Introduction

Four pathogens are responsible for 60% of intraluminal catheter-related bloodstream infections (CR-BSIs) at a cost of $225 million/year and 200,000 ICU days/year. Manufacturers of positive displacement intravenous (IV) connectors received a FDA Alert & Notification on July 2010 regarding the need to prove that positive displacement IV connectors do not cause bloodstream infections (1).

Research shows that both positive and negative displacement IV connectors are associated with CR-BSIs (2-4). Additional, negative displacement IV connectors are associated with increased occlusions that lead to a CR-BSI (7).

Theoretically, the new silver-coated and ion-engineered technologies of needless IV connectors promote antibacterial activity. However, once blood contacts the silver coating, loss of antibacterial effectiveness occurs.

Therefore, researching comparative technologies for bacterial growth patterns is necessary to refine nursing care and decrease CR-BSI incidence, particularly with immuno-compromised patients.

Purposes

1. Evaluate in-vitro differences in colony forming units (CFUs) with 4 different bacteria over 4 days using 5 different needless IV connectors: one positive, three negative and one zero displacement connector.
2. Evaluate different IV connector’s occlusion in multiple clinical settings.
3. Compare 2 antibacterial needless IV connectors: one silver coated and one with chlorhexidine/silver ion engineering, and the best non-antibacterial needless IV connector from previous research using 4 different bacteria.
4. Determine mean infection rates for ICU, MICU and SICU when changing from positive and split septum connectors to an intraluminal protection device (IPD) zero displacement connector.

Methods

An independent laboratory, Nelson Laboratories, Inc. (UT), tested the different needless IV connectors, 20 connectors of each type with 6 controls, each day for 4 days under identical laboratory conditions. Each connector was swabbed, inoculated with a minimum of $10^6$ of a pooled specimen of 4 different bacterial organisms (Staphylococcus epidermidis and aureus, Pseudomonas aeruginosa, Escherichia coli). Appropriate equipment, reagents, media and safety were employed. Repeated measures ANOVA was used to examine differences between connectors over time (level of significance = 0.05; Bonferroni post hoc testing determined specific group differences).

References


Conclusions

- RyMed Technologies InVision-Plus® (non-antibacterial) had the best overall performance at reducing the number of CFUs for all the pathological organisms compared to the other IV connectors; B-D Q-Syte™ had the worst overall performance.
- CareFusion/Medegen MaxPlus® Clear™ and ICU Medical MicroClave® were both inconsistent in the number of CFUs between growth days; Hospira Lifeshield™ TKO™/Clave® had consistently high CFU amounts.
- The silver-coated Baxter V-Link™ (antibacterial) IV connector produced up to 200 more bacteria than RyMed Technologies InVision-Plus® (non-antibacterial) and RyMed Technologies InVision-Plus® CS® with Chlorhexidine/Silver ion (antibacterial) IV connectors regardless of bacteria type. These findings demonstrate that antibacterial and non-antibacterial needless IV connectors differ on CFU counts in-vitro, which increases the probability for CR-BSIs in patients.
- The positive and negative displacement, plus the one silver-coated needless IV connectors were not effective in controlling bacterial growth. Only the RyMed Technologies InVision-Plus® CS® with Chlorhexidine/Silver ion Engineering (antibacterial) zero displacement needless IV connectors exhibited no consistent CFU counts for all 4 bacteria over all 4 days.
- The RyMed Technologies InVision-Plus® (non-antibacterial) needless IV connector in oncology clinical settings decreased occlusion rates between 20 -84% without other changes made to patient care methods.


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