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Evaluation of Critically Ill Paediatric Patients in the Adult ICU

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Abstract

Background: Critically ill paediatric patient (CIPP) care may be required in the adult intensive care unit (aICU) of hospitals in cases where there is no paediatric intensive care unit (pICU) or when the pICU bed capacity is insufficient.
Objectives: This is a retrospective evaluation of CIPPs who were accommodated in aICUs over the last 10 years to determine the type of hospital admission, indications for hospitalization, presence of comorbidities, treatments, causes of mortality, and effects of these parameters on mortality.
Methods: We retrospectively analysed the medical records of 600 patients aged 28 days to 17 years who had been cared for at least 24 hours in aICUs between 2011 and 2021.
Results: The average age of the CIPPs ((252 female (42%), 348 male (58%)) was 6 (7.4 $\pm$ 5.4) years. The mortality rate was 14.7%, and trauma (31.8%) was the most common cause of mortality, followed by respiratory diseases and septic shock. The independent risk factors found to be associated with mortality were as follows: Lower age, admission to ICUs from emergency departments of hospitals, higher Pediatric Risk of Mortality III and Pediatric Logistic Organ Dysfunction II scores, duration of hospital stay and of mechanical ventilation, vasopressor/inotropic agent requirement in the first 24 hours, higher total transfusion requirement, presence of nosocomial infection, thrombocytopenia, and lower haemoglobin level.
Conclusions: It is important to achieve the best results and better outcomes for CIPPs in pICUs. However, a significant proportion of CIPPs currently hospitalized in aICUs are admitted with trauma. A close follow-up of mortality scores and clinical parameters in the early period of CIPP care in the aICU is critical as some mortality risk factors are preventable.

Keywords: Intensive Care Unit, Paediatric, Adult, Mortality

1. Background

Adult intensive care units (aICUs) accommodate 56% of critically ill paediatric patients (CIPPs) in hospitals without paediatric intensive care units (pICUs); 44% of these patients have to be transferred to the pICUs of other hospitals (1, 2). As this increased need could not be met in aICUs, the number of pICUs has increased since the beginning of the 2000s in Turkey (3). Nowadays, attempts to fill this gap through the training of pICU specialists continue rapidly, and the number of newly opened PICUs is increasing. In hospitals without a pICU, CIPPs are still cared for by anaesthesiology and reanimation specialists (ARSs) in the aICU (4, 5). According to the current data of the Ministry of Health of the Republic of Turkey, the average number of beds in the aICU is 32.663, and the number of beds in the pICU is 1.956 (17%) (5).

Ventilator-associated pneumonia (VAP), septicaemia, septic shock, and multi-organ failure (MOF) have been reported as the most frequent causes of mortality in pICUs (6, 7). The pICU mortality rate, particularly of trauma patients, varies according to the patient's age and the development level of the country. Accordingly, trauma is the second most common cause of mortality in the 1 - 4 year age group and the most common cause of mortality after 4 years of age in developed and developing countries. Moreover, trauma is also the most common cause of mortality in the 1 - 14 year age group in developed countries (8, 9).

2. Objectives

This study aimed to retrospectively evaluate CIPPs who were cared in aICU in the last 10 years. We determined the relationship between demographic data, indication of ICU admission, presence of chronic comorbidities, and patients' outcomes and mortality.

3. Methods

This study was approved by the Istanbul Prof. Dr. Cemil Tascioglu City Hospital Ethics Committee (03.05.2021/118).

The CIPPs who were hospitalized in Istanbul Bagcilar Training and Research Hospital Anesthesiology and Reanimation Department's aICU between 01.01.2011 and 01.01.2021 included in the study. Patients who were of < 28 days and > 17 years old, and who were hospitalized at the aICU less than 24 hours were excluded from the study.

Patient files and the hospital electronic patient information system (HEPIS) were retrospectively evaluated.

