



# Hidden fluids in critical care patients

Susan E. Smith, PharmD, BCPS, BCCP; Rebecca Phan, Pharm.D. Candidate;  
on behalf of the UGA Critical Care Collaborative (UGA C3)

## BACKGROUND

- Intravenous fluid therapy is one of the most common interventions in the intensive care unit (ICU).
- Excessive fluid administration resulting in fluid overload is associated with organ failure and increased mortality.
- Hidden fluids are defined as fluids not used for resuscitation or maintenance therapy (i.e. medications, blood products, enteral nutrition).
- **Purpose:** Describe the contribution of hidden fluids to total fluid intake in the ICU.
- **Hypothesis:** Hidden fluid volume will increase while maintenance and resuscitation fluids decrease as length of stay in the ICU increases.

## OUTCOMES

### Primary

- Percentage of hidden fluids contributing to total fluid intake

### Secondary

- Types of fluids contributing to hidden fluids

## STUDY DESIGN

- **Design:** IRB-approved, retrospective cohort
- **Time Frame:** January 2017 through April 2018
- **Setting:** 350-bed community teaching hospital
- **Inclusion Criteria:**
  - Non-pregnant adults admitted to mixed medical/surgical ICU for  $\geq 72$  hours
- **Exclusion Criteria:**
  - Receiving TPN
  - End stage renal disease
  - Do not intubate/resuscitate status on admission
  - Transferred from an outside institution
  - Specific indication for IVF (e.g. diabetic ketoacidosis)
- **Statistical Plan:**
  - Descriptive analyses were used for all outcomes

