

# Central Line Patency: Management With Normal Saline Flushes for Adult Patients With Cancer

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**BACKGROUND:** Central venous catheter (CVC) maintenance is critical in administering chemotherapy, transfusions, and high-frequency laboratory draws. Although normal saline (NS) flushes have been associated with similar incidences of irreversible port occlusions as heparin among adult patients with cancer and ports, additional research is needed regarding NS efficacy in other central line maintenance within large populations with cancer.

**OBJECTIVES:** The aim of this study was to analyze changes in reported CVC line patency via tissue plasminogen activator (tPA) administration rates in ports and other central lines because of an institutional switch from heparin to NS as preferred flushes in adult ambulatory patients with cancer.

**METHODS:** Retrospective data were collected from patients with ports (3,706 prepolicy, 3,402 postpolicy) and nonport CVCs (816 prepolicy, 694 postpolicy).

**FINDINGS:** Patients with nonport CVCs experienced similar tPA usage pre- versus postpolicy, versus an increased rate of tPA usage for ports. This policy resulted in institutional savings of \$28,695.92. NS flushes are as effective as heparin for maintaining patency in ports and other CVCs for adult outpatients with cancer and address safety concerns with heparin-associated complications.

## KEYWORDS

central venous catheter; flush; normal saline; heparin; alteplase; catheter occlusion

## DIGITAL OBJECT IDENTIFIER

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**MULTIPLE SYSTEMATIC REVIEWS AND RETROSPECTIVE STUDIES** have suggested that normal saline (NS) is noninferior to heparin to ensure central line patency consistently with ports (Egnatios & Gloria, 2021; Klein et al., 2018; Regina de Silva et al., 2021; Zhong et al., 2017). Findings from these studies supported recommendations from a European Society for Medical Oncology guideline to routinely flush lines with NS (Sousa et al., 2015). Use of NS rather than heparin flushes eliminates the risk of hypersensitivity reactions to heparin, heparin-induced thrombocytopenia, and bleeding, in addition to potentially reducing cost (Fernandes Bel Homo & Fernandes Costa Lima, 2018; Sharma et al., 2019).

Adults receiving outpatient oncology standard-of-care treatments present unique challenges, such as less frequent line monitoring and longer catheter life spans. However, the incidence of irreversible port occlusion has been suggested to be similar in adult populations of patients with cancer with the use of NS flushes for implanted ports compared to that of heparin flushes (Klein et al., 2018). These end points have not been validated for patency of other central lines in large populations of patients with cancer. Literature suggests that flushing technique is critical in reducing the incidence of line-associated complications (Boord, 2019) rather than the use of heparin, which is, in part, because of its short half-life of one to two hours (Cullinane, 2019).

Multiple safety events occurred at Fred Hutchinson Cancer Center (FHCC) in Seattle, Washington, during which patients with documented allergies to heparin unintentionally received heparin flushes for line maintenance. Further characterization of this with data from December 2017 through May 2018 revealed a 2.6% incidence (79 of 2,985 patients) of heparin flush administration despite documented heparin allergies. Multiple interventions were established to prevent future similar occurrences. These included educating staff to check allergies prior to flushing, reporting heparin allergies in handoffs to other RNs, and implementing heparin standing orders, which would alert staff to allergies via electronic health record pop-ups during the order entry process. It was found that flushing with heparin was ingrained into central venous catheter (CVC) maintenance practice and was the first action performed by staff in the laboratory or clinics, sometimes without reviewing the chart for allergies. This National Cancer Institute–designated cancer center made the decision to switch from heparin to NS flushes for CVC maintenance to improve patient safety.