Blood Volume Measurements: Impact on Fluid Management

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Introduction

Resuscitation of critically ill patients from trauma, surgery or septic insult has been well studied.

Treatment goal is achievement of adequate volume status and improved tissue oxygenation.

Intravascular fluid status is assessed by vital signs, urinary output, pulmonary artery catheter (PAC) data, laboratory values and imaging.

We evaluated if the addition of blood volume (BV) measurement changed our treatment in the Surgical Intensive Care Unit patients.

Hypothesis

Blood volume measurements will alter treatment in comparison to data gathered by traditional methods.

Methods

Retrospective chart review of patients with BV measurements. Patients whose BV was difficult to assess (persistent tachycardia, low cardiac index, renal dysfunction, poor oxygenation, vaso-active medication) underwent a BV study. Results of the BV measurement were available to the treating team within 2-6 hours and integrated in fluid and transfusion management. By retrospective chart review a change in treatment after inclusion of BV information was noted.

Blood volume measurement:

Injection of 1ml of Iodine 131 labeled serum albumin intravenously containing 25 micro curies of radioactivity. Five milliliter blood samples are collected at 12,18,24, 30 and 36 minutes after injection. A baseline hematocrit is obtained at time of study. The BV assessment is performed with the BVA-100 Blood Volume Analyzer (Daxor Corporation, New York, NY).

Results

40 patients, 32 male and 8 female, generated 86 data points.

Age: 61 ± 20, APACHE II score 20 ± 6.

Mortality was 13% (5/40).

14 patients were trauma victims, 22 general surgical patients, 4 from other surgical subspecialties. 11 patients had severe sepsis/septic shock, 7 presented with hemorrhagic shock, 20 had ARDS/ respiratory failure and 2 cardiac failure.

With addition of BV information a treatment change occurred in 31/86 cases (36%).

30 data points were generated in patients with a PAC. In 6/30 occasions (20%) BV information resulted in treatment change.

All 6 instances required a decrease in fluids/diuretics and 2 received blood transfusion.

56 data points were collected from patients without PAC. In 25/56 cases (45%) the results lead to a different treatment.

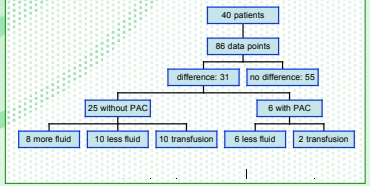
Results

10 instances required less fluid/ diuretics, 8 needed more fluid and 10 received transfusion in combination with or without fluid restriction.

The effect of altered treatment on oxygenation, renal dysfunction, vasopressor use and cardiac index within 6 to 12 hours was evaluated.

No improvement was noted in 18/31 cases (58%). In 13/31 occasions (42%) a positive response in one or more of above parameters was detected.

Difference in treatment after blood volume measurement



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Conclusions

Fluid management in the Surgical Intensive Care Unit relies on the correct interpretation of clinical data.

The integration of BV measurements changed our fluid and transfusion management in 36% of cases.

Whether BV information will change outcome and Intensive Care Unit days or ventilator days needs to be evaluated in a prospective study.