Intraoperative Contamination of Fluids by Anesthesia Providers

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Objective: To investigate the utility of a novel modified syringe to reduce intraoperative contamination of fluids by anesthesia providers.

Background: Nosocomial infections contribute significantly to morbidity as well as increased health care costs. In recent years the role of anesthesia providers' contribution to bacterial infections in the intraoperative period has become a topic of study. At our institution transfusion of blood products during pediatric surgical cases involves the use of syringes for better control of volumes administered. These syringes are sometimes refilled multiple times, especially during periods that require rapid resuscitation. Similarly, the requirement for blood samples from an arterial line necessitates drawing back fluid from extension tubing. A syringe attached to the transducer is often used to draw back then return this fluid to the patient after the sample has been taken. This syringe may also be used multiple times when frequent blood draws are necessary. Concern for contamination of syringes used in these settings led to the development of a modified syringe with a sheathed plunger to prevent the possibility of bacterial transmission intraoperatively. We hypothesize that standard syringes can be a source of bacterial contamination by anesthesia providers during the intraoperative period and that the use of modified sheathed syringes can be a means of decreasing this contamination risk.

Blood Transfusion Setup

Arterial Line Setup

Methods: We created modified sheathed syringes at our institution and sterilized them using conventional sterilization techniques. 20 sheathed and 20 standard 10 mL syringe packs were opened under a filtered-air hood and handled with sterile gloves. The sterile gloves were "contaminated" by introducing S. aureus via a dropper. The contaminated gloves were then used to handle the syringes, avoiding the distal barrels and tips. Each syringe was filled and emptied five times from a test tube containing a solution of sterile 1% peptone culture medium. These tubes were incubated for 8 hours and then plated to check for contamination. We alternated types of syringes and "recontaminated" the gloves before handling each syringe. Estimating a contamination rate of 30%, with a power of 0.8 and an alpha level of 0.05, a power analysis determined that we would need to have at least 19 syringes in each group. The Fisher Exact test was used to analyze results.

Results: 6 out of 20 culture mediums from the standard syringes were positive for S. Aureus while none of the culture mediums from sheathed syringes were positive. Using the Fisher Exact Test this was significant with $p = 0.02$.

Conclusions: Our results support the hypothesis that standard syringes can be a source of bacterial contamination and that the use of sheathed syringes can reduce this contamination. This is directly applicable to the use of syringes by anesthesia providers during the intraoperative period. The use of sheathed syringes should be considered in a setting where the provider might use a syringe multiple times.

Modified Sheathed Syringes

Conducting Experiment

References:
1. Loftus RW, et al. Transmission of Pathogenic Bacterial Organisms in the Anesthesia Work Area. Anesthesiology. 2008; 108: 399-407
2. Loftus RW, et al. Hand Contamination of Anesthesia Providers Is an Important Risk Factor for Intraoperative Bacterial Transmission. Anesthesia and Analgesia. 2011; 112:98-105.
3. Blogg CE, Ramsay MAE and Jarvis JD. Infection Hazard From Syringes. British Journal of Anaesthesia. 1974; 46:260-262.
4. Lessard, MR, et al. A microbiological study of the contamination of the syringes used in anaesthesia practice. Canadian Journal of Anesthesia. 1988; 35: 567-569.