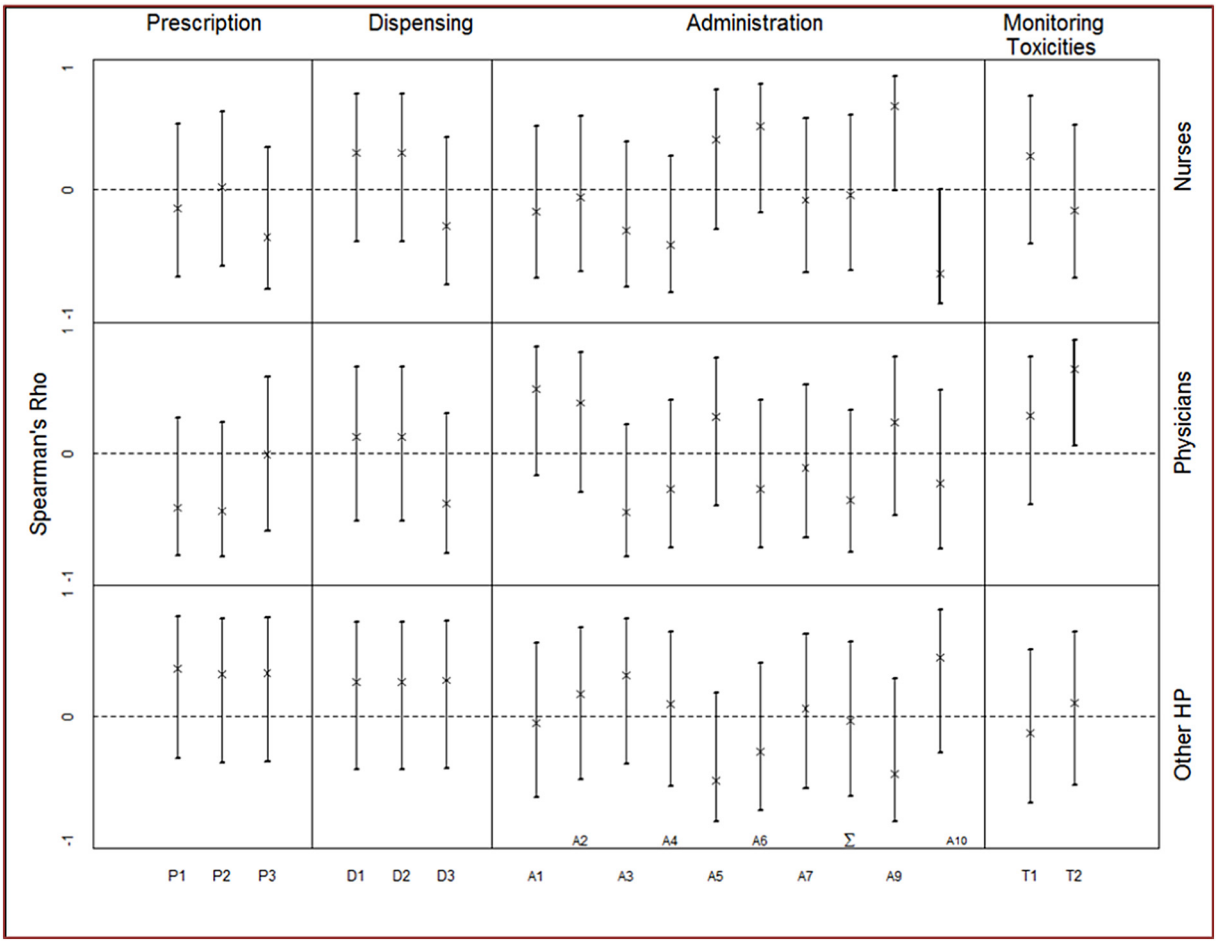

Fig. 1. Correlation[a] between medication error[b] rates and moral distress scores. [a]correlation coefficients and 95% confidence intervals. [b]medication process steps correspond to those shown on Tables 1a and 1b, except A9 and A10 correspond to A8 and A9, respectively. Abbreviations: HP: health professionals; Σ: sum of all administration errors (A1-A7).

