



ORIGINAL ARTICLE

Clinical management for patients admitted to a critical care unit with severe sepsis or septic shock[☆]



Wai Keung Cheung^{a,*}, Lai Sheung Chau^{b,1},
Iun Ieng Laurinda Mak^{b,1}, Mei Yi Wong^{b,1},
Sai Leung Wong^{b,1}, Agnes Fung Yee Tiwari^{a,2}

^a School of Nursing, The University of Hong Kong, Hong Kong Special Administrative Region

^b Intensive Care Unit, Tuen Mun Hospital, Hong Kong Special Administrative Region

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KEYWORDS

Critical care nursing;
Norepinephrine;
Septic shock;
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Summary

Background: The Surviving Sepsis Campaign promotes the use of norepinephrine as the first-line inotropic support for patients presenting with severe sepsis or septic shock in cases of persistent hypotension, despite adequate fluid resuscitation. However, there is little published evidence on how much noradrenaline is administered to such patients when admitted to the intensive care unit (ICU). The authors report the clinical management of this group of patients, with a special focus on the total amount and duration of norepinephrine infusion required.

Methods: A chart review of the admission records of an ICU in Hong Kong was carried out in 2013. A total of 5000 patients were screened by their diagnosis of severe sepsis or septic shock (in the admissions book) between 1 January 2011 and 31 December 2013. A total of 150 of these were identified and 100 included in the study after simultaneous in-depth reviews of their case notes by two of the investigators. The analysis covers those with severe sepsis or septic shock who required ICU admission for further care. Clinical management and outcomes were analysed.

Results: 100 patients (median age 61.6; M/F ratio 2:1) met the inclusion criteria. The mean ICU stay was 13.4 days (range = 1–371). 14 patients (14%) died in the ICU, with a 28-day mortality rate of 22%. The mean period of mechanical ventilation was 6.1 days (range = 0–137). 91.5% ($n = 43$) of patients had been operated on immediately before admission to the ICU, and the majority of these operations had been of the emergency type (97.7%, $n = 43$). The mean total volumes of crystalloid and colloid administered were 3420 ml and 478 ml, respectively. The mean wean-off period for norepinephrine infusion was 4234 minutes (70.5 hours). All patients were

[☆] This study was performed in Intensive Care Unit of Tuen Mun Hospital, 23 Tsing Chung Koon Road, Tuen Mun, Hong Kong: SAR.

* Corresponding author. Tel.: +852 39176644.

E-mail addresses: alessi@hku.hk (W.K. Cheung), cls971@ha.org.hk (L.S. Chau), mii672@ha.org.hk (I.I.L. Mak), wmy315@ha.org.hk (M.Y. Wong), wsl039@ha.org.hk (S.L. Wong), afytiwar@hku.hk (A.F.Y. Tiwari).

¹ Tel.: +852 24637939.

² Tel.: +852 28192633.

prescribed norepinephrine for persistent hypotension despite adequate fluid resuscitation, and the mean total amount administered was 87,211 mg. Final multiple linear and logistic regression analysis showed different clinical outcomes associated with different covariates, which included: (1) total amount of crystalloid given, positively associated with the total amount and duration of norepinephrine infusion; (2) duration of mechanical ventilation, positively associated with the type of operation the patient had undergone; (3) 28-day mortality rate, positively associated with the INR.

Conclusions: What this study adds to knowledge about patients suffering from severe sepsis or septic shock: (1) the mean duration of norepinephrine infusion for septic shock patients in an ICU is almost three days; (2) the more crystalloid is required to correct hypoperfusion, the higher the dosage and longer the duration of norepinephrine infusion will be necessary; (3) the longer the patient's INR, the higher the chances of death within 28 days. Since not all patients have their body weight measured on or after admission to the ICU, we suggest further research into indirect estimation of body weight by other means, such as anthropometric measures, to guide the use of drugs and nutritional support in the ICU. In addition, APACHE scores should be included in further studies to compare the severity of the patient's condition in other research. Furthermore, since this study does not cover university hospital ICUs, we suggest that further research concerning such patients should compare and reflect similarities and differences between public and university hospitals in the territory.

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Implications for Clinical Practice

What is already known about the topic?

- Protocolised resuscitation of patients with sepsis should be initiated once hypoperfusion is recognised and the patient requires critical care support.
- Norepinephrine is the initial vasopressor of choice to maintain blood pressure for septic shock patient.

What this paper adds

- The mean duration of norepinephrine infusion for septic shock patients in an ICU is almost three days;
- The more crystalloid that is required to correct hypoperfusion, the higher the dosage and longer the duration of norepinephrine infusion will be necessary;
- The longer the patient's INR, the higher the chances of death within 28 days.

Introduction

Sepsis is the clinical syndrome that results from a dysregulated inflammatory response to an infection. It exists if two or more of the following abnormalities are present, along with either a culture-proven or a visually identified infection:

- temperature >38.3 or $<36^{\circ}\text{C}$
- heart rate >90 beats/minutes
- respiratory rate >20 breaths/minutes or $\text{PaCO}_2 <32$ mmHg
- WBC >12000 cells/ mm^3 , <4000 cells/ mm^3 or $>10\%$ immature (band) forms.

Severe sepsis refers to sepsis plus at least one of the following signs of hypoperfusion or organ dysfunction:

- areas of mottled skin
- capillary refilling requiring three seconds or longer
- urine output <0.5 ml/kg over at least one hour, or renal replacement therapy

- lactate >2 mmol/L
- abrupt change in mental status
- abnormal electro-encephalographic (EEG) findings
- platelet count $<100,000$ per ml
- disseminated intravascular coagulation
- acute lung injury or acute respiratory distress syndrome (ARDS)
- cardiac dysfunction (i.e., left ventricular systolic dysfunction), as defined by echo-cardiography or direct measurement of the cardiac index.

Septic shock exists if there is severe sepsis, plus one or both of the following:

- systematic mean blood pressure <60 mmHg (or <80 mmHg if the patient has baseline hypertension) despite adequate fluid resuscitation
- maintaining systematic mean blood pressure at >60 mmHg (or >80 mmHg if the patient has baseline hypertension) requires dopamine >5 mcg/kg per minutes, norepinephrine >0.25 mcg/kg per minutes, or epinephrine

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