The patients' demographic data, Pediatric Risk of Mortality III (PRISM-III) score, Pediatric Logistic Organ Dysfunction II (PELOD-II) score, duration of mechanical ventilation (MV) (days), length of ICU stay (days), length of hospital stay (days), discharge from the aICU (due to being transferred to a medical or surgical hospital ward or to the pICU of another hospital or due to mortality) were recorded. The following data of each patient were evaluated: ICU admission form (from the emergency department of the hospital, postoperative care from operating room, paediatric and other hospital departments, and/or from another hospital), indications of aICU admission, presence of chronic comorbidities, need for MV support (non-invasive or invasive MV), MV complications (atelectasis, pneumothorax, and/or VAP), need of tracheostomy for prolonged MV, requirement of vasopressor and inotropic agents in the first 24 hours, average of measurements during the first 24 hours of mean arterial pressure (MAP)/mmHg, heart rate (HR)/minute, body temperature (°C), plasma platelet count (PLT)/$\times 10^3$/UL, white blood cell count (WBC)/mm^3, haemoglobin concentration (Hb) (g/dL), total transfusion requirements (red blood cells (RBCs), fresh frozen plasma (FFP), platelet suspension, white cell suspension (WCS), albumin, and fibrinogen). Nosocomial infection rate, localization (deep tracheal aspirate (DTA), systemic blood circulation, urinary system, wound site, and cerebrospinal fluid (CSF)), and the most commonly isolated pathogens were determined.

Mortality rate and the causes of mortality (trauma, respiratory system, septic shock, multiple organ failure, and cardiovascular disease) were determined.

Comparisons of the data were performed between non-survivors and survivors. The correlation values of the factors affecting mortality among these parameters were assessed with single and multivariable logistic regression (MLR) tests.

3.1. Statistical Analysis

Descriptive statistics were presented as mean ± standard deviation, median (lowest-highest), frequency, and ratios. The distribution of variables was assessed with a Kolmogorov Smirnov test; quantitative independent data, a Mann-Whitney U test; qualitative independent data, a chi-square test; and when the chi-square test conditions were not met, a Fischer test. Impact levels were analysed with univariate and multivariate logistic regression analyses. IBM SPSS Statistics (Version 27.0. Armonk, NY: IBM Corp.) was used for the statistical analysis.

4. Results

We included 600 CIPPs aged 28 days to 17 years who were admitted to aICUs and were cared for at least 24 hours between 2011 and 2021. We excluded patients aged below 28 days and older than 17 years, those in the aICU for less than 24 hours, and those who were readmitted to the aICU.

The mean age of the patients was 6 years (7.4 ± 5.4), gender distribution was 252 (42%) female and 348 (58%) male, median PRISM-III score was 8 (1 - 48), median PELOD-II score was 1 (0 - 62), mean MV duration was 4.38 ± 11.7 days, mean length of ICU stay was 6.6 ± 14.2 days, and mean length of hospital stay was 11.8 ± 17.7 days. The demographic data are showed in Table 1.

The patients were admitted to the aICU from the emergency department (n = 372, 62%), operating room (n = 138, 23%), paediatric or other departments of hospital (n = 46, 7.67%), and other hospitals (n = 44, 7.33%) (Table 1).

The most common indications of aICU admission were polytrauma (n = 262, 43.67%), postoperative care (n = 140, 23.3%), and sepsis (n = 40, 6.67%) (Table 2).

The presence ratio of chronic comorbidities was 76.2%, with 67.8% of these patients exhibiting two or more comorbidities (Table 2).

It was determined that 379 (63.1%) of the patients needed MV support, of which 315 (83.1%) were provided with invasive MV support involving endotracheal intubation. In 12.1% of these patients, the following MV complications were detected: VAP (n = 27, 7.1%), atelectasis (n = 17, 4.5%), and pneumothorax (n = 2, 4.3%). Tracheostomy for prolonged MV was required in 43 (7.17%) patients (Table 3).

Vasopressor and inotropic agents were required by 184 (30.7%) patients within the first 24 hours.

The total transfusion requirement ratio was 59.8% of the patients. The administration rates were as follows: RBC (n = 362, 60.33%), FFP (n = 293, 48.33%), WCS (n = 74, 12.33%), platelet suspension (n = 70, 11.67%), albumin (n = 97, 16.17%), and fibrinogen (n = 54, 9%).