## RESULTS

Figure 1. Patient Enrollment

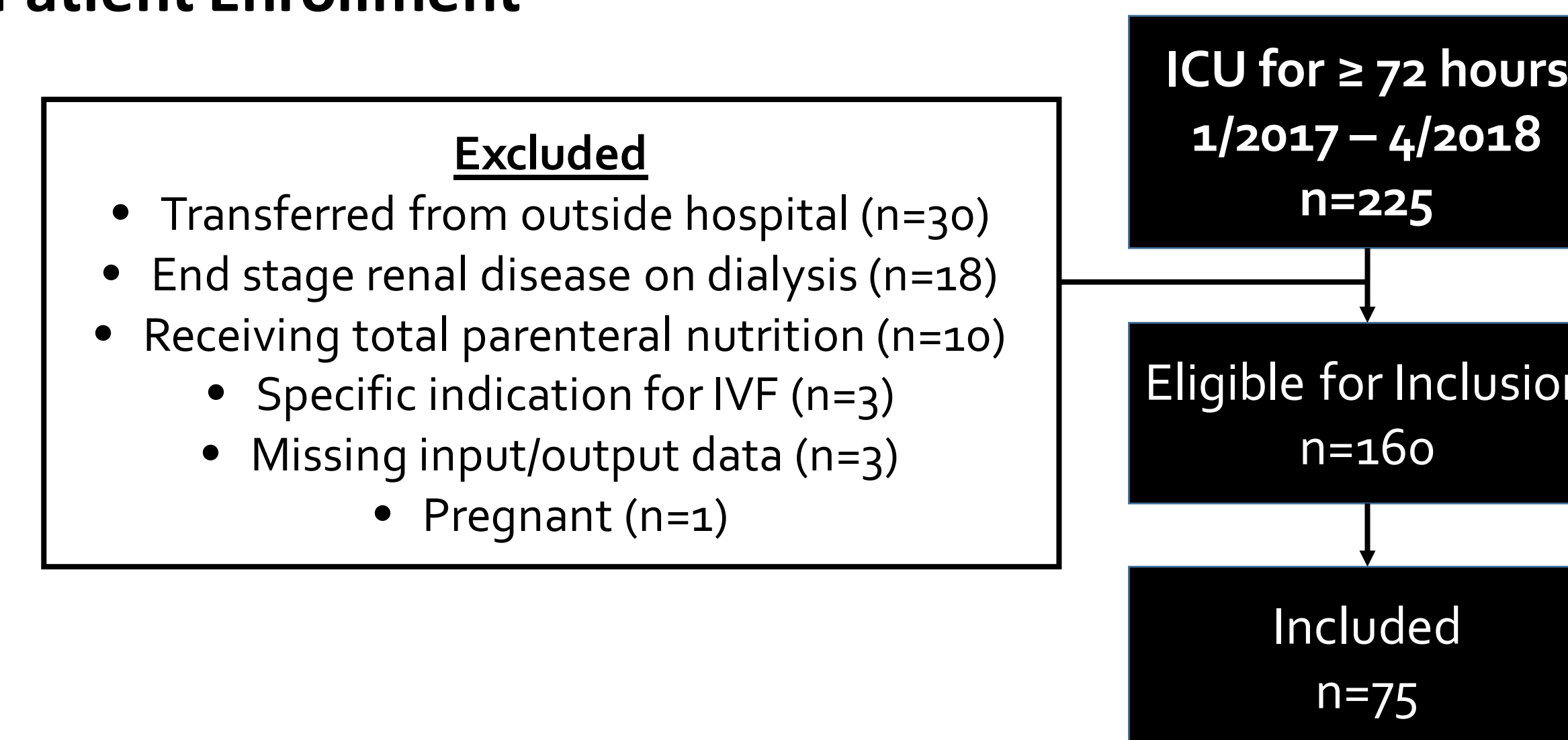


Table 1. Baseline Characteristics

	n=75
Male	41 (55%)
Age, years	64 (52 – 71)
Caucasian Race	12 (48%)
African American Race	26 (35%)
Body Mass Index, kg/m <sup>2</sup>	27 (22 – 33)
Weight, kg	77 (63-92)
Medical ICU	65 (87%)
SOFA score	6 (4-8)

All values presented as Number (%) or Median (Interquartile Range)

