Fluid Resuscitation: Review Questions

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QUESTIONS

Choose the single best answer for each question.

Questions 1 and 2 refer to the following case.

A 65-year-old man who resides in a skilled nursing facility becomes febrile, tachycardic, dyspneic, and hypotensive 90 minutes after bladder catheterization. His past medical history is notable for Alzheimer's disease, renal insufficiency, and anemia. His heart rate is 115 bpm, and his blood pressure is 85/55 mm Hg.

1. **What is the first step in the management of this patient?**
   (A) Administer 6% hetastarch in a 500 mL 0.9% sodium chloride injection
   (B) Administer 20 mL of albumin (human) 25% through a large-bore IV line
   (C) Rapidly administer 500 mL of normal saline through a large-bore intravenous (IV) line
   (D) Transfuse 1 U of packed red blood cells

2. **The patient becomes more dyspneic. Chest radiography reveals bilateral infiltrates. The patient progresses to respiratory failure and requires intubation. He is placed on mechanical ventilation with a fractional concentration of oxygen in inspired gas (Fio_2) of 100% and positive end-expiratory pressure of 8 cm H_2O to maintain an oxygen saturation of 90%. He continues to be hypotensive. What is the next step in the management of this patient?**
   (A) Administer an additional 6% hetastarch in a 500 mL 0.9% sodium chloride injection
   (B) Administer another 500 mL bolus of normal saline
   (C) Administer another 20 mL of albumin (human) 25%
   (D) Transfuse an additional unit of packed red blood cells

3. **What are the target hemodynamic parameters to minimize the duration of mechanical ventilation in the presence of acute respiratory distress syndrome?**
   (A) Fluid therapy to maintain a central venous pressure (CVP) of 10 to 14 mm Hg and a pulmonary artery occlusion pressure (PAOP) of 14 to 18 mm Hg
   (B) Fluid therapy to maintain a CVP of less than 4 mm Hg and a PAOP of less than 8 mm Hg
   (C) Fluid therapy to maintain a CVP of 8 to 12 mm Hg
   (D) Fluid therapy to maintain a CVP of 12 to 15 mm Hg

4. **What is the ideal hematocrit in fluid resuscitation in the absence of acute myocardial disease?**
   (A) 21% to 27%
   (B) 24% to 30%
   (C) 30% to 36%
   (D) 42% to 45%

(turn page for answers)

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ANSWERS AND EXPLANATIONS

1. **(C) Rapidly administer 500 mL of normal saline through a large-bore IV line**. This patient is most likely in septic shock following bladder catheterization. In the early phases of fluid resuscitation in a septic patient, rapid volume expansion is the key to achieving a good outcome. Adequate and early volume expansion is generally more important than immediate insertion of a central venous catheter or a pulmonary artery catheter if adequate peripheral access is available. The choice of fluid administered is not as critical as early volume expansion.[1,2] The target mean arterial blood pressure is 65 mm Hg or greater.[3] Pressor therapy may be necessary later; however, adequate volume replacement would be necessary initially to "prime the pump" for more effective pressor function.
2. **(B) Administer another 500 mL bolus of normal saline.** Again, the choice of fluid administered is not as critical as timely administration of fluid, even in the presence of acute respiratory distress syndrome.[1,2] Rivers et al[3] emphasized the importance of early goal-directed therapy for treatment of sepsis before transfer to the intensive care unit. Their approach involved adjustment of cardiac preload, afterload, and contractility to balance oxygen delivery with oxygen demand. The reported in-hospital mortality rate was 30.5% in the early goal-directed therapy group compared with 46.5% in the standard therapy group. These goals have been incorporated into the Surviving Sepsis Campaign guidelines.
3. **(B) Fluid therapy to maintain a CVP of less than 4 mm Hg and a PAOP of less than 8 mm Hg.** A recently published randomized study compared 7 days of conservative versus liberal fluid management strategies in 1000 patients with acute lung injury.[4] The primary endpoint was death at 60 days. Secondary endpoints included the number of ventilator-free days and organ-failure–free days. Although 60-day mortality was not significantly different, ventilator-free days and time in the intensive care unit were reduced in the first 28 days using the conservative strategy. Acute lung injury is characterized by increased vascular permeability. Although early goal-directed therapy with appropriate fluid resuscitation is crucial, once acute lung injury has occurred, a more conservative approach to fluid therapy may be better than a more liberal approach.
4. **(A) 21% to 27%.** Chronically ill septic patients may have hemoglobin levels in the range of 8 to 10 g/dL or may quickly achieve these levels due to the dilutional effects of fluid resuscitation. Some dilution may improve circulation and oxygen delivery.[1] Although it is likely that an elderly septic patient may have some degree of peripheral or cardiovascular disease, most critically ill patients with cardiovascular disease in the absence of an acute myocardial infarction or unstable angina can tolerate hemoglobin levels of 7 to 9 g/dL (hematocrit of approximately 21%–27%).[5] The transfusion of aged blood cells may not improve oxygen transport and may in fact have deleterious immunologic implications.

REFERENCES

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