The rate of nosocomial infection was 12.8% (n = 77). The most common nosocomial infections according to the primary sites were pneumonia (n = 30, 38.96%), blood stream infection (n = 24, 31.17%), surgical site infection (n = 11, 14.29%), central nervous system infections (n = 7, 9.09%),

Table 1. Demographic Data

Variables	Min - Max	Median	Mean ± SD or No. (%)
Age (y)	0.0 - 17.0	6.0	7.4 ± 5.4
Gender			
Female			252 (42.0)
Male			348 (58.0)
PRISM III score	1.0 - 48	8	
PELOD II score	0.0 - 62	1	
Admission to ICU from			
Emergency department of hospital			370 (61.7)
Operating room			140 (23.3)
Pediatric and other departments of hospital			46 (7.7)
Another hospital			44 (7.3)
Duration of MV (days)	0.0 - 120	7	4.38 ± 11.7
Lenght of stay ICU (days)	1.0 - 139	2	6.6 ± 14.2
Lenght of stay hospital (days)	0.0 - 164	7	11.8 ± 17.7
Discharging from the aICU			
Transfered to medical or surgery hospital ward			502 (83.6)
To another hospital's pICU			10 (1.7)
Mortality			88 (14.7)

Abbreviations: PRISM, Pediatric Risk of Mortality; PELOD, Pediatric Logistic Organ Dysfunction; MV, mechanical ventilation; ICU, intensive care unit; aICU, adult ICU; pICU, pediatric ICU.

and urinary tract infections (n = 5, 6.49%). The most commonly isolated pathogens were *Klebsiella pneumoniae* (n = 27, 35.1%), *Acinetobacter baumannii* (n = 15, 19.5%), and *Pseudomonas aeruginosa* (n = 15, 19.5%) (Table 3).

The mortality rate was (14.7% (88/600 patients)). The causes of mortality of were as follows: complications secondary to trauma in 28 patients (31.8%), including intracranial haemorrhage (n = 17), polytrauma with three injured organs (n = 4), polytrauma with two injured organ (n = 3), isolated abdominal trauma (n = 3), and electrical burn (n = 1); respiratory system complications in 22 patients (25%), including pneumosepsis (n = 8), paediatric acute respiratory distress syndrome (p-ARDS) (n = 8), and pulmonary haemorrhage (n = 6); septic shock in 16 patients (18.2%); multi-organ failure in 11 patients (12.5%); and cardiovascular diseases in 11 patients (12.5%), including heart valve failure (n = 4), hypertrophic cardiomyopathy (n = 3), dilated cardiomyopathy (n = 2), and Wolff-Parkinson-White syndrome (n = 2) (Table 4).

In the mortality group, the mean age (P = 0.002) and length of hospital stay (P = 0.000) were statistically significantly lower. The duration of MV, PRISM-III scores, and PELOD-II scores were statistically significantly higher (P = 0.000).

Mortality was statistically more frequent in patients who were admitted to the ICU from the emergency department (P = 0.013) and from another hospital (P = 0.000).

The presence of trauma (P = 0.002), requirement of vasopressor and inotropic agents within the first 24 hours (P = 0.000), total transfusion requirement (P = 0.000), presence of nosocomial infection (P = 0.002), and VAP (P = 0.015) were found to be significantly higher in the mortality group.

During the first 24 hours, the averages of measurements of MAP and of body temperature were significantly lower (both P = 0.000) and that of the heart rate was significantly higher (P = 0.029) in the mortality group.

During the first 24 hours, the averages of measurements of platelet count and haemoglobin level were lower (P = 0.000) and that of WBC was higher (P = 0.002) in the mortality group (Tables 5 and 6).

ICU, intensive care unit; MV, mechanical ventilation; WCS, white cell suspension; RBC, red blood cells; FFP, fresh frozen plasma; VAP, ventilator associated pneumonia; MAP, mean arterial pressure; WBC, white blood cells count.

Table 2. Indication of Intensive Care Unit Admission and Presence of Chronic Comorbidity

Variables	No. (%)
Indication of ICU admission	
Multi-system	
Polytrauma	262 (43.7)
Postoperative care	140 (23.3)
Sepsis	40 (6.7)
Intoxication	37 (6.2)
Burn	25 (4.2)
Malignancy	16 (2.7)
Anaphylactic shock	3 (0.5)
Respiratory	38 (6.3)
Neurological	32 (5.3)
Cardiovascular	2 (0.3)
Endocrine	2 (0.3)
Renal	1 (0.16)
Hematological	1 (0.16)
Gastrointestinal	1 (0.16)
Presence of chronic comorbidity	457 (76.2)
Only one illness	147 (24.5)
Two illness	125 (20.8)
Three illnes	99 (16.5)
More than three illness	86 (14.4)

Abbreviation: ICU, intensive care unit.