Figure 2. Day 1, 2, and 3 ICU Fluid Intake

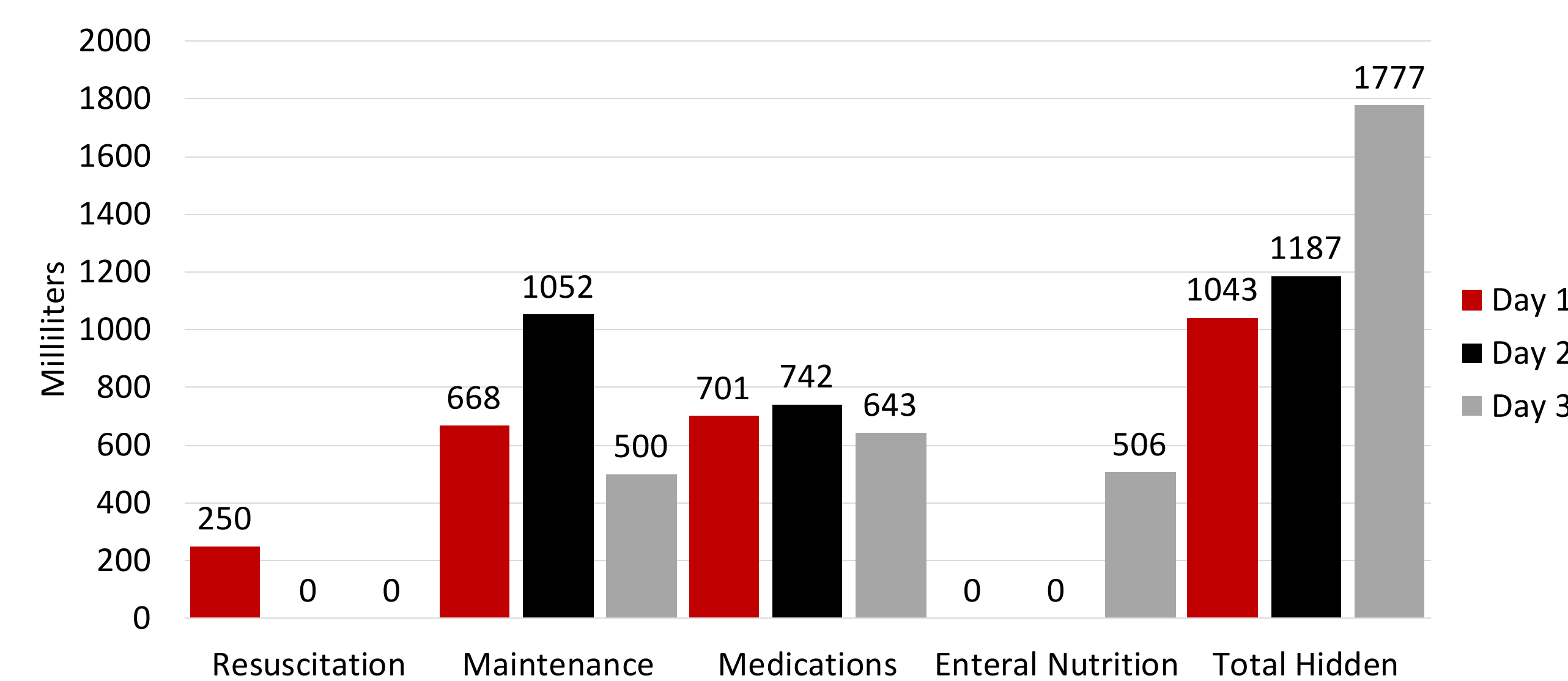
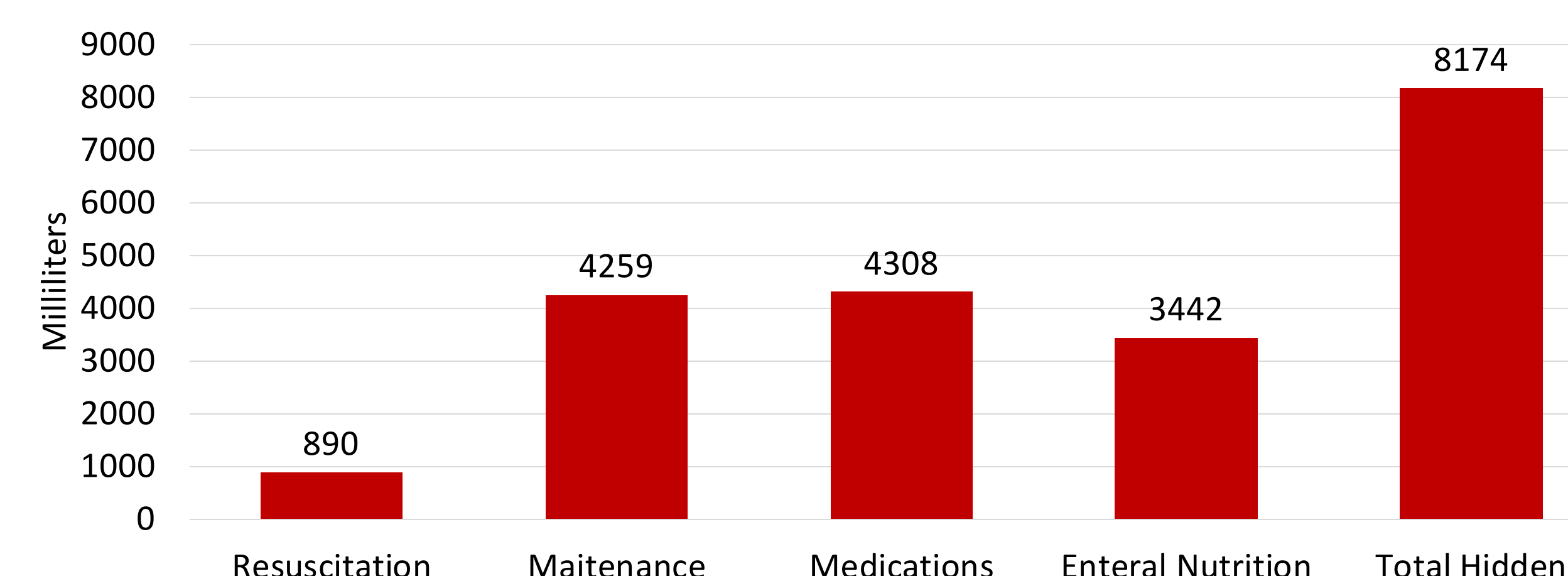


