# Most Effective Peripheral IV Catheter-Replacement Method to Decrease Rates of Phlebitis in Medical/Surgical Patients

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## Introduction

Peripheral IV catheters are changed every 72–96 hours as recommended by the Centers for Disease Control (CDC) to prevent complications of peripheral IV such as phlebitis. Changing the peripheral IV catheters at a fixed time interval is called routine replacement—this is the current practice at most hospitals in the United States. Another type of replacement method for changing peripheral IV catheters is called clinically indicated replacement, where the IV is changed if there are clinical signs of complications developing. Clinical signs that would require attention include pain, erythema, leakage, swelling, palpable venous cord, infiltration, blockage or air emboli. Clinically indicated replacement is more affordable than routine replacement because the IV is changed less frequently. The average cost of a peripheral IV catheter insertion in the United States is between $28 and $35 (Helm et. al., 2015). With repeated insertions, the cost increases. In addition, repeated insertions can be uncomfortable for the patient; therefore, clinically indicated replacement increases patient satisfaction by reducing insertions. Our study attempts to determine if clinically indicated replacement is more effective at decreasing the incidence of phlebitis in medical/surgical patients.

## Background and Significance

Phlebitis is an inflammation of the vein that can be categorized as mechanical, chemical, or bacterial. Phlebitis is characterized clinically by a reddened, warm area around the insertion site or along the path of the vein, pain or tenderness at the site or along the vein, and swelling. Two of the above types of phlebitis often occur together. Chemical phlebitis occurs from irritating medication or solution, rapid infusion, and medication incompatibilities (Hinkle, 2014, p. 282). Mechanical phlebitis results from long periods of cannulation, catheters in flexed areas,

gauges larger than the vein lumen, and poorly secured catheters. Bacterial phlebitis results from poor hand hygiene, lack of aseptic technique, failure to check all equipment before use, and failure to recognize early signs and symptoms of phlebitis (Hinkle, 2014, p. 282).

Management of phlebitis includes stopping the infusion at the first sign of pain or redness, removing the peripheral IV catheter, applying warm or moist compresses to the area, elevation of the affected limb and applying an anti-inflammatory agent to the area. Anti-inflammatory analgesics can be prescribed to treat both the inflammation and the pain associated with phlebitis (Hinkle, 2014, p. 282). Bacterial phlebitis can be prevented by proper hand washing and aseptic technique before catheter insertion. Mechanical phlebitis can be avoided by selecting the smallest possible device for the largest vessel. Early recognition will enable prompt intervention, so frequent inspection of IV catheters is necessary for both prevention and treatment (Hinkle, 2014, p. 282).

Phlebitis is a common occurrence in the hospital setting and can lead to serious complications. One study found that 1.25 percent of patients with peripheral IV catheters contract phlebitis (Urbanetto et. al, 2016). A large number of inpatients receive peripheral IV therapy for medications, hydration fluids, blood products, and nutritional supplements, making the incidence of phlebitis high (Frank, 2016). Phlebitis can have serious implications; complications of phlebitis include local infection and abscess formation, clot formation, and progression to deep-vein thrombosis and pulmonary embolism (Nabili, 2016).

The Centers for Disease Control's official policy on peripheral IV catheters is to change the catheter every 72–96 hours to prevent phlebitis (Centers for Disease Control, 2011). The CDC cites several articles to support its policy. The Centers for Disease Control's official position on clinically indicated replacement in the Guidelines for the Prevention of Intravascular

Catheter-Related Infections 2011 is that it is an unresolved problem. The CDC has referenced three strong research studies in favor of clinically indicated replacement in the Guidelines for the Prevention of Intravascular Catheter-Related Infections 2011. The current CDC policy does suggest that IV sites be assessed periodically; however, they fail to establish an allotted time for the assessment of IV catheters (Centers for Disease Control, 2011).

**Synthesis of the current evidence**

In a randomized trial, Webster, Clarke, Paterson, Hutton, Dyk, Gale & Hopkins (2008) found that there was not a statistically significant difference in rates of phlebitis and infiltration between clinically indicated replacement and routine replacement. The study was comprised of 755 medical/surgical patients and was divided into a control and an intervention group: 379 allocated to catheter replacement only when clinically indicated and 376 allocated to routine care of catheter (control group). Catheters were removed because of phlebitis or infiltration from 123 of 376 (33 percent) patients in the routine-replacement group compared with 143 of 379 (38 percent) patients in the clinically indicated replacement group; the difference was not significant. This study does not accurately test phlebitis because phlebitis and infiltration are aggregated as one variable as opposed to two variables (Webster, Clarke, Paterson, Hutton, Dyk, Gale, & Hopkins, 2008).