Table 3. Patients' Outcomes

Variables	No. (%)
Need for MV support	379 (63.1)
Invasive MV	315 (83.1)
Non-invasive MV	64 (16.9)
Tracheostomy for prolonged MV	43 (13.6)
MV complications	46 (12.1)
VAP	27 (7.1)
Atelectasis	17 (4.5)
Pneumothorax	2 (0.5)
Primary sites of nosocomial infections	
Lower respiratory	30 (39.0)
Blood stream	24 (31.2)
Surgical site	11 (14.29)
Central nervous system	7 (9.09)
Urinary tract	5 (6.49)
Isolated pathogens	77 (12.8)
Klebsiella pneumoniae	27 (35.1)
Acinetobacter baumannii	15 (19.5)
Pseudomonas aeruginosa	15 (19.5)
Escherichia coli	7 (9.1)
Candida albicans	5 (6.5)
MRSA	5 (6.5)
Stafilococus epidermidis	2 (2.6)
Enterobacter cloacae	1 (1.3)

Abbreviations: MV, mechanical ventilation; VAP, ventilator-associated pneumonia; MRSA, methicillin-resistant *Staphylococcus aureus*.

5. Discussion

In this recent study, lower age, higher PRISM-III and PELOD-II scores, higher dosages of vasopressor/inotropic support during the first 24 hours, prolonged MV duration, greater requirement of blood product transfusion, presence of trauma, nosocomial infection, VAP, thrombocytopenia, lower MAP and haemoglobin values, and leukocytosis during the first 24 hours were to be found mortality risk factors.

Similar to other studies, in the present study, the mean age of the patients cared for in the aICU was (7.4 ± 5.4) years (10-12). The length of stay in the pICU was generally between 2 and 9.7 days in previous studies; it was similarly 6.6 ± 14.2 days in the present study (13-15). The length of hospital stay was found to vary according to the inpatient profile, with 11.8 ± 17.7 days in the present study, which was different to other studies (15, 16). It is thought that the longer ICU and hospital stays recorded in the present study could be attributable to chronic comorbidities in 76.2% of the patients and the lack of a sufficient number of palliative care units and rehabilitation centres.

There are many scoring systems used to predict mortality. However, the most commonly used at the time of writing is the PRISM-III score (17, 18). The median PRISM-III score determined in the present study is similar to that of Asilioglu and Kot (19) and Celik et al. (20), and the PELOD-II scores of the patients with mortality in the present study were found to be similar to those found by Grinkeviciute et al. (8).

Mortality is a significant indicator of the adequacy of ICU care, though it is also closely related to the patient profile and the reason for admission to hospitals. The mortality rates of pICUs in countries other than Turkey range from 2.2% to 35.3% (21); in particular, 2.9% in the United States and 5.6% in Europe (22, 23). In this study, the most common causes of mortality were trauma, respiratory system complications, and septic shock. Traumatic injuries are one of the most common causes of mortality in the pae-

Table 4. Causes of Mortality

Causes of Mortality	No. (%)
Traumatic	28 (31.8)
Intracranial hemorrhage	18 (20.4)
Polytrauma +3 organs	4 (4.6)
Polytrauma +2 organs	3 (3.4)
Isolated abdominal trauma	3 (3.4)
Respiratory system	22 (25)
Pneumosepsis	8 (9)
p-ARDS	8 (9)
Pulmonary hemorrhage	6 (7)
Septic shock	16 (18.2)
Multiple organ failure	11 (12.5)
Cardiovascular disease	11 (12.5)
Heart valve disease	4 (4.5)
Hypertrophic cardiomyopathy	3 (3.4)
Dilated cardiomyopathy	2 (2.3)
Wolff-Parkinson White Syndrome	2 (2.3)

Abbreviation: ARDS, acute respiratory distress syndrome.

diatric age group (24). In our study, trauma was the most common reason for admission to the aICU. Moreover, Arias et al. (25) found that trauma may be one of the most common causes of mortality because of inadequate multidisciplinary management in pICUs.

It has been reported that the presence of chronic comorbidities in patients increases mortality and morbidity and prolongs the duration of hospital stay (26). In Turkey, the rate of accompanying chronic diseases, mostly neurological diseases, is 25.7 - 61.7% in pICUs (12, 19). In our study, the chronic comorbidity rate was identified in 76.2% of the patients admitted to the aICU. We believe that the length of hospital stay was longer for this reason, though we could not confirm a significant relationship between the presence of chronic comorbidity and mortality.

