The Effectiveness of Central Venous Catheter Needleless Connectors and Protective Caps in Reducing Central Line Associated Blood Stream Infections

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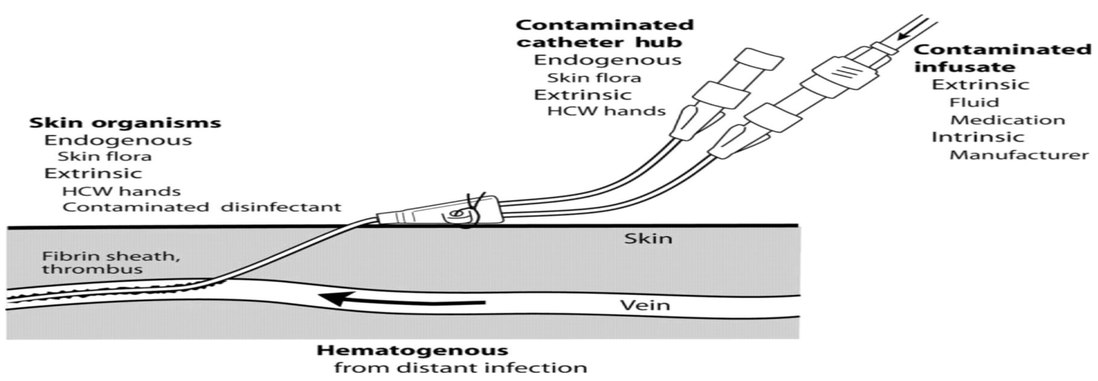
BACKGROUND

- In the U.S., the **incidence of Central Line Associated Blood Stream Infections (CLABSI) is approximately 250,000, with mortality as high as 35%, resulting in 28,000 deaths per year**.
- Complications from CLABSI are preventable; however, these complications cause a prolonged hospital length-of-stay (LOS) by up to three weeks and have an estimated cost of $16,500.00.
- Needleless connectors (NC) are placed on Central Venous Catheters (CVC) to close the system, preventing entry of microorganisms to the intraluminal surface of the CVC, and have been linked to an increase in CLABSI rates.
- Options for disinfecting NCs include scrubbing the hub with 70% alcohol, chlorhexidine, or povidone iodine; or using a NC disinfectant cap, which protects the NC when not in use.
- **The CDC and Infusion Nurses Society (INS) recommendations state the NC should be scrubbed with disinfectant; however, there is no recommendation as to the length of scrubbing time or drying time before accessing the NC.**

PURPOSE

The purpose of this review was to review the state of nursing science regarding how needleless connectors are being cared for, what protocols are being followed for scrubbing the hub, and whether the use of needleless protector caps have an impact on decreasing CLABSIs.




Split septum


Positive fluid displacement


Negative fluid displacement


Zero fluid displacement

METHOD

- A literature search was conducted using EBSCO, CINAHL, MEDLINE, PubMed, Ovid, and Google Scholar
- Key words used in the search for appropriate articles included: central line associated blood stream infection, CLABSI, central venous catheter, CVC,, needleless connectors, needleless injection ports, catheter related blood stream infections, needleless connector protector cap, needleless cap, infection, disinfection, and disinfection of needleless connectors.
- Limits included articles written in the English language that were published within the last ten years and available in full text.
- Dependent on the grouping of key words, results ranged from one to 298articles.
- 15 full text articles were evaluated for content and quality.
- Ten primary research articles were selected for the literature review.

RESULTS

- Of the three types of NCs studied, the zero fluid displacement NC was found to have a **significant decrease** ($p < .0001$) in CLABSI rates, when used in conjunction with an alcohol-impregnated port protector cap ($p = .03$); the split septum negative fluid displacement NC with a clip on protector cap was effective in preventing intraluminal bacterial contamination ($p = .04$); **there was no difference in CLABSIs using a positive fluid displacement NC ($p = .497$).**
- **Multi-lumen CVCs in place for ≥ten days were found to have a higher incidence of CLABSIs**; disinfecting the NC hub with a scrub time of ten seconds showed a significant drop rate in bacterial transfer when compared with five ($p = .002$) or eight seconds ($p = .0006$), while there was no difference when compared with 12 ($p = .239$) or 15 seconds ($p = .402$).
- Nurses lack knowledge in the different types of NCs ; **educational programs on CVC care increased nurses' knowledge and reduced CVC hub colonization and catheter-related blood stream infections in children with cancer;** two predictors of nurses intention to "scrub the hub" include their perception of peer beliefs concerning disinfection of NCs and their personal belief that the likelihood of a patient acquiring a CLABSI is increased when the NC is not disinfected before accessing the IV line.

DISCUSSION IMPLICATIONS

Findings did not detect a significant difference in CLABSI rates with the use of various NCs and/or protector caps even though there was a reduction in CLABSIs during the interventions.

Practice:

- **Nurses need structured education on the use of NCs and/or protector** caps, emphasizing strict adherence to aseptic technique when providing CVC line care.
- It is essential for healthcare providers to be current on recommendations for CVC line care and disinfecting NCs; current evidence must be used to develop strategies for "scrubbing the hub" time and drying time, and implementing the use of NC protector caps.

Research:

- **Further clinical studies, such as RCTs**, need to be conducted on the efficacy of NC protector cap use to prevent CLABSIs.
- Additional studies need to be conducted on disinfectant times required to properly scrub the hub to reduce bacterial transfer.

Policy:

- **Disinfection of catheter hubs/NCs should be incorporated into CVC policies and procedures to improve patient outcomes in regards to CLABSIs.**
- Institutions should incorporate one NC for all IV line use with clear policies and procedures on the proper use and care of the NC.

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Reference list available upon request.