Figure 3. Cumulative ICU Fluid Intake



## RESULTS CONTINUED

Figure 4. Median Contribution of Hidden Fluids

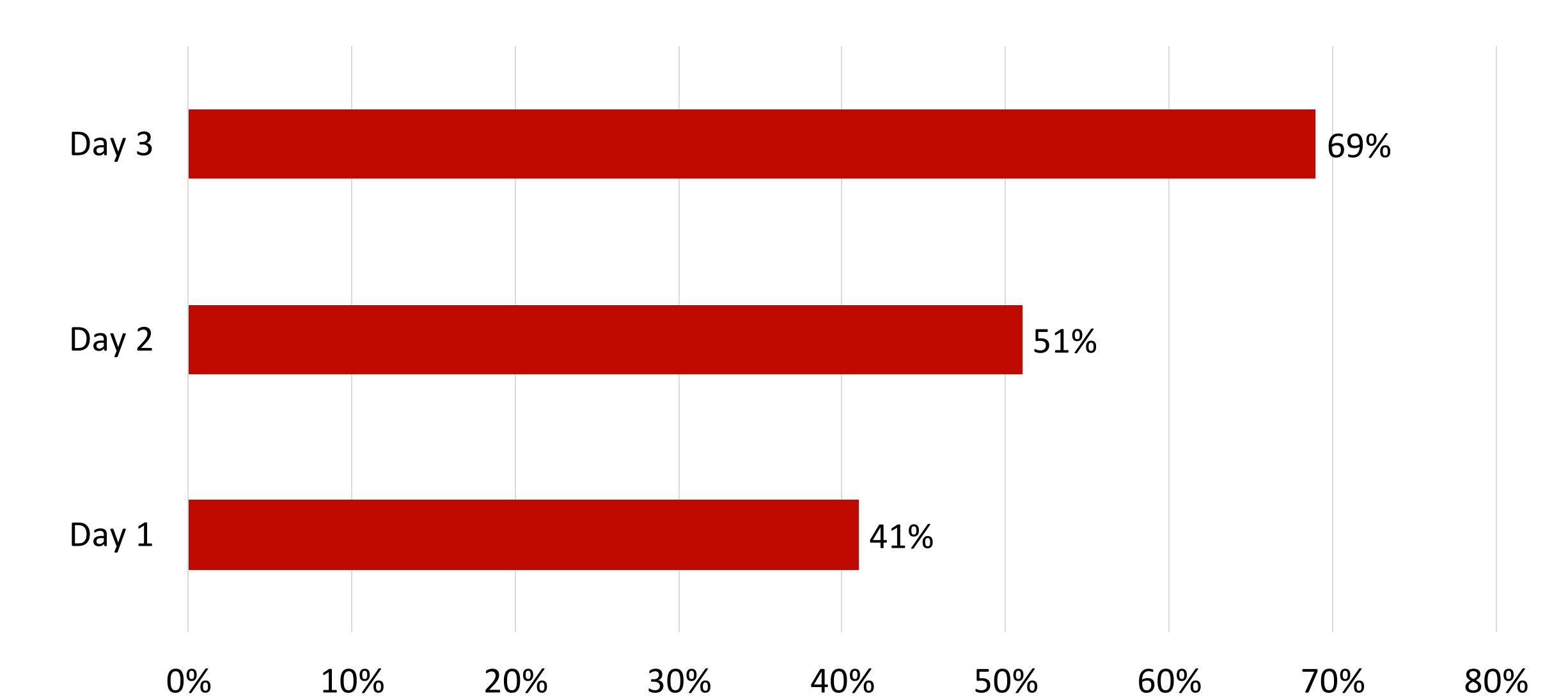


Table 2. Clinical Outcomes

	n=75
Mechanical Ventilation	43 (57%)
Ventilator-Free Days	21 (6 – 24)
ICU Length of Stay	7 (5 – 11)
Hospital Length of Stay	13 (8 – 18)
New Onset A-fib	9 (12%)
New Renal Replacement Therapy	1 (1%)
ICU Mortality	7 (9%)
Hospital Mortality	11 (15%)

All values presented as Number (%) or Median (Interquartile Range)

## CONCLUSIONS

- Hidden fluids were the major contributor to total fluid intake in the ICU.
- Increased fluid intake due to hidden fluids was associated with prolonged mechanical ventilation.
- Medications made up a significant portion of hidden fluids; therefore medication volumes should be closely monitored.
- This study was limited by its retrospective design and the inability to capture all hidden fluids (e.g. intravenous flushes)

## REFERENCES

- Fraze E, Kashani K. Fluid Management for Critically Ill Patients: A Review of the Current State of Fluid Therapy in the Intensive Care Unit. *Kidney Dis (Basel)*. 2016;2(2):64-71.
- Bashir, Muhammad Umair, et al. Hidden Obligatory Fluid Intake in Critical Care Patients. *Journal of Intensive Care Medicine*. Jan 2016;32(3):223-227.