A Prospective Randomized Trial Using Blood Volume Analysis vs. Pulmonary Artery Catheter Measurements to Guide Fluid and Red Cell Management

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OBJECTIVES

The purpose of this study was to compare the combination of blood volume analysis with fluid and red cell management as compared to the current practice of red cell management using pulmonary artery catheter (PAC) readings and fluid management guided by PAC readings (PAC group). The trial was powered using a formula which included a difference in the mean change in vital signs of 10 mmHg in systolic blood pressure (SBP) between the two groups. The sample size calculation was 60 patients in each arm. A total of 144 patients with severe sepsis or septic shock (60 in each arm) were included in the study. The primary outcome measure was the difference in change in SBP at 6 hours post-randomization between the blood volume analysis group and the PAC group. The secondary outcome measure was the difference in change in heart rate (HR) at 6 hours between the two study groups. The study was stopped early due to the lower number of patients enrolled. The study was conducted at the University of Hawaii, Department of Surgery and Critical Care and Queen's Medical Center.

RESULTS

The study reached its primary endpoint of difference in change in SBP after 6 hours with the blood volume analysis group experiencing a greater increase in SBP compared to the PAC group (31 mmHg vs. 19 mmHg; p = 0.008). No significant difference was found in the change in HR after 6 hours (p = 0.15). The blood volume analysis group also showed a trend towards a lower mean rate of fluid administration compared to the PAC group (p = 0.08).

CONCLUSION

The use of blood volume analysis in the management of severe sepsis or septic shock results in a greater increase in SBP compared to the current practice of red cell management using pulmonary artery catheter readings and fluid management guided by PAC readings. The study was stopped early due to the lower number of patients enrolled. Further studies are needed to confirm these findings.

FIGURE 1. Blood volume analysis

FIGURE 2. Change in vital signs

FIGURE 3. Change in heart rate

TABLE 1. Baseline characteristics

TABLE 2. Change in vital signs

TABLE 3. Change in heart rate

TABLE 4. Outcomes and resource consumption


1) Yu Mi et al. Shock 2007 219: 150
2) Schreiber et al. Crit Care Med 2016 44: 543
3) Marik, Quantum Research Foundation, American Foundation for Safe Surgery and Health Care, Denver, CO

METHODS

A prospective randomized trial in severe sepsis or septic shock. The primary outcome measure was the difference in change in SBP at 6 hours post-randomization. The secondary outcome measure was the difference in change in HR at 6 hours between the two study groups. The study was terminated early due to the lower number of patients enrolled. The study was conducted at the University of Hawaii, Department of Surgery and Critical Care and Queen's Medical Center.

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