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# Implementing Zero/Neutral Displacement IV Connectors to Reduce Blood Stream Infections

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## Abstract

Catheter related blood stream infections are a major problem in the United States and account for over $225 million each year with over 1,300 infections occurring each day. By researching the most effective type of IV connector, health care providers have the ability to give the best and safest care to patients requiring IV access. Zero/neutral IV connectors may be the answer to decreasing these infections as they produce no reflux in the connector which is a breeding ground for bacteria and occlusions. In several studies, zero/neutral connectors performed better than positive and negative IV connectors when comparing both reflux and bacteria growth. By implementing zero/neutral connectors into every day practice over positive and negative connectors the number of catheter related blood stream infections can be cut down and prevent additional harm to patients.

## PICOT Statement

**Population – Any patient requiring IV access**

**Intervention – Zero/neutral displacement IV connectors**

**Comparison or Routine Method – Positive and negative displacement connectors**

**Outcome – Decreased incidence of catheter related blood stream infections**

**Time – duration of necessary IV access**

## Intervention

Implement the best zero/neutral connector design available in all inpatient and outpatient settings.

By implementing zero/neutral displacement connectors it has been proven that less blood reflux will occur after disconnection.

- This will decrease the ability for blood to accumulate in the connector creating an environment for occlusions and bacteria growth


## Background Information

Needleless connectors allow for the administration of fluids, medications, and blood into indwelling venous or arterial catheters.

- Considered the microbial gatekeeper
- Use began in 1991 to reduce the risk of needlestick injuries when accessing IV's

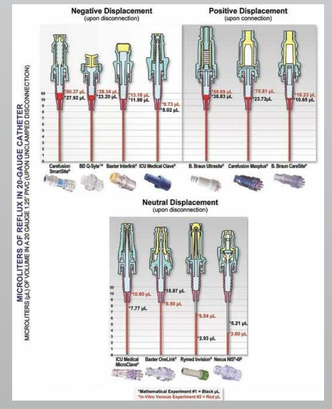
Catheter related blood stream infections (CRBSI) occur at a rate of 57 per hour.

- 1,370 per day with a 25% mortality rate
- CRBSIs cost $225 million per year and $40,000 per incident
- 200,000 ICU days per year

| | Negative Displacement Connector | Zero/Neutral Displacement Connector | Positive Displacement Connector |
|---|---|---|---|
| Fluid movement upon disconnection | Blood refluxes into catheter | No blood reflux | Fluid moves toward patient |
| Fluid movement upon connection | Fluid moves toward patient | Fluid moves toward patient | Blood refluxes into catheter |
| Manufacturer recommended clamping sequence | Clamp before disconnection | No specified clamping | Clamp after disconnection |

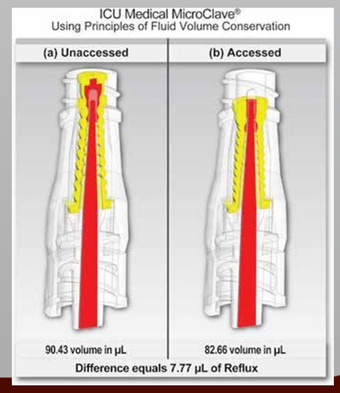
**CRBSI can be a direct result of occlusion caused by improper maintenance by health care providers.**

- **Improper clamping resulting in blood reflux can cause occlusions and a breeding ground for bacteria**
- **The minimum amount of blood to cause an occlusion or how long it takes for an occlusion to develop is unknown**
- **Current best nursing practice to prevent CRBSIs is to use proper hand hygiene, site care, flushing regimens, and adequate knowledge on their facility's connector**




**Leakage of less than 8 microliters in an unaccessed connector may seem like a miniscule amount but gives an opportunity for bacteria to enter the bloodstream and cause a potentially fatal infection.**

**In a study by Hull (2017), his team looked at reflux in 11 different connectors. The zero/neutral connectors of four different companies out performed all the negative and positive connectors in the study.**




## Outcomes

In a 2010 study by Cynthia Chernecky, she assessed the differences in the growth of colony forming units of bacteria in five different needleless connectors.

- The zero/neutral connector had the lowest number of colony forming units on average over the four days of the study

This same zero/neutral connector proved to decrease occlusion incidences in outpatient pediatric oncology patients by 84%.

When replacing positive displacement connectors with zero/neutral displacement connectors in the ICU, MICU, and SICU, the data showed a significant decrease in the number of infections per 1000 catheter days.

- ICU decreased from 3 infections to 0 in 1000 days
- MICU decreased from 7 infections to 1 in 1000 days
- SICU decreased from 8 infections to 1 in 1000 days (Chernecky & Waller, 2010)

Zero/neutral connectors have proven to decrease the incidence of infection and occlusion when implemented in critical care and outpatient areas

- By implementing the best connector in practice health care professionals can help patients keep infections at bay
- Reducing CRBSIs we can reduce medical costs, length of hospital stays, and potential harm to patients

Additionally, companies are currently testing antimicrobial connectors with chlorhexidine gluconate and/or silver impregnated into the septum.

- This allows for internal disinfection along with the external disinfection performed by nurses when manipulating the connector

## References

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