In recent literature, it has been reported that the longer the MV duration in paediatric patients, the longer the length of hospital stay and the greater the rate of mortality (27). The incidence of MV is 8.5 - 80% of patients in pICUs (28). In this study, we found that the incidence of MV was 63.1%, which is consistent with the literature. Similar to the literature, the mean duration of MV was 4.38 $\pm$ 11.7 days (29). We found that the mortality rate of patients who received MV support was 23.2%, and the most common complication of MV was VAP.

Some studies have reported that there is a correlation between high-dose vasopressor/inotropic agent usage and mortality (30). In the present study, the rate of vasopressor/inotropic agent usage was 30.7%, and the mortality rate was 43.7% in these patients, similar to the findings of Krishnan et al. (31). The use of high-dose vasopressors and inotropes was associated with the finding that the majority of admissions to aICUs were trauma patients, and that their haemodynamic parameters were unstable at the time of admission.

Different studies have reported that the requirement for total transfusion is associated with a mortality rate of 2.4 - 34.4% in the pICU (32, 33). Similar to our findings, total transfusion requirements were administered at a rate of 59.8% in the present study, and the mortality rate was found to be 20%. This higher rate of total transfusion requirements was attributed to the higher incidence of multiple trauma and penetrating injuries in our paediatric patients. Similar to the data of Yilmaz et al. (34), thrombocytopenia and lower haemoglobin levels were found to be associated with mortality among CIPPs.

It has also been reported that nosocomial infections prolong hospital stay and increase mortality in the paediatric age group (13, 15). The nosocomial infection rate was 12.8% in our study. The localization of microorganisms may differ according to the patient type and the ICU flora, and so different localizations have been reported in various studies. The US National Nosocomial Infection Surveillance System has reported that the most common localization is systemic infection (35). In a multicentre study conducted in Europe, the localization of the microorganism was determined to be the pulmonary system, similar to our study (36), and the most frequently isolated microorganisms from nosocomial infections in the pICU were *Klebsiella* spp., *A. baumannii*, and *P. aeruginosa* like ours (37).

The main limitation of this study was its single-centre and retrospective design. Since the patient data were obtained from the HEPIS and patient files, no wider comparison could be made due to the inadequacy of the data from previous years. Another major shortcoming of this study was the lack of consideration of confounding factors.

5.1. Conclusions

It is crucial to achieve the best results and better outcomes for CIPPs. One of the ways to reach this goal is to establish a multidisciplinary pICU to provide paediatric patients with the best care available (38). However, a significant proportion of CIPPs currently hospitalized in aICUs are admitted with trauma. An analysis of the presence of chronic comorbidities of CIPPs revealed a predominance of neurological disease, which requires a multidisciplinary approach.

Table 5. Comparison of Demographic and Clinical Parameters Between the Two Groups

Variables	Survival (n = 512)		Mortality (n = 88)		P
	Mean ± SD or No. (%)	Median	Mean ± SD or No. (%)	Median	
Age (y)	7.6 ± 5.4	7.0	5.9 ± 5.5	4.0	0.002 m
Lenght of stay hospital (days)	13.5 ± 18.2	9.0	1.4 ± 8.7	1.0	0.000 m
Duration of MV (days)	3.3 ± 10.6	1.0	8.4 ± 16.1	3.0	0.000 m
PRISM-III score		7.0 (1.0 - 39)		33.5 (6.0 - 48)	0.000 m
PELOD-II score		1.0 (0.0 - 58)		42 (2.0 - 62)	0.000 m
Admission to ICU from emergency department of hospital	307 (60.0)		65 (73.9)		0.013 χ^2
Admission to ICU from operating room	140 (27.3)		2 (2.3)		0.000 χ^2
Admission to ICU from another hospital	28 (5.5)		16 (18.2)		0.000 χ^2
Presence of trauma	235 (45.9)		56 (63.6)		0.002 χ^2
Requirement of vasopressor and inotropic agents in the first 24 hours	104 (20.3)		80 (90)		0.000 χ^2
Total transfusion requirement	287 (56.1)		72 (81.8)		0.000 χ^2
WCS	33 (6.4)		41 (46.6)		0.000 χ^2
RBC	239 (56.4)		73 (83.0)		0.000 χ^2
FFP	226 (44.1)		67 (76.1)		0.000 χ^2
Platelet suspension	34 (6.6)		36 (40.9)		0.000 χ^2
Fibrinogen	22 (4.3)		32 (36.4)		0.000 χ^2
Albumin	52 (10.2)		45 (51.1)		0.000 χ^2
Presence of nosocomial infection	59 (11.5)		18 (20.5)		0.002 χ^2
VAP	21 (4.1)		9 (10.2)		0.015 χ^2
Average of measurements on the first 24 hours of MAP (mmHg)	61.1 ± 11.0	65.0	34.6 ± 11.6	32.5	0.000 m
Average of measurements on the first 24 hours of heart rate (beat/min)	118.7 ± 25.3	116.0	122.9 ± 39.9	126.0	0.029 m
Average of measurements on the first 24 hours of body temperature (°C)	36.7 ± 0.9	36.5	36.5 ± 1.3	36.0	0.000 m
Average of measurements on the first 24 hours of platelet ($\times 10^3$/UL)	197.6 ± 74.9	210.0	105.1 ± 82.6	65.0	0.000 m
Average of measurements on the first 24 hours of haemoglobin (g/dL)	8.9 ± 2.5	8.6	6.5 ± 2.2	6.6	0.000 m
Average of measurements on the first 24 hours of WBC (mm^3)	13.4 ± 5.8	11.9	15.6 ± 7.5	14.3	0.002 m

