THE CLINICAL QUESTION

What is the difference between I.V. administration sets used for continuous infusion and those used for intermittent infusion?

Is it safe to disconnect and reconnect a continuous administration set to allow for patient activities?

BACKGROUND

In 1971 a nationwide outbreak of infection was traced to contaminated I.V. fluids, causing the Centers for Disease Control to issue the first set of guidelines for prevention of bloodstream infections from intravenous catheters. Those guidelines recommended the change of I.V. administration sets every 24 hours. It was proven that the type of closure on the glass I.V. bottles caused the contamination. Since that period, the use of I.V. administration sets for continuous infusion has been extended to at least 96 hours with some studies supporting use for 7 days. This is based on the concept that infusate and set contamination can lead to bloodstream infection.
Practice changes over the past 40 years include:

- Increasing complexity of infusion therapy in hospitalized patients with greater numbers of intermittent infusions
- Increased use of rate control with electronic infusion pumps, often requiring a set dedicated to that pump only
- More hospitalized patients receiving infusion therapy
- More types of peripheral and central vascular access devices
- Greater workload for nursing staff due to the increased number of patients with higher acuity

Microorganisms causing catheter-related bloodstream infections (CRBSI) come from 4 sources:

- Skin of the patient and persons caring for the vascular access device
- VAD hub and its manipulation
- Contaminated infusates
- Hematogenous seeding from other sites of infection

Extreme efforts have focused on reducing the risk of CRBSI with the greatest intensity addressing central vascular access device (CVAD) insertion procedures. Tremendous reduction in CRBSI resulted from these efforts, however the problem is not totally solved. Len Mermel, a well-known epidemiologist, states, “CRBSI arising from an intraluminal source reflects a breach in aseptic technique when manipulating catheter hubs, caps, connectors, or stopcocks, or contamination of the infusate itself.”¹ Since 1975, there has been concern about the role of the junction between the catheter hub and the administration set and its relationship to causing CRBSI.²

It is difficult, if not impossible, to determine the actual source of organisms that produce CRBSI in each patient. Evidence shows that VADs dwelling for a short period (i.e., 7-10 days) have a greater risk of CRBSI from the
extraluminal source while longer dwell times mean an increasing risk from intraluminal sources such as the VAD hub and its manipulation. If the goal is to reach zero infections, we must focus equally on aseptic management of the VAD hub and that must include management of the administration sets attached to the VAD hub.

A survey of nurses about their practices with intermittent administration sets asked questions about routine disconnection of continuous administration sets. Disconnection was practiced by 62% of nurses. The most common reasons for disconnection were allowing time for patients to shower, ambulate, and eat, plus allowing children time to play. Less common reasons included transportation to other departments within the hospital, removal of the infusion pump for magnetic resonance imaging, and evaluating problems with the VAD. More than 75% reported no hospital policy to address this practice. Periods of time for fluid absence ranged from a few minutes to an indefinite length of time. This survey was published in 2007 and there is no update to reveal how practice has changed over the past 10 years.  

DEFINITIONS

Continuous infusion – the uninterrupted infusion of I.V. fluids with or without added electrolytes or medications over several days, weeks, or months.

Intermittent infusion – the infusion of I.V. medications over short periods of time (e.g., 30, 60, or 120 minutes) and repeated at intervals of several hours (e.g. every 4, 6, 8, 12, or 24 hours). Intermittent infusion sets may be attached to injection ports on the continuous administration set or directly to the VAD hub.
Sterile administration set components – the internal fluid pathway and both ends of all administration sets covered by a cap – the spike that is inserted into the fluid container and the male luer end attached to a female end of another set or VAD hub.

EVIDENCE

A literature search on I.V. administration sets was conducted without restriction to a time period. Crystalloid solutions were the primary infusate in the studies but some included data on parenteral nutrition. Studies assessing set use exclusively for I.V. lipids (fat emulsion) and parenteral nutrition were not included as they have special restrictions on the length of their use.

The body of evidence from 15 studies shows an increasing length of time that I.V. administration sets can be used, beginning with 24 hours and currently supporting use up to 7 days. Outcomes in these studies generally focused on infusate contamination showing no increase when the life of the set was extended.

Several points stand out in these studies:

- All studies emphasized set CHANGE, indicating the set was connected to the VAD hub at the beginning of the study period and disconnected at the end of the designated period. These studies did not report the practice of disconnection and reconnection with one exception. A Canadian study in neonates reported exclusion of data if the set had been disconnected for longer than 4 hours without a sterile gauze covering. 

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• It is clear that extending the life of the set does not increase the risk of infection from contaminated fluid or medications infusing through the set. Gillies stated, “there is good evidence that decreasing the frequency of administration set changes to an interval of 72 hours or more does not increase the risk of infusate-related BSI.”

• When the measured outcome focused on CRBSI rather than infusate-BSI, the evidence continues to support longer periods of set use up to 7 days. Gillies reported “fair evidence,” related to CRBSI. Rickard used semi-quantitative cultures of the catheter tip after removal, a process that would not identify intraluminal organisms. Simon used one positive blood culture from the CVAD plus clinical signs and symptoms of CRBSI.

• No studies included data on the length of time for administration sets used for intermittent infusions that are routinely connected and disconnected. The study by Maki, et.al, stated that small-volume infusion were given with a “150 mL minibag set and are backfilled to the proper dilution with fluid from the primary solution before administration.” This seems to be describing a secondary set for intermittent medication that is left attached to the administration set for the continuous fluid. All other studies are silent on sets used for secondary medication administration.

This evidence reveals that the current common practice of frequently disconnecting an administration set from any type of VAD receiving a continuous infusion of fluid or medication has NOT been studied. This practice is not supported by evidence and the outcomes are unknown. Unanswered questions include:

• What are reasonable indications for disconnecting continuous infusion of prescribed fluids, if any?
• What impact does the practice of disconnections and reconnections of an administration set used of continuous infusion have on the incidence of CRBSI?
• Is this disconnection practice influenced by the presence of a needleless connector attached to the VAD hub?
• What is the clinical effect of withholding the prescribed infusion on the patient’s stability and progress to meeting the plan of care?
• Do these periods of absence of the prescribed fluids result in extending the hospital length of stay and increase costs?
• What are the risks of administration set disconnections on accidental tubing misconnections to other devices?

PRACTICE RECOMMENDATIONS

1. Conduct an evaluation of nursing practices regarding these disconnection practices, toward the goal of improving surveillance rates of central line associated bloodstream infection (CLABSI).
   a. What are the nurses’ reasons for these disconnections?
   b. How long is the period of disconnection?
   c. What are the common fluids and medications involved?
   d. How is the male luer end of the disconnected set maintained while disconnected?
   e. What is done to ensure correct reconnection?
2. Involve Infection Prevention Department for input on reducing CLABSI rates.
3. Work with Risk Management to determine if any problems with tubing misconnection have occurred.
4. Involve the prescribing practitioners for their input on this practice and the periods of time when fluids and medications are not being infused.
5. Evaluate the need for a needleless connector on the VAD hub when continuous infusions are prescribed.
6. Revise policies and procedures to have the least amount of manipulation of the entire infusion system from the fluid container down to the VAD insertion site.

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7. Obtain the 2016 Infusion Therapy Standards of Practice and review the Standard on Administration Set Change to ensure that your practice is meeting this standard.

REFERENCES


