

# Heparin Versus Normal Saline: Flushing Effectiveness in Managing Central Venous Catheters in Pediatric Patients With Cancer

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**BACKGROUND:** There is insufficient evidence of the effects of intermittent flushing with normal saline versus heparin to prevent occlusion or increased alteplase use in pediatric patients with central venous catheters.

**OBJECTIVES:** The primary objective was to evaluate the effectiveness of a new standard flushing practice in the management of central venous access devices in pediatric patients with cancer. A secondary objective was to assess the cost of heparin flushing supplies to patients and financial impact.

**METHODS:** New flushing guidelines included tunneled lines flushed with saline in the push-pause method twice daily in the inpatient setting. The outpatient setting required saline lock while receiving care and heparin lock on discharge. Alteplase usage was monitored for five months in all pediatric patients with cancer who had tunneled central lines.

**FINDINGS:** There was no statistically significant difference in alteplase usage rate pre- to postimplementation. A formal flushing guideline was recommended using saline and lower heparin concentrations for tunneled catheters.

## KEYWORDS

central venous catheters; pediatric patients with cancer; heparin; normal saline

## DIGITAL OBJECT IDENTIFIER

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**CENTRAL VENOUS CATHETERS (CVCs) ARE USED EXTENSIVELY** in health care to deliver long-term IV therapy while caring for children with cancer (Da Costa et al., 2019). These vascular devices are inserted for numerous indications, such as the need for total parenteral nutrition, chemotherapy, and blood product infusions (Anttila, 2018). Commonly used CVCs include tunneled central venous catheters with single- and double-lumen catheters or implanted ports (Flick & Winters, 2021). Adequate CVC patency without catheter occlusions must be present to allow for fluid infusions and blood draws (Da Costa et al., 2019). If an occlusion occurs, alteplase is administered. Alteplase administration through long-term CVCs displayed effectiveness in treating thrombus-related obstructive events in pediatric patients with cancer (Da Costa et al., 2019). The CVC may also require removal because of an occlusion (Da Costa et al., 2019).

Traditionally, heparin flushing has been the most common flushing solution used to maintain catheter patency in CVCs (De Oliveira et al., 2020). Flushing with heparin is performed according to agency policy because flushing recommendations vary regarding product guidelines, frequency, and dosage used to flush CVCs (Infusion Nurses Society, 2021). However, recent studies within the adult population have suggested that flushing CVCs with normal saline may be as effective as flushing with heparin (Infusion Nurses Society, 2021). A systematic review and meta-analysis found that flushing CVCs with heparin in adult patients does not have more favorable effects than flushing with normal saline (Sharma et al., 2019). Another systematic review and meta-analysis reinforced that heparin is not superior to normal saline (Zhong et al., 2017). In addition, multiple studies have reported that flushing with normal saline does not significantly affect the safety of CVCs in comparison to flushing with heparin within the adult population (López-Briz et al., 2018).

Although support is abundant within the literature regarding the safety and effectiveness of flushing CVCs with heparin and normal saline solutions within the adult patient population, more evidence is needed within the pediatric patient population (Bradford et al., 2020). Within the project time frame, literature searches yielded only two results relevant to the pediatric population, with one of the results being outdated. This outdated prospective