Abbreviations: SD, standard deviation; m, Mann-Whitney U test; χ^2, chi-square test.

Footnotes

Authors' Contribution: Study concept and design: M. S. S.; acquisition of data: M. S. S., K. E.; analysis and interpretation of data: M. S. S., K. E.; drafting of the manuscript: M. S. S., K. E.; critical revision of the manuscript for important intellectual content: M. S. S., K. E.; statistical analysis: M. S. S.; administrative, technical, and material support: M. S. S., K. E.; study supervision: K. E.

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Data Reproducibility: The data presented in this study are openly available in one of the repositories or will be available on request from the corresponding author by

Table 6. Regression Analysis of the Factors Affecting Mortality

Variables	Univariate Model			Multivariate Model		
	OR	%95 CI	P	OR	%95 CI	P
Age (y)	0.94	0.90 - 0.98	0.005			
Duration of MV (days)	1.03	1.01 - 1.04	0.002			
Lenght of stay hospital (days)	0.63	0.56 - 0.70	0.000	0.84	0.80 - 0.88	0.000
PRISM-III score	1.27	1.22 - 1.33	0.000			
PELOD-II score	1.18	1.15 - 1.21	0.000	1.11	1.07 - 1.16	0.000
Admission to ICU from emergency department of hospital	1.887	1.136 - 3.134	0.014			
Admission to ICU from operating room	0.062	0.015 - 0.254	0.000			
Admission to ICU from another hospital	3.841	1.981 - 7.449	0.000			
Presence of trauma	2.06	1.29 - 3.293	0.002			
Requirement of vasopressor and inotropic agents in the first 24 hours	39.23	18.38 - 83.72	0.000			
Total transfusion requirement	3.53	2.00 - 6.23	0.000			
WCS	12.66	7.32 - 21.89	0.000			
RBC	3.76	2.10 - 6.72	0.000			
FFP	4.04	2.40 - 6.79	0.000			
Platelet suspension	9.73	5.62 - 16.86	0.000			
Fibrinogen	12.73	6.92 - 23.40	0.000			
Albumin	9.26	5.58 - 15.37	0.000			
Presence of nosocomial infection	1.97	1.10 - 3.54	0.023			
VAP	2.664	1.178 - 6.025	0.019			
Average of measurements on the first 24 hours of MAP (mmHg)	0.86	0.84 - 0.89	0.000	0.94	0.90 - 0.99	0.017
Average of measurements on the first 24 hours of platelet ($\times 10^3$/Ul)	0.98	0.98 - 0.99	0.000	0.99	0.99 - 1.00	0.047
Average of measurements on the first 24 hours of haemoglobin (g/dL)	0.55	0.48 - 0.64	0.000			
Average of measurements on the first 24 hours of WBC (mm^3)	1.05	1.02 - 1.08	0.003			

Abbreviations: OR, odds ratio; CI, confidence interval; ICU, intensive care unit; MV, mechanical ventilation; WCS, white cell suspension; RBC, red blood cells; FFP, fresh frozen plasma; VAP, ventilator associated pneumonia; MAP, mean arterial pressure; WBC, white blood cells count.

this journal representative at any time during submission or after publication. Otherwise, all consequences of possible withdrawal or future retraction will be with the corresponding author.

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