

Aseptic Administration of Intravenous Medications by Anesthesia Providers; a Quality
Improvement Project

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Abstract

This quality improvement project addresses the lack of compliance by anesthesia providers in following aseptic techniques for preparing and administering IV medications. An initial 8-question survey was conducted to assess baseline knowledge of, and compliance with aseptic techniques by anesthesia providers. Following that, an educational intervention was performed and then a follow-up survey was conducted to assess changes in aseptic technique, knowledge, and compliance. The goal of the project was to improve knowledge and compliance of anesthesia providers following aseptic techniques. A Plan-Do-Study-Act Model was used for the organization and study of the overall results of this project.¹

Problem

Healthcare acquired infections are a substantial and continuing problem in the medical field. These infections lead to increased length of stay, increased morbidity and mortality, and increased costs for the hospital and healthcare industry as a whole.² Approximately 440,000 patients develop healthcare acquired infections annually in the United States.³ Additionally, healthcare acquired infections cost approximately 9.8 billion dollars annually.³

Infections that occur after elective surgery account for a significant proportion of all healthcare acquired infections.⁴ The potential contribution of anesthesia providers to these infections has been often overlooked and not extensively researched, although it is clear that certain aspects of anesthesia practices could influence the rates at which these infections occur.^{5,6} An estimated 17% of surgical patients will acquire an infection that is traceable to their anesthesia care during surgery.³

Contamination rates are high when medications are prepared in the operating room, making strict adherence to aseptic technique essential. Lapses in aseptic technique during medication preparation can be especially harmful because some commonly used anesthetics support bacterial growth. Inconsistent techniques may also result from the misperceptions of anesthesia providers.⁷ Microbial pathogens cannot be seen and real-time testing for contamination is not available. This relative lack of feedback to anesthesia providers makes it difficult for them to appreciate the connection between practice and infection.³ Further work is needed to implement education and compliance of aseptic IV administration by anesthesia providers to prevent bacterial transmission events in the OR. The purpose of this quality improvement project is to improve

knowledge and compliance of the anesthesia providers at the Department of Anesthesia at Bryan Medical Center, for following aseptic techniques for IV medication administration.

Current Research

Current research has shown that anesthesia providers' are a vector in bacterial transmission to patients through intravenous access.⁵ Many studies show that anesthesia providers continue to use unacceptable practices for administering IV medications to patients.^{2,5,6,7,8,9} Perioperative bacterial transmission can result from a variety of pathways such as ineffective hand washing, inadequate disinfection of IV ports, and poor aseptic techniques during medication handling and preparation.⁵

Medication Vial Tops and Dust Covers

Many providers have a misconception about the purpose of the flip top dust cover on the top of medical vials. There is a common mistaken belief that the dust cover provides a sterile seal on the rubber access diaphragm, therefore, the need to wipe it off with alcohol is overlooked. Hilliard et al⁷ assessed the level of knowledge of anesthesia providers on medication dust covers through a 2-question survey. The survey questions included: 1) "Prior to removing the plastic flip-top cover, is the rubber stopper on a propofol vial sterile under routine conditions?" and 2) "Does the flip-top cover on a propofol vial create a sterile barrier which prevents contamination of the rubber stopper if the vial is exposed to an external contaminant?"

The results showed that 52% (n=878) of the respondents thought that the access diaphragms were sterile in routine conditions, while 42% (n=876) of respondents believed, or were unsure if, the dust cover would prevent contamination when the access diaphragm was exposed to a contaminant.⁷

The researchers also performed a bench study on a total of 42 medication vials. The bench study consisted of culturing the access diaphragms of medication vials after routine handling, after submersion into a bacterial medium with the dust cover on, and after exposure to aerosolized contamination with the dust cover on. Two of the 12 vials sampled after routine handling had contaminants on the access diaphragm. No growth was found on the 25 vials exposed to the aerosolized *E. coli*; however, 7 of the 15 vials that were submersed into the bacterial medium were contaminated.⁵ Their study showed that a dust cover does not provide a sterile barrier to the top of a medication vial and it can become contaminated. Also, as the survey results show, anesthesia providers need more education related to the capability of dust covers to prevent contamination of access diaphragms.⁷

Intravenous Stopcocks

Intravenous stopcocks are contaminated frequently during an anesthetic as a result of the fast pace of events at the beginning of the case, when multiple medications are administered consecutively, or in emergency situations where the need to administer a medication is urgent. During an anesthetic often caps/covers to the IV line are taken off and not replaced, therefore exposing the line to contamination. In addition leur-locks on the IV line are also exposed to contaminants, and frequently in the rush to administer medications the leur-lock is not cleansed with alcohol before connecting the medication syringe to administer the medication.

