



FLUID ADMINISTRATION PATTERNS AND OUTCOMES IN PATIENTS WITH SEPTIC SHOCK ADMITTED FROM EMERGENCY DEPARTMENT

Medicine

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ABSTRACT

INTRODUCTION: Traditional teaching suggests aggressive initial fluid resuscitation in patients with sepsis and septic shock. Surviving sepsis guidelines recommends aggressive fluid resuscitation in first 24 hours of admission and 30ml/kg of fluid bolus in first 3 hours of identification of septic shock. However recent literature suggests worsened clinical outcomes particularly with respect to kidney function and overall increased mortality with aggressive fluid resuscitation. In this context we performed a study in our centre to look into fluid resuscitation patterns and subsequent outcomes. **MATERIALS AND METHODS:** We performed retrospective chart review of patients admitted from emergency department to intensive care unit who were diagnosed septic shock(n=101). The definitions of sepsis and septic shock were accordance with SEPSIS-3 international consensus definition. **RESULTS AND CONCLUSION:** In a study conducted in our institute on outcomes of fluid resuscitation in septic shock, We found patients with larger volume resuscitation and higher cumulative balance were at higher risk for acute kidney injury and longer duration of ICU stay. We are planning to perform larger prospective study to test the hypothesis generated in this study.

KEYWORDS

FLUID ADMINISTRATION, SEPTIC SHOCK, EMERGENCY DEPARTMENT

INTRODUCTION

Fluids are the most widely used medication in critical care and emergency medicine departments and first line therapy for septic shock. Traditional teaching states that aggressive fluid resuscitation is a cornerstone in management of sepsis¹. Surviving sepsis guidelines recommends 30ml/kg as initial fluid bolus in patients with sepsis and septic shock. This recommendation has led to widespread use of fluid in initial phases of septic shock resuscitation and subsequent higher degree of positive fluid balance in sepsis patients. The reason to administer fluid challenge is to increase stroke volume and subsequently cardiac output, however multiple studies have shown benefit with fluid bolus is short lived and only 50% of patients will respond to fluid bolus².

Multiple recent studies have shown that conservative fluid administration is beneficial in critically ill patients compared to liberal strategy. This strategy is different from guidelines laid by the surviving sepsis campaign. We hypothesized that large volume fluid resuscitation in emergency departments leads to higher subsequent positive fluid balance in critically ill septic patients and leads to negative outcomes.

METHODS:

Definition: Septic shock is defined based on third consensus definition on sepsis(sepsis 3) which is a state of acute circulatory failure and defined as life threatening organ dysfunction caused by dysregulated host response to infection along with vasopressor requirement and lactate levels >2mmol/lit³.

Setting: Study was performed in a tertiary care hospital in south india, retrospective chart analysis of patients who were admitted to ICU from the emergency department. Total of 101 patient charts were retrospectively analyzed. study duration is 6 months(January 2019 to June 2019)

INCLUSION CRITERIA:

Age more than 18 years presented to emergency department with septic shock.

EXCLUSION CRITERIA:

Patients who cannot tolerate large fluid boluses(eg: Chronic kidney disease patients who were on maintenance hemodialysis)

RESULTS AND DISCUSSION:

We analyzed a total of 101 patient charts over a period of 6 months. Community acquired pneumonia is the most common clinical

condition(32%), followed by Urosepsis(28%). We analyzed patients with definitive diagnosis of mentioned clinical conditions either by radiological or laboratory or culture positivity. Dengue shock syndrome is a type of vasodilatory shock, initial presentation of dengue shock syndrome is similar to septic shock.

