



Research Week 2020

Fluid Creep in the PICU: Characterizing Fluid Administration Beyond Maintenance Fluids

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Abstract

Critically ill children receive fluids for multiple reasons including resuscitation, nutrition, and medications. However, while it is well established that fluid overload is associated with negative outcomes in critical care, it is challenging for clinicians to consider all fluid sources and adjust accordingly. "Fluid creep" refers to insidious IV fluid intake (medications, flushes, etc.) in excess of standard predicted maintenance fluid requirements (MFR). This phenomenon has been previously described in burn patients and adults, but is less clear among pediatric patients. We aimed to quantify fluids administered to patients admitted to a quaternary Pediatric Intensive Care Unit (PICU) in comparison to predicted MFR in order to quantify the association between fluid creep (FC) and fluid overload.

Analysis included EHR-derived data from all PICU patients admitted between 2010-2019 and limited to the first 120 hours of PICU stay. Fluid volumes were indexed to patient weight and categorized by type. IV fluids were deemed "resuscitation" if administered at $\geq 10\text{mL/kg/hr}$. The Holliday-Segar method was used to estimate MFR. FC was defined as non-resuscitation IV fluid in excess of MFR. Fluid overload (FO) was defined as $\geq 100\text{mL/kg}(10\%)$ in cumulative fluid balance. A logistic regression model was used to test for association between FC and FO.

The study included 14176 admissions by 10119 distinct patients (Table 1). Average daily fluid intake was $97.9\text{mL/Kg}(SD=75)$ of which $6.4\text{mL/Kg}(6.5\%)$ was resuscitation and $36.0\text{mL/Kg}(37\%)$ was enteral. Average FC on Day 1 was $23.4\text{mL/Kg}(SD=31)$, and FC represented 21% of all fluid intake through Day 5. FO was present at some point in 16% of admissions. Day 1 FC (per mL/Kg) was associated with increased odds of FO (OR 0.0237, 95%CI 0.022-0.025, $p<0.001$).

FC is a significant component of overall fluid intake and increased FC early in the PICU stay is associated with FO. Further analysis will evaluate potential confounding variables and clinical applications.