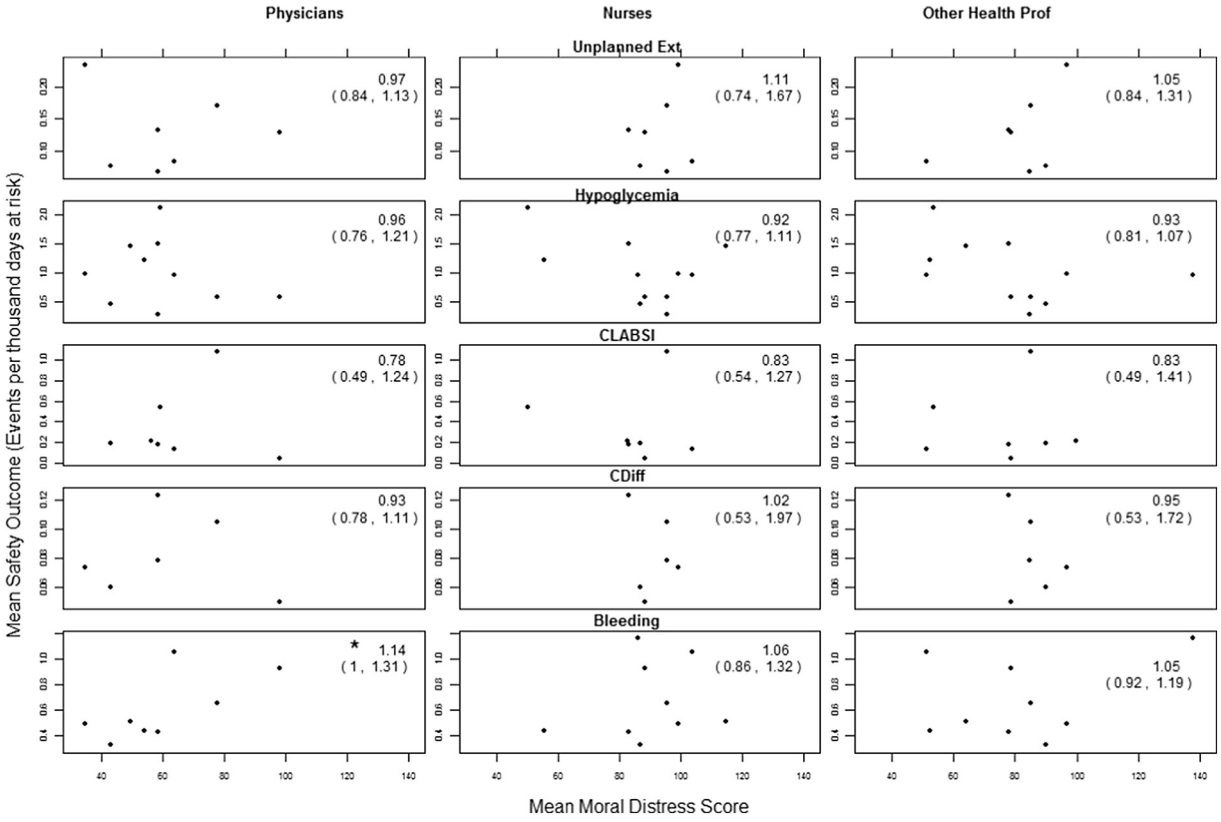

Fig. 2. Relationship between Moral Distress and Adverse Safety Events (by profession)[a]. [a]Number in the top right corner of each panel is the hazard ratio (95% CI) for the time to first safety outcome per 10 point increase in mean moral distress score, adjusted for number of ICU beds, and for age, sex, and APACHE II score of the patient; $^{*}p = 0.05$. Abbreviations: Ext: extubation; CLABSI: central-line associated blood stream infection; CDiff: *Clostridium difficile* infection; Bleeding: bleeding while receiving therapeutic anticoagulants.

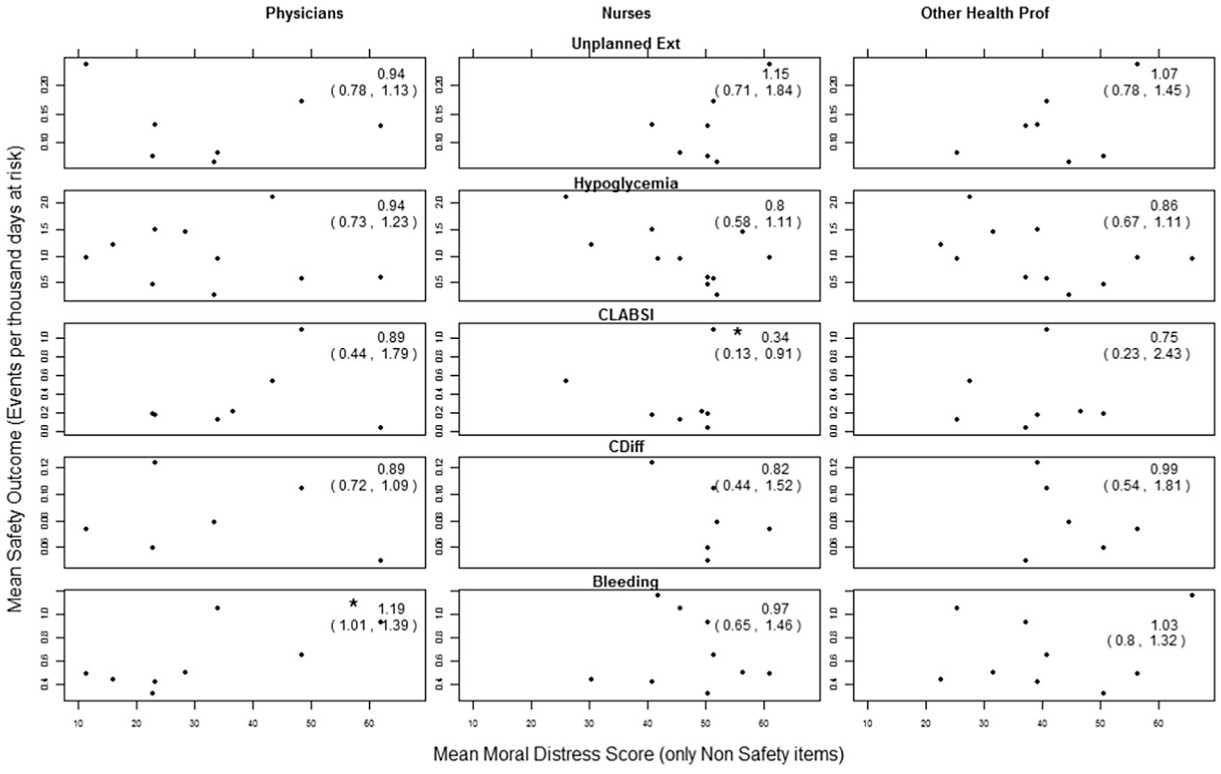

Fig. 3. Relationship between Moral Distress due to Situations that are Unrelated to Patient Safety and Adverse Safety Events (by profession)[a]. [a]Number in the top right corner of each panel is the hazard ratio (95% CI) for the time to first safety outcome per 10 point increase in mean moral distress score, adjusted for number of ICU beds, and for age, sex, and APACHE II score of the patient; $^{*}p = 0.04$. Abbreviations: Ext: extubation; CLABSI: central-line associated blood stream infection; CDiff: *Clostridium difficile* infection; Bleeding: bleeding while receiving therapeutic anticoagulants.

Moral distress is associated with a variety of emotional and cognitive consequences for the affected individual [3]. We hypothesized that these consequences may also lead to distraction or inattention, which may in turn lead to errors and adverse events in patient care. Other than one study that showed a positive relationship between moral distress scores and providers' perspectives (but not objective event rates) about patient safety [4], we are not aware of any published studies that have examined this relationship. However, there are several studies that have examined the relationship between burnout (a consequence of moral distress) and patient safety. In a large cross-sectional study of physicians and nurses in 31 ICUs in France [11], there was no significant relationship between burnout and objectively-measured medical errors (not just medication errors); however, there was a positive relationship between depression symptoms and these errors. This finding was corroborated in a study of pediatric residents [12]. In three other studies of mostly nurses from ICUs in Switzerland [13], Brazil [14], and Norway [15] there was a positive relationship between burnout and safety climate (staff perceptions of patient safety). Two of these studies [14,15] were cross-sectional, so it is difficult to determine the directionality of this relationship. However, the third study [13] was longitudinal and cross-lagged structural equation modelling showed a sequential relationship between emotional exhaustion (the most important component of burnout), interpersonal teamwork, and clinician-rated patient safety, in that order. Two recent systematic reviews on this topic have shown a positive relationship between burnout and patient safety incidents [16,17], but nearly all of the studies reviewed measured only perceptions of patient safety incidents by the respondents; in the few studies where these incidents were measured objectively, there was no association detected.

We initially hypothesized that moral distress might cause errors and adverse events in the ICU because of the potential association between psychological distress and cognitive errors as noted in a previous study [4]. Instead we found no consistent relationships between moral distress and either errors or adverse events. Potential reasons for our observation are that this type of distress does not impair cognitive function enough to lead to these errors and adverse events, that this type of stress usually leads to both hypervigilance and distraction which in turn leads to no net effect, or that the event rate was too low to detect a significant association with moral distress.

Strengths of the current study included the use of a validated instrument to measure moral distress, a fair response rate to this survey, explicit definitions of medication errors and events, objective data from up to 13 hospitals from both tertiary and community settings, and hierarchical analysis to adjust for non-independence of observations within hospitals. Limitations include the fact that this was a cross–sectional study; therefore, it is difficult to infer causality. Furthermore, there were small numbers of data points, and therefore, wide confidence intervals, for most correlations. In addition, there was a risk of spurious correlations due to multiple comparisons. Finally, unmeasured system attributes (e.g. varying levels of staffing, new staff, teamwork, overtime, safety culture, protocols/practice patterns, and support from ICU educators, leaders, infection control officers, and other consultants) may have accounted for some of the variability in the results obtained. Although we adjusted the analysis for number of ICU beds and patient characteristics, other ICU structure or process characteristics could have had variable and opposing effects on the relationship between moral distress and safety outcomes.

6. Conclusions

Moral distress in ICU personnel is generally not associated with errors or adverse events related to medications, but it may be associated with both hyper-vigilance and distraction. Similarly, after adjustment for site and patient factors, there are no consistent relationships between moral distress and other adverse safety events in these ICUs.

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Declaration of Competing Interest

None of the authors has any competing interests to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcrc.2019.06.023.

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