Table 1:

Clinical condition	Prevalence
Community acquired pneumonia	32%
Urosepsis(including pyelonephritis)	28%
Dengue shock syndrome	20%
Intraabdominal sepsis	10%
Cellulitis	10%

Mean age of patient population is 47.8±18 years, our study population is relatively younger and predominantly female sex (55%). Most commonly encountered co morbidity is diabetes mellitus, followed by hypertension. Total number of patients on mechanical ventilator were 31(30%) and total number of deaths were 10(10%)

Table 2: Demographic variables

Variable	
Age(years)	47.8±18
Sex(female)	55%
Diabetes mellitus	32%
Hypertension	20%
Coronary artery disease	16%
Chronic obstructive pulmonary disease	10%
Malignancy	10%
Mechanical ventilation(number)	31
Renal replacement therapy(number)	21
Death(number)	10

We hypothesized that larger fluid boluses in the emergency department leads to higher subsequent positive fluid balance. We analyzed fluid balance of patients and renal function at 48 hours. Mean IV fluid given in the emergency department is 1584±300ml, We divided patients into two cohorts based on fluid balance at the end of 48 hours. Mean IV fluid received in the group with more than 4litres positive balance was 1400±100 Vs 1100±100 in patients who have fluid balance less than 4litres at 48 hours, which is significant(p=0.001).

Similarly mean increase in creatinine value(Δcreatinine) in patients with less than 4litres fluid balance is 0.5 vs 0.9 in patients with fluid balance greater than 4litres.

Table 3: Characteristics of patients in two subgroups.

	Fluid balance <4litres at 48 hours(n=39)	Fluid balance>4 litres at 48 hours(n=62)
Mean ED fluid(ml)	1200±100	1400±100
Increase in creatinine(Δcreatinine)	0.5	0.9
Renal replacement therapy(number)	5	16
Mechanical ventilation (number of patients)	6	25
Mechanical ventilation(days)	5	7.5
Death(number)	1	9

Number of patients who underwent renal replacement therapy is lower in patients with less positive fluid balance(5 vs 16) compared to patients with more positive fluid balance and similar results were seen in number of patients who received mechanical ventilation($p<0.001$) and number of ventilator days($p=0.001$)

In the study done by rivers et al⁴, in 2001, a protocol based fluid management strategy called early goal directed therapy (EGDT) reduced mortality and this formed basis for large volume resuscitation in initial phases of sepsis and septic shock, recently similar trials(ProCESS⁵, ARISE⁶, ProMISE⁷) showed no improvement in mortality with EGDT. It was also shown recently in a large meta analysis that EGDT is potentially harmful⁸.

Maitland et al⁹, performed a study on African paediatric population and found that fluid boluses in the emergency department (either saline or albumin) leads to higher mortality and morbidity at 48 hours. Even though the study was performed in resource limited setup, results showed the harm of large volume fluid resuscitation.

Marik et al¹⁰, performed a large study on fluid administration in sepsis and septic shock based on discharge registry database. They found mortality of 25.3% across all subgroups they studied. Study also showed higher mortality and more ventilator days when volume resuscitation crossed more than 5 litres. Compared to our study, mortality was higher in the above study, Probably because of the younger age group and lower volume of fluids given in the emergency department.

One potential limitation of our study is excluding patients with compensated sepsis with out shock and fluid administration patterns in those patients was not studied. Type of fluid (balanced crystalloids or Saline) was a topic of debate in recent times. Multiple recent trials like SALT-ED¹¹, SMART¹² showed reduced mortality and less kidney injury when treated with balanced crystalloids. We did not analyse the data on the type of fluid used in our study because most patients received both the type of fluids(balanced solutions and saline).

We also noticed that despite lower volume of fluid resuscitation in emergency department, overall positive fluid balance at 48 hours is high emphasis should be laid on early de-resuscitation whenever feasible and we also concluded ROSE strategy¹³ for fluid stewardship should be aggressively implemented in our hospital.

CONCLUSIONS:

We concluded that average fluid used in emergency department for septic shock is less than standard surviving sepsis guidelines and we also noticed that positive fluid balance (>4litres) results in longer ICU Stay, higher mortality and worse renal outcomes. We are planning larger prospective study in our setup on volume and type of fluid used in sepsis resuscitation.

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