Addressing this problem, Cole et al⁸ collected IV tubing stopcock sets at the time of patient discharge following outpatient surgery procedures performed with, and without, an anesthetic using propofol. They wanted to determine if there was a greater

risk of IV stopcock contamination if nutrient rich medications, such as propofol, were utilized during anesthesia.⁸

A total of 150 IV stopcocks were collected. Bacteria counts were sampled at 6 hours, 24 hours, and 48 hours to measure any differences in the growth of microorganisms over time. Positive bacterial counts were recovered from 17.3% of propofol stopcocks and 18.6% of non-propofol stopcocks. There was a significant increase in bacterial density over time with the propofol stopcocks compared with the non-propofol stopcocks. In addition, the researchers found that when visible residual propofol remained in the stopcock, 13 of 27 of those stopcocks had bacterial growth (48%). This finding reveals that visible propofol in the stopcock could be an alarming finding for increasing the risk of bacterial contamination. Overall, they found that there is a degree of IV stopcock bacterial contamination during anesthesia, with or without the use of propofol.⁸

Also supporting that contamination of the IV stopcock is a concern was research conducted by Loftus et al.³ The researchers evaluated the transmission of bacteria to the anesthesia machine and IV stopcock in 164 anesthetics. Their study identified intraoperative bacterial transmission to the IV stopcock set in 11.5% (19/164) of cases, 47% (9/19) of which were of provider origin. They also identified bacterial transmission to the anesthesia environment in 89% of cases, 12% of which were of provider origin.⁹ It is important to note that when evaluating the degree of contamination from the anesthesia provider to the IV stopcock (47%), hand hygiene is a major factor in bacterial transmission.³ The anesthesia providers' hands were contaminated with bacteria such as Methicillin-Resistant Staphylococcus Aureus and other bacterias associated with severe

infections in 66% of the cases. As for the anesthesia environment, the use of proper cleaning techniques may be more of a factor contributing to the contamination.

Medication Preparation and Handling

Contamination of IV medications can occur through the preparation and handling of them. Some providers may be using single-use vials for multiple patients, reusing a syringe and/or needle, failing to properly clean a vial or ampule prior to access, or practicing ineffective hand-washing. Gargiulo et al⁵ conducted an audit of 303 cases where anesthesia providers were asked to inject all bolus drugs, except antibiotics and propofol, through a 0.2-um filter. The researchers then cultured the filters and the residual contents of the syringes used for drawing up and administering medications.

Microorganisms grew from 19 of the 300 filter units (6.3%) and from 55 of the 2,318 syringes.⁵ This study showed that a degree of contamination occurred during the preparation and handling of medications by the anesthesia providers.

Provider Barriers and Misconceptions

There are many barriers that exist to providing aseptic administration of IV medications such as production pressure, overall task density, and an overall focus on immediate threats to patients' safety. Often it is a difficult balance for anesthesia providers when trying to adhere to infection control recommendations while meeting important patient safety needs during anesthesia care.^{10, 11} Safety of the patient is considered in many aspects of anesthesia such as: airway management, appropriate drugs to administer to the patient considering the comorbidities present, and smooth induction, maintenance, and emergence from anesthesia. Sometimes the basics of following aseptic techniques may be forgotten or abandoned.

Another barrier present is the lack of feedback of the bacterial transmission from the anesthesia provider to the patient, as it may not manifest until days later. Therefore, the importance of following aseptic techniques may not be appreciated. Gounder et al⁹ surveyed anesthesia providers to assess medication injection safety knowledge and practices. The survey consisted of 23 questions. There were a total of 595 that responded to the survey.

Approximately 94-99% of respondents correctly answered questions regarding injection-contamination mechanisms. Of the practice questions that were included, use of single-use vials for multiple patients was reported by 49% of respondents and was more common of providers in the outpatient setting. Barriers reported to the use of one vial per one patient consisted of medication shortage (44%), cost (27%), and reduction of waste (44%).⁹ Therefore, this study showed that there was a high degree of knowledge on the topic, but that in practice the correct techniques were not always followed.

Project

Plan

The theoretical framework that was the basis for this quality improvement project was the Plan-Do-Study-Act Framework. It is a tool that is used for quality improvement projects in healthcare. It involves using rapid small-step change cycles to implement the change.¹ The Plan phase was the initial stage of the project where the planning of the project and meetings with stakeholders occurred.

The primary stakeholders included the Department of Anesthesia at Bryan Medical Center. The Chair of the Department of Anesthesia at Bryan Medical Center was the member who was communicated with to obtain approval of this quality improvement

project (Appendix A).

An application for Exempt status was approved by the Bryan College of Health Sciences Institutional Review Board (Appendix B). The Institutional Review Board was presented with all items to be used for the project, which included the 8-question survey about compliance with aseptic technique in the administration of IV medications, and the 17-slide educational presentation on aseptic administration of IV medications by anesthesia providers.

The 8-question survey and educational presentation was developed by the researcher based on a review of the American Association of Nurse Anesthetists Safe Injection Guidelines for Needle and Syringe Use, and the Centers for Disease Control and Prevention Safe Injection Practices to Prevent Transmission of Infections to Patients. The participants were the anesthesia providers at Bryan Medical Center. A participant email list was obtained from the Chair of the Anesthesia Department, following approval by the Institutional Review Board. No identifying information was collected in the surveys with all responses remaining anonymous.

Do

The methods for this quality improvement project involved emailing a survey link to a questionnaire created on Survey Monkey® to the anesthesia providers who provide care at Bryan Medical Center. This survey consisted of 8 closed ended questions to assess the anesthesia providers' baseline knowledge of, and compliance with aseptic IV medication administration (Appendix C). The email was sent to their department email addresses and the anesthesia providers were given two weeks to complete the survey. A reminder email was sent after one week to remind them of the two week deadline for

survey completion (Appendix D).

After closure of the initial survey, the educational intervention was conducted on August 7th, 2017 at the Bryan Medical Center Anesthesia Department meeting. An approximately 10 minute verbal presentation was supplemented by a slide presentation of key points (Appendix E). Eight anesthesia providers were in attendance. The slide presentation was then emailed to all anesthesia providers, so those that did not attend the meeting could access the educational intervention. The anesthesia providers had three weeks to view the educational intervention. Part of the Plan intervention was to predict what would happen when the solution was implemented. The prediction was knowledge of, and compliance with aseptic technique when administering and preparing IV medications would improve in anesthesia providers after the educational intervention.

A repeat administration of the survey was done after the three-week opportunity to review the educational intervention. The post intervention survey was available for two weeks for the providers to complete. A reminder email was sent after one week, reminding the anesthesia providers that there was one week left to complete the survey (Appendix F).

Data collection began following the closure of the post intervention survey. All responses to the survey were collected and entered into a spreadsheet for data analysis by the primary investigator. The participants remained anonymous at all times, as only the responses to the 8 closed ended questions were recorded. Therefore, no email addresses or dates/times were collected. Also, all survey results were deleted from the SurveyMonkey® account within one week of the survey closing.

The survey was sent to 55 anesthesia providers at Bryan Medical Center. There were 35 respondents to the initial survey for a 64% response rate. Fifteen replied to the post intervention survey for a 27% response rate. Comparison of the survey responses to the initial survey to the post intervention survey occurred in this phase of the project. Overall, it was difficult to compare the results as the number of the respondents varied greatly between the initial survey and the post intervention survey.

Survey question 1: *Do you think following aseptic techniques for IV medication administration plays a significant role in bacterial transmission from the anesthesia provider to the patient?* Forty-seven percent (n=7) of the respondents to the post intervention survey choose “Highly Significant” with another 47% (n=7) choosing the “Somewhat Significant” response. This was similar to the responses to the initial survey with 43% (n=15) choosing “Highly Significant” and 40% (n=14) choosing “Somewhat Significant”. One respondent (6%) to the post intervention survey chose “Minimally Significant” compared to 6 (17%) respondents to the initial survey. No respondents chose “No Significance” (Figure 1).

Survey question 2: *Do you wipe the rubber stopper on medication vials with alcohol before withdrawing medication?* Twenty-nine percent (n=10) of respondents to the initial survey and 27% (n=4) of respondents to the post intervention survey chose “Always”. The most common response was “Sometimes” with 51% (n=18) of the initial survey responders and 47% (n=7) of the post intervention survey responders choosing the answer. A higher percentage of respondents chose “Rarely” (n=3, 20%), and “Never” (n=1, 6%) to the post intervention survey, compared with the initial survey responders who chose “Rarely” 17% of the time (n=6) and “Never” 2% of the time (n=1) (Figure 2).

Survey question 3: *Do you wipe the neck of a glass ampule with alcohol prior to opening the ampule?* A higher percentage of respondents chose “Always” (n=2, 13%) using alcohol in the post intervention survey compared to the initial survey (n=3, 9%). Less respondents answered that they “Rarely” (n=2, 13%) or “Never” (n=5, 33%) did with the post intervention survey compared with the initial survey, “Rarely” (n=7, 20%) and “Never” (n=18, 51%) (Figure 3).

Survey question 4: *Do you reenter single-use medication vials or solutions to prepare doses for multiple patients?* There were more respondents who chose that they “Sometimes” (n=6, 40%) reenter vials in the post intervention survey, when comparing it the initial survey (n=11, 31%). A higher percentage of respondents chose that they “Never” (n=8, 53%) reentered vials in the post intervention survey as compared to the initial survey (n=14, 40%). There were no respondents that chose that they “Always” reenter single-use medication vials for both the initial and post intervention survey (Figure 4).

Survey question 5: *Do you use a new needle and syringe each time you prepare a medication?* There was not an improvement in the percentage of respondents answering that they “Always” (n=14, 93%) use a new needle and syringe in the post intervention survey compared to the initial survey (n=34, 97%). However, as the data (Figure 5) shows, this practice is already widely used by the providers. There was an increase in the percentage of respondents choosing “Sometimes” (n=1, 7%) for the post intervention survey, when compared to the initial survey (n=1, 3%). There were no respondents who chose “Rarely” or “Never” (Figure 5).

Survey question 6: *Do you keep medication syringes capped when they are not connected to the IV line?* There was no improvement in the percentage of respondents choosing that they “Always” (n=9, 60%) do this in the post intervention survey compared with the initial survey (n=29, 83%). There were 6 respondents who chose that they “Sometimes” (40%) keep medication syringes capped for the post intervention survey, compared with 6 respondents (17%) who did for the initial survey. There were no respondents who chose the responses “Rarely” or “Never” (Figure 6).

Question 7: *Do you cap leur-locks in the IV line when not in use?* There was an improvement in the percentage of respondents choosing that they “Always” (n=5, 33%) do, or “Sometimes” (n=10, 67%) do this in the post intervention survey when compared to the initial survey, “Always” (n=11, 31%) and “Sometimes” (n=20, 57%). In the initial survey, there were 3 respondents that chose “Rarely” (9%) and one that chose “Never” (3%), compared to no respondents picking either of those responses in the post intervention survey (Figure 7).

Survey question 8: *What factor is most significant in impeding compliance with aseptic techniques for IV medication administration in the OR?* “Time Pressure” (n=16, 46%, for the initial survey) (n=7, 47%, for the post intervention survey) was the most common factor that respondents chose for impeding compliance. “Lack of Supplies” (n=4, 11%, for the initial survey) (n=1, 7%, for the post intervention survey) was the answer that was least often chosen. The second most common response chosen was “Do Not Believe The Patient Will Be Harmed” (n=7, 20%) for the initial survey, compared with (n=4, 27%) for the post intervention survey. There were 8 respondents that chose

“Forget To” (23%), compared with 3 respondents (20%) choosing that response for the post intervention survey (Figure 8).

Study

It was predicted there would be improved knowledge of and compliance in following aseptic technique by anesthesia providers after the education intervention. There was not a consistency seen overall in the responses in the post intervention survey showing improved compliance. Time pressure was the most common reason chosen for not following aseptic techniques, while lack of supplies was the least common.

Other significant findings were the high percentage of anesthesia providers who are not following the recommended aseptic techniques. When comparing the results of this survey to other research findings on aseptic administration of medications, the findings are comparable. Many factors contribute to the poor compliance of following these techniques.

There continues to be misconceptions about: the sterility of dust covers on medication vials, use of single-use medication vials for multiple patients, not believing harm is being done to the patient by not following aseptic techniques, forgetting to follow these techniques, and also not adequately performing good hand hygiene.^{2, 5, 6, 7, 8, 9} All of these misconceptions and lack of knowledge on the topic continue to result in the poor compliance of following aseptic techniques.

In addition to that, other studies showed that anesthesia providers have knowledge on the topic but chose to follow inappropriate practices such as using a single-use vial for multiple patients due to medication shortages and reduction of waste.⁹ Also,

time pressure was another significant factor contributing to poor compliance which was also consistent with the survey that was sent out.¹⁰

A major limitation to this quality improvement project was the small number of responders to the post intervention survey. This limited the ability to evaluate the effectiveness of the educational intervention, because the comparison of the results of the initial survey with the post intervention survey by statistical analysis could not be performed.

Act

The goal of this project was to improve both the knowledge and compliance of anesthesia providers following aseptic techniques when administering and preparing IV medications. After analyzing the results, there was not a significant change noticed in the compliance of anesthesia providers following aseptic techniques. There was some improvement in some of the questions in the survey, but overall not a strong consistency. It is difficult to implement change in healthcare providers who are accustomed to completing clinical tasks in a certain way. Furthermore, during the administration of anesthesia there are many pertinent and immediate threats to a patient, which often overshadow, and take priority over, less-immediate threats to the patient. As a result, many times something that could potentially harm the patient is forgone for the more immediate threat.

Also, the distribution of the project could have also led to less significant results. As the providers receive countless emails each day, it is very possible they could have simply overlooked the survey or the educational intervention.

One recommendation to lead to more consistency and successful compliance of anesthesia providers following aseptic techniques would be implementation of a representative doing random audits to ensure proper techniques are being followed. There could possibly be one or two auditors who visit random OR's to observe if providers are following aseptic techniques. A second recommendation would be to further disseminate education on the topic to reinforce its' importance. As some respondents had chosen they forget to follow these techniques, or felt failure to follow the techniques did not present harm to the patient, reminders sent via email or posters hung in the anesthesia area in the OR room could also be helpful. Any of these further interventions would require further approval through the Department of Anesthesia at Bryan Medical Center.

Healthcare is a field where change is constantly occurring. Healthcare professionals are responsible to always follow the best practice recommendations and always put patient safety first. Bacterial transmission from the provider to the patient is an area in healthcare that has led to increased patient morbidity and mortality, along with increased costs overall.³ By making changes through following aseptic techniques when administering and preparing medications, improvements can be made in all of these areas to provide better patient care.

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Appendix A

Dear Associated Anesthesiologists, P.C.,

I am conducting my senior capstone project on compliance of aseptic IV medication administration in the OR. The purpose of my quality improvement project is to improve compliance in following aseptic techniques of IV medication administration in the OR by anesthesia personnel.

My project involves sending out an 8-question survey via SurveyMonkey to the anesthesia providers that provide care at Bryan Health Hospital. This survey will assess compliance of aseptic IV medication administration. After completion of this survey, administration of an education intervention at the anesthesia team's monthly meeting will be conducted. This education intervention is a short 10-minute presentation on the topic. The education intervention will also be emailed to all anesthesia providers at Associated Anesthesiologists, P.C. After completing the education intervention and sending out the email of the education intervention, the survey will again be sent out to assess compliance of aseptic IV medication administration. All responses will be confidential and no identifiers will be present, as only the responses to the questions will be gathered for data collection. Locums will also not be included.

I am writing to seek approval for sending out my survey and conducting an education intervention at one of the monthly anesthesia meetings. If approval is granted, presenting at the August meeting would be preferred if possible.

Thank you,

Brittney Stewart

Appendix B

**BRYAN COLLEGE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW BOARD**
Notification of Action

Date of Notification: 7-20-2017

This letter pertains to IRB actions regarding:

Title of Study/Project: Aseptic Administration of Intravenous Medication by Anesthesia Providers; a Quality Improvement Project

IRB Number: 1707-001 (to be used in all future correspondence about the Study/Project)

Submitted by: Brittny Stewart

Type of Review Performed:

Exempt – Performed by June Smith _____
 Expedited
 Full

Date of Review: 7-20-2017

Document(s) Reviewed: Request for Review; Addendums A-F (Pre-Post Survey, and communications with subjects); Educational presentation (study intervention)

Decision

The Bryan College of Health Sciences' IRB has made the following decision related to your study:

APPROVED: Your study has been found to meet criteria necessary for the protection of human subjects as stated in the Code of Federal Regulations Title 45 Part 46. Data collection may start once all required IRB approvals are obtained.

PENDING APPROVAL CONTINGENT ON MINOR CHANGES: Your study has been found to meet criteria necessary for the protection of human subjects as stated in the Code of Federal Regulations Title 45 Part 46; however minor changes are necessary to strengthen one or more part(s) of the study. Those minor changes are detailed below. Please resubmit the final amended *Request for Review, Informed Consent*, or any other necessary study documents. After submission of the final documents you will receive an approval letter with the approved, stamped informed consent document if required for the study/project.

MUST BE RESUBMITTED WITH MAJOR CHANGES: Your study HAS NOT been found to meet all criteria necessary for the protection of human subjects as stated in the Code of Federal Regulations Title 45 Part 46. One or more major change(s) must be made as detailed below. **DATA COLLECTION MAY NOT BE STARTED** until those changes have been made and formal approval has been granted by the IRB.

Changes, if required: None required

Obligations to the IRB

The investigators of a study approved by the IRB must fulfill the following obligations in order to retain permission to conduct their study:

CONSENT FORM: If you submitted a consent form for approval, the approved consent will be returned to you marked with a red '**APPROVED.**' **Colored copies** of that **approved** consent must be made and all participants enrolled in the study must sign one of those **colored consent forms**. The original, colored consent forms must be saved with the investigator's study documents. Each participant must be given a copy of the informed consent. The participant's copy may be a black and white copy of the original, colored informed consent.


PLANNED CHANGES TO THE STUDY: Any non-editorial change to an approved study/project must be submitted to the IRB for approval before initiation of the change except when necessary to eliminate immediate hazards to the participant(s). These changes include (but are not limited to):

- Names and roles of study/project personnel;
- The number of enrolled participants;
- Change to the methods used in the study/project;
- Change to the study/project's consent form;
- Additional method(s) used to recruit subjects (beyond those approved with the initial review);
- Proposed communication(s) to potential or enrolled subjects.
- Any change initiated prior to IRB approval (undertaken to eliminate immediate hazards to participants) must be reported as soon as possible to the Chair or Secretary of the IRB.

UNANTICIPATED PROBLEM OR ADVERSE EVENTS: The investigators of an approved study/project are required to submit to the IRB a full report of the following within two (2) business days of the occurrence:

- An unanticipated problem or adverse event occurring to one or more enrolled subjects including, but not limited to:
 - Any breach in confidentiality.
 - Physical or psychological harm.
 - Unresolved complaint of a participant, family member, or other individual.
 - Any other occurrence of an adverse nature related to participation in the study/project.
- Any deviation from the approved study/project protocol with the reason for the deviation and any consequences to the study/project participants or the integrity of the study/project's data.
- The withdrawal of any participant
- If a preliminary review of a study/project's data indicates the probability that continuing with the study/project will result in harm to one or more participants.

ONGOING AND FINAL REPORTS: The investigators of an approved study/project will submit a final report (using the IRB Final Report template) within sixty (60) days of the end of data collection. If an approved study has not completed data collection 12 months after the initial IRB approval date, the investigators must submit an Annual Report (using the IRB *Annual Review* template).

 _____ Chair, Bryan College of Health Sciences' IRB	7/20/2017 _____ Date
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Appendix C

Aseptic Administration of Intravenous Medications by Anesthesia Providers

Hello, I am Brittany Stewart, a Senior SRNA in the Bryan nurse anesthesia program. I am conducting my senior capstone project on compliance of aseptic intravenous medication administration in the OR. The following survey contains 8 closed ended questions regarding the use of aseptic techniques when administering intravenous medications. After completion of this survey, administration of an education intervention at the anesthesia team's monthly meeting will be conducted. This education intervention is a short 10-minute PowerPoint presentation on the topic. The education intervention will also be emailed to all anesthesia providers at Associated Anesthesiologists, P.C. After completing the education intervention, and sending out the email of the education intervention, the survey will again be sent out to assess compliance of aseptic IV medication administration.

Subjects participating in the survey will remain anonymous at all times, as only responses to the closed ended questions will be recorded. Therefore, no email addresses or dates/times will be collected.

The survey takes less than 5 minutes to complete. Your participation would be greatly appreciated. Thank you!

1. Do you think following aseptic techniques for IV medication administration plays a significant role in bacterial transmission from the anesthesia provider to the patient? (Highly significant, Somewhat significant, Minimal significance, No significance)
2. Do you wipe the rubber stopper on medication vials with alcohol before withdrawing medication? (Always/Sometimes/Rarely/Never)
3. Do you wipe the neck of a glass ampule with alcohol prior to opening the ampule? (Always/Sometimes/Rarely/Never)
4. Do you reenter single-use medication vials or solutions to prepare doses for multiple patients? (Always/Sometimes/Rarely/Never)
5. Do you use a new needle and syringe each time you prepare a medication? (Always/Sometimes/Rarely/Never)
6. Do you keep medication syringes capped when they are not connected to the IV line? (Always/Sometimes/Rarely/Never)
7. Do you cap leur-locks in the IV line when not in use? (Always/Sometimes/Rarely/Never)
8. What factor is most significant in impeding compliance with aseptic technique for IV medication administration in the OR? (Time pressure/Lack of supplies/Do not believe patients will be harmed/Forget to)

Appendix D

Hello,

This is a reminder email that you have 4 days left to complete the first survey on Aseptic IV Medication Administration. The email with the survey link was sent on 7/26/17. Your participation would be greatly appreciated. Thank you!

Brittney Stewart, SRNA

Appendix E

Attached is the PowerPoint presentation on Aseptic Administration of Intravenous Medications concerning current research and procedures to follow. Please read through. I will email the follow-up survey in 3 weeks and ask that you complete it. Thank you!

Appendix F

If you have already completed the second survey, which was sent out on 8/29/17, thank you so much for completing it. If you have yet to complete it, I would appreciate you taking a few minutes to do so. Also attached is the educational PowerPoint to review if needed. Thank you for taking the time to complete this second survey.

Figure 1

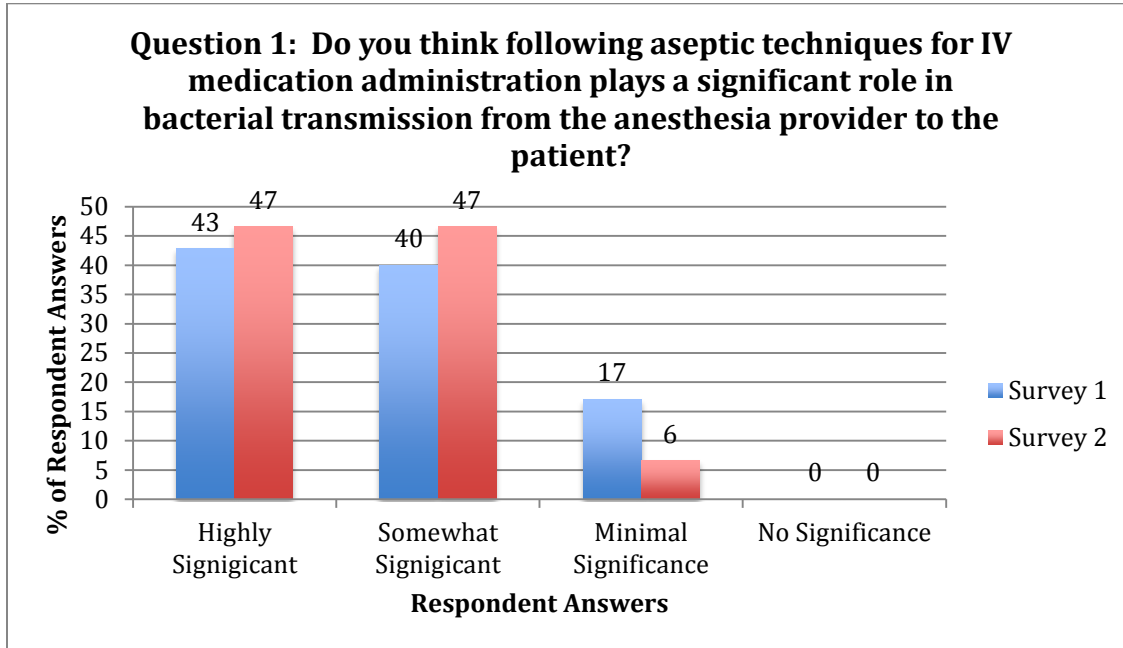


Figure 2

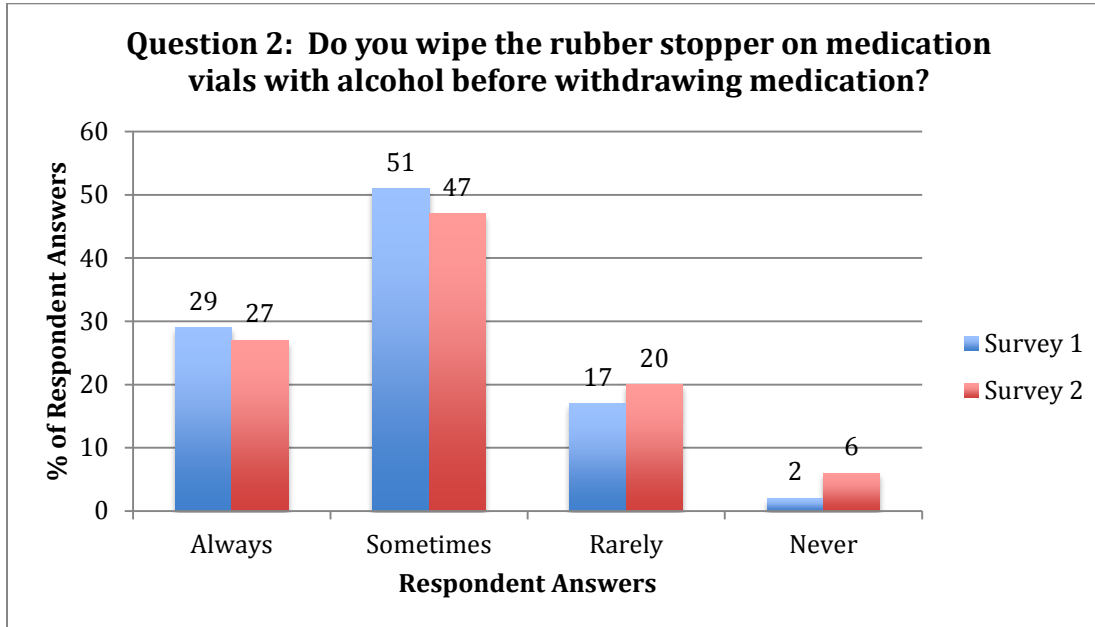


Figure 3

