

Fluids for Septic Shock

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A 26-year-old male presents to the emergency department (ED) with a five day history of feeling ill with fever, productive cough, chest pain, nausea and vomiting. He had been seen in the ED 24 hours earlier, and discharged with a diagnosis of influenza. A chest X-ray on his first visit was normal, with no evidence of pneumonia (Figure 1). He returned to the ED because he felt much worse and was now short of breath.

His extremities were warm, his peripheral pulses were palpable and his capillary refill was normal. On examination of his respiratory system, he was not using accessory muscles, he was able to speak in full sentences and on auscultation, his breath sounds were decreased in the right lower lung field.

Patient Stats

- His temperature was 38.6 C; his respiratory rate was 22 breaths/minute and pulse was 120 beats/minute. His blood pressure was 124/70 mm Hg and SaO₂ was at 95%.
- A chest X-ray revealed bilateral patchy infiltrates consistent with bronchopneumonia (Figure 2). His white blood cell count was 3700/mm³. He was given intravenous cefotaxime, azithromycin, and fluid. He remained tachycardic and became hypotensive, requiring increasing amounts of supplemental oxygen and fluid over the following three to four hours. He continued to deteriorate radiologically and clinically, and underwent endotracheal intubation in the ED, followed by admission to the intensive care unit, where he spent the next three weeks.



Figure 1. First visit.



Figure 2. Second visit, pre-intubation.

Questions

1. What is this patient's most likely diagnosis?
2. What should I know about sepsis?
3. What are the principles of management of the septic patient?

Table 1

Diagnosis of Sepsis

Diagnosis requires two or more of the following four clinical features, as well as a source of infection:

1. Temperature > 38 C or < 30 C
2. Heart rate > 90 beats/minute
3. Respiratory rate > 20 breaths/minute or alveolar pressure carbon dioxide (PaCO₂) < 32 mm Hg
4. White blood cell count > 12,000/mm³ or < 4,000/mm³ or > 10% immature forms

Answers & Discussion

1. What is this patient's most likely diagnosis?

This patient has septic shock as a result of influenza-associated bacterial pneumonia. Pneumonia is the most common complication of influenza and results from damage to both cellular and mechanical defences in the lung by the flu virus. It occurs most frequently in the immune-compromised or in older patients, and may manifest itself as "primary" influenza viral

pneumonia, secondary bacterial pneumonia or mixed viral and bacterial pneumonia. Empiric treatment is the same as for other community acquired pneumoniae. Prophylactic antibiotic therapy to avoid bacterial pneumonia in influenza is contraindicated as it may select resistant organisms.


2. What should I know about sepsis?

Sepsis represents a cascade of events which occur in response to an inciting infection (Table 1). Sepsis may arise from many different types of micro-organisms and from infection from many different sites. This cascade involves a loss of homeostasis between pro-inflammatory and anti-inflammatory mediators, as well as coagulation pathways. Patients may develop hypotension, organ dysfunction and organ failure. Septic shock is a form of vasodilatory shock.

3. How do I manage a patient with sepsis?

As with any critically ill patient arriving in the ED, management should begin with the ABCs. Airway management and ventilation should be a priority in patients unable to protect their own airway or requiring assistance with ventilation. The goal of resuscitation in patients with septic shock is to correct the deficit which exists in systemic perfusion and oxygenation, and to interrupt the inflammatory cascade which occurs in sepsis.

A careful history and physical examination must be completed to identify a source of infection. Early administration of appropriate antibiotic therapy reduces mortality. The choice of antibiotic therapy should be guided by the site of infection, although ceftriaxone 1g to 2g IV is a reasonable choice to start with in cases where no site is apparent at initial evaluation.

Fluid resuscitation with crystalloid is the primary treatment option for hypotension in sepsis. Patients often require large volumes of intravenous fluid during resuscitation and volumes greater than six litres of crystalloid are frequently required during the initial 24 hours. Fluid management may initially be guided by non-invasive methods of monitoring such as heart rate, blood pressure, pulse oximetry, urine output and mental status. Persistent hypotension and hypoperfusion that is refractory to fluid resuscitation may require the use of vasoactive drugs. Hemodynamic monitoring may be necessary to detect ongoing deficits in systemic perfusion and oxygenation and to guide further resuscitation, so early consultation and transfer to an intensive care unit is advised. It is essential to remember that fluid resuscitation is the primary treatment for hypotension in sepsis and adequate fluid resuscitation should be attempted prior to introduction of vasopressors or inotropes. 

**Fluid resuscitation
is the primary
treatment for
hypotension in
sepsis.**

For references or more information,
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