Webster, Osborne, Rickard, & New (2015) found that there was a statistically insignificant difference between routine replacement and clinically indicated replacement for peripheral IV catheters. A randomized control trial compared routine and clinically indicated removal of peripheral IV catheters in patients receiving continuous infusions. The study was limited to patients who required a peripheral IV catheter for at least three days of continuous

therapy. Phlebitis was assessed in six trials and showed a nonsignificant increase in the clinically indicated group—9 percent clinically indicated vs. 7.2 percent routine. (Webster, Osborne, Rickard, & New, 2015).

Van Donk, Rickard, McGrail, & Doolan (2009) found that the rate of phlebitis and occlusion with peripheral IVs showed no significant difference in a clinically indicated replacement group vs. a routine replacement group. They conducted a randomized controlled trial to test routine replacement in community-based "hospital in the home" patients without the use of specialized IV teams. The study revealed that the rate of phlebitis and/or occlusion at 96 hours was 23.4 percent (74 of 316 IVs), which was identical to the rate of phlebitis and/or occlusion associated with the 111 IVs used beyond 96 hours (P = .99). This is another study that does not accurately test phlebitis, because phlebitis and occlusion are aggregated into one variable (Van Donk, Rickard, McGrail, & Doolan, 2009).

All the evidence points to a lack of a significant difference between clinically indicated replacement and routine replacement. Therefore, it is reasonable to change the replacement method from routine replacement to clinically indicated replacement in order to decrease costs associated with changing peripheral IV catheters. However, more research is needed on this issue to further substantiate claims that the difference in rates of phlebitis between clinically indicated replacement and routine replacement are insignificant. Also, further research on the cost effectiveness of clinically indicated replacement is also needed. Our research proposal is based on these two gaps in research.

**Proposed intervention**

The proposed intervention is to change the peripheral IV catheter when there are early signs of complications such as phlebitis or infiltration.

**Plan for Implementation**

The intervention will be implemented as a pilot study with two groups—one control group (routine replacement) and one experimental group (clinically indicated replacement) on two similar medical/surgical units. In the experimental and control group, nurses would assess the site each shift and prior to medication administration. In the experimental group, peripheral IV catheters will be replaced only if there are signs and symptoms of peripheral IV catheter complications developing, such as phlebitis or infiltration. The control group would replace the peripheral IV catheter every 72–96 hours, and if there are signs and symptoms of peripheral IV catheter complications developing. A cost analysis comparing the total cost of routine replacement to clinically indicated replacement per capita will also be implemented. Data from this experiment will be collected over a period of six months.

**Criteria for Evaluation**

The outcome that is being evaluated is the incidence of phlebitis. The clinical indicator that is being used to evaluate the outcome is the widely used phlebitis scale. The phlebitis scale is graded from 0–4. Grade 0 representing no symptoms, while Grade 1 is presence of erythema at access site with or without pain. Grade 2 is presence of pain at the access site with erythema. Grade 3 is pain at access site with erythema, streak formation, and palpable venous cord. Grade 4 is pain at access site with erythema, streak formation, palpable venous cord, greater than one

inch in length and purulent drainage (Hinkle, 2014, p. 282). A hypothesis test will be performed between the two groups after six months to determine if there was a statistically significant difference between the groups' rates of phlebitis.

## Conclusion

The review of literature currently does not show a significant difference between the rates of phlebitis between clinically indicated replacement and routine replacement. In conclusion, we recommend that hospitals switch their replacement policy of peripheral IV catheters to clinically indicated replacement to decrease costs associated with replacement of peripheral IV catheters. Research suggest that no additional harm from phlebitis will occur from using clinically indicated replacement rather than routine replacement. A research proposal was formulated in this paper that could further substantiate this claim. Clinically indicated replacement increases patient satisfaction and decreases cost without posing a greater risk to the patient in terms of phlebitis.

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