

## Methods

### Background & Purpose

Peripherally inserted central catheters (PICCs) often get trimmed to achieve patient-specific length. Trimming an antimicrobial (AM) catheter leads to a distal tip with exposed surface which may lack antimicrobial protection. Present study compares antimicrobial effectiveness of a Chlorhexidine treated-PICC (CH-PICC) with trimmed tip versus intact tip.

### Results

All three replicates of CH-PICC with trimmed tips maintained similar effectiveness after 30-days as the CH-PICC with intact tips. There was no statistically significant difference between the microbial recoveries from Group B (trimmed tip) and Group C (intact tip). Average Log<sub>10</sub> reduction produced by CH-PICC with trimmed tip and CH-PICC with intact tip against *Escherichia coli* were 5.51 and 5.45 respectively; against Methicillin Resistant- *Staphylococcus aureus* were 5.44 and 5.28 respectively; and against *Candida albicans* were 4.84 and 4.68 respectively (Table 1).

Three groups of PICCs were included in the study (Figure 1) - 4.5Fr non-AM PICC (Group A), CH-PICC with trimmed tip (Group B) and CH-PICC with intact tip (Group C). Nine samples of 41cm length each from the three PICCs groups were placed in individual 58cm, 40Fr silicone tubing which was capped at both ends (Figure 2). One of the caps holding the sample in place allowed 40cm of the sample, including the tip end, exposed to the conditioning fluids. Samples were first exposed to 100% human serum for pre-conditioning for 30 minutes followed by a 30-day soak in sterile saline maintained at 37°C and shaking at 50 rpm (revolutions per minute). Saline was exchanged 3-times a week. On day 30, each pre-conditioned PICC sample was transferred to another sterile 47cm, 14 Fr silicone tube with a cap applied on the distal end of the tube holding the sample in place. Saline was replaced with nutrient broth containing approximately 10<sup>5</sup> colony forming units per milliliter (CFU/ml) of Methicillin Resistant- *Staphylococcus aureus* (MRSA), *Escherichia coli*, or *Candida albicans*. There were three samples tested against each of the three test organisms. After 24 hours, samples were transferred to another sterile 40Fr silicone tubing, and rinsed three times in sterile saline. Adherent organisms were then recovered through sonication in Dey-Engle (D/E) neutralizing media which thereafter was serially diluted, filtered, plated on D/E nutrient agar, and incubated at 37°C for 18-72 hours. Log<sub>10</sub> reductions in microbial adherence were based on the initial inoculum concentration.

**Figure 1. Test Groups**

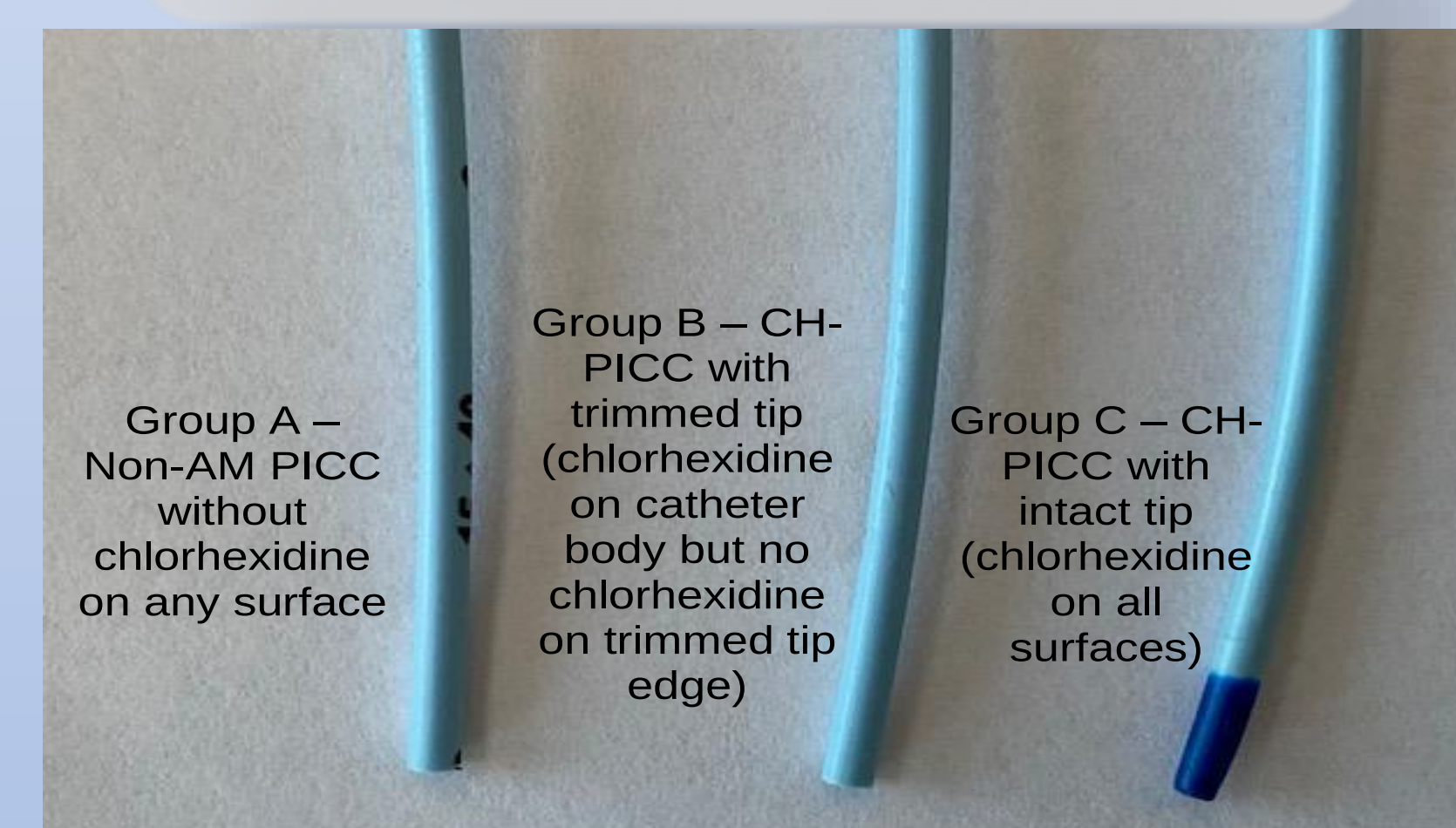


**Figure 2. Experimental set-up**

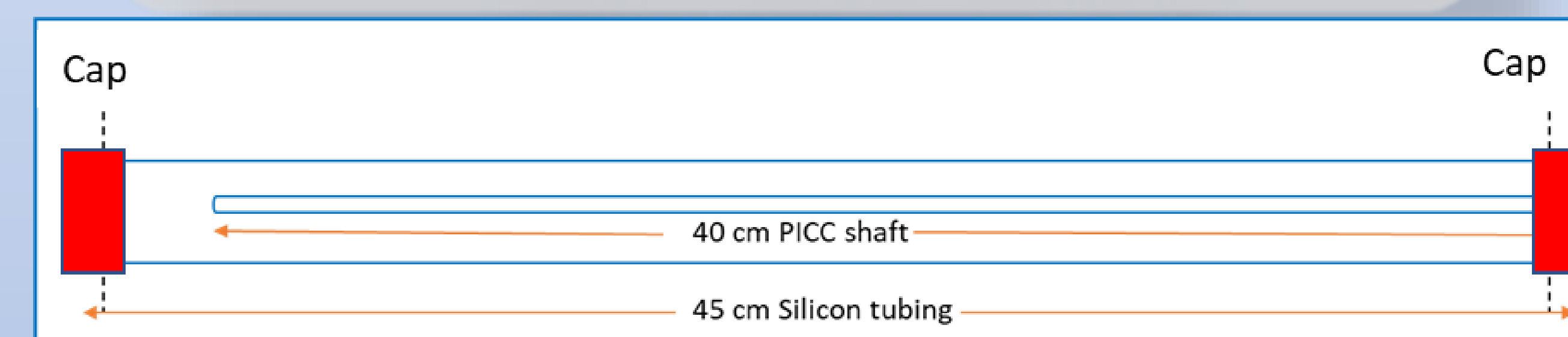


**Table 1 – Log<sub>10</sub> Reduction in Catheter Colonization compared to Initial Challenge Concentration**

| Test Group                          | Log <sub>10</sub> Reduction |                                                        |                         |
|-------------------------------------|-----------------------------|--------------------------------------------------------|-------------------------|
|                                     | <i>Escherichia coli</i>     | Methicillin Resistant-<br><i>Staphylococcus aureus</i> | <i>Candida albicans</i> |
| <b>B (CH-PICC with trimmed tip)</b> | <b>5.51</b>                 | <b>5.44</b>                                            | <b>4.84</b>             |
| <b>C (CH-PICC with intact tip)</b>  | <b>5.45</b>                 | <b>5.28</b>                                            | <b>4.68</b>             |

### Conclusions

The CH-PICC with trimmed tip maintained antimicrobial efficacy performance for 30-days with greater than 4-Log<sub>10</sub> or 99.99% reduction in microbial adherence for all three tested organisms similar to the CH-PICC with intact tips. Therefore, trimming of CH-PICC does not lead to lack of antimicrobial protection at the distal tip with exposed surface and still offers antimicrobial protection against gram-positive and gram-negative bacteria as well as fungal pathogens.

### Limitations & Disclosure

Testing was performed with limited sample size and against limited number of organisms. Correlation of these *in vitro* results with clinical outcomes is not established. PICCs used in this study are manufactured by Teleflex and the authors are employees of Teleflex.