

## Evaluation of the Outcome and Adverse Event of Intravenous Vitamin C in the Treatment of Septic Shock or Acute Respiratory Distress Syndrome (ARDS) among Patients Admitted to the Intensive Care Unit (ICU) of a Tertiary Hospital in Malaysia

Hoey Lin Oh, MPharm (Clin Pharm)<sup>1,2</sup>, Calvin Ke Wen Wong, MRCP (UK)<sup>3</sup>, Biing Horng Lee, MRCP (UK)<sup>4</sup>, Kah Shuen Thong, MPharm (Clin Pharm)<sup>2</sup>, Kit Weng Foong, M Med (Anaes), Fellowship in Intensive Care<sup>5</sup>

<sup>1</sup>Department of Pharmacy, Slim River Hospital, 35800 Slim River, Perak, Malaysia, <sup>2</sup>Department of Pharmacy, Raja Permaisuri Bainun Hospital, 30400 Ipoh, Perak, Malaysia, <sup>3</sup>Department of General Medicine, Sarawak General Hospital, 93586 Kuching, Sarawak, Malaysia, <sup>4</sup>Department of General Medicine, Taiping Hospital, Perak, 34000, Malaysia, <sup>5</sup>Department of Anesthesiology, Raja Permaisuri Bainun Hospital, 30400 Ipoh, Perak, Malaysia

### ABSTRACT

**Introduction:** Numerous studies have suggested that Vitamin C may enhance recovery from sepsis and improve clinical outcome in acute respiratory distress syndrome (ARDS) through its effect in attenuating organ failure and improving the microcirculation and hemodynamic parameters. **Methods:** A retrospective observational study was conducted between 2018 and 2020 among patients admitted to the intensive care unit and who received intravenous vitamin C for septic shock or ARDS (N=35). Primary outcome was the vasopressor and ventilator-free-days at day 28 of treatment. **Results:** The vasopressor and ventilator-free-day at day 28 of intravenous vitamin C was 9 days (IQR 0,25) and 12 days (IQR 0,22) respectively; which was shorter compared to the VICTAS study (25 days). Resolution of shock was observed in 66% of the patients (n=23) within 46 hours and this finding was consistent with the results of HYVCTISS study. The vasopressor requirement was reduced by 36% within 24 hours of treatment (from 0.63mcg/kg/min to 0.4mcg/kg/min of norepinephrine equivalent doses) (p<0.001). However, the 28-day all-cause mortality rate was higher compared to other studies (55% vs 20-35%). This may be due to the high SOFA score (14 and above) among these patients prior to treatment and a delay in treatment from the onset of septic shock (> 24 hours as recommended in 10 out of the 19 deceased patients). **Conclusion:** Although the 28-day all-cause mortality rate was higher in our patients, rapid resolution of shock was observed among those who responded to the intravenous vitamin C treatment.

## The Burden and Costs of Sepsis Shock Management in Intensive Care Unit in a Tertiary Hospital, Malaysia

Hoey Lin Oh, MPharm (Clin Pharm)<sup>1,2</sup>, Chin Hui Ng, PhD<sup>2</sup>, Calvin Ke Wen Wong, MRCP (UK)<sup>3</sup>, Biing Horng Lee, MRCP (UK)<sup>4</sup>, Kah Shuen Thong, MPharm (Clin Pharm)<sup>2</sup>, Kit Weng Foong, M Med (Anaes), Fellowship in Intensive Care<sup>5</sup>

<sup>1</sup>Department of Pharmacy, Slim River Hospital, 35800 Slim River, Perak, Malaysia, <sup>2</sup>Department of Pharmacy, Raja Permaisuri Bainun Hospital, 30400 Ipoh, Perak, Malaysia, <sup>3</sup>Department of General Medicine, Sarawak General Hospital, 93586 Kuching, Sarawak, Malaysia, <sup>4</sup>Department of General Medicine, Taiping Hospital, Perak, 34000, Malaysia, <sup>5</sup>Department of Anesthesiology, Raja Permaisuri Bainun Hospital, 30400 Ipoh, Perak, Malaysia

### ABSTRACT

**Introduction:** The burden of septic shock management is ascertained. This study aimed to explore the burden of septic shock management in the Intensive Care Unit (ICU) in a tertiary hospital and to evaluate the effect of intravenous ascorbic acid in this population. **Methods:** A retrospective observational study was conducted between 2018 and 2020 on the cost of surviving and non-surviving sepsis patients from a paymaster perspective. Medical records were abstracted to identify events and resources consumed in ICU retrospectively. The cost accrued was received from the price listed by the Attorney General's Chambers of Malaysia for foreigner and private pathology laboratories. The price list of types and quantities of healthcare components utilized during the patient's stay was taken into consideration. **Results:** An average cost of treatment in ICU for sepsis patients was RM14,833.50 (CI: RM10,560.94, 95%CI). From the 35 septic shock patients, 51% died and 49% survived and were discharged from the ICU. The mean hospital costs incurred per surviving patient was RM 20167 and the average stay in ICU was 28 days. The mean hospital cost incurred per death in ICU was RM 9796 with an average stay of 10 days. Only the number of total ICU stay has a strong relationship (r: -0.99) with the management cost. The proportion of the cost of intravenous ascorbic acid was 2.84% (CI: 0.65%,95%CI) from the total management cost. The majority of the expenses accrued was from laboratory tests which was 52.98% (CI:1.03,95%CI). **Conclusion:** This study provided insight with the efficacy of intravenous ascorbic acid and the burden of sepsis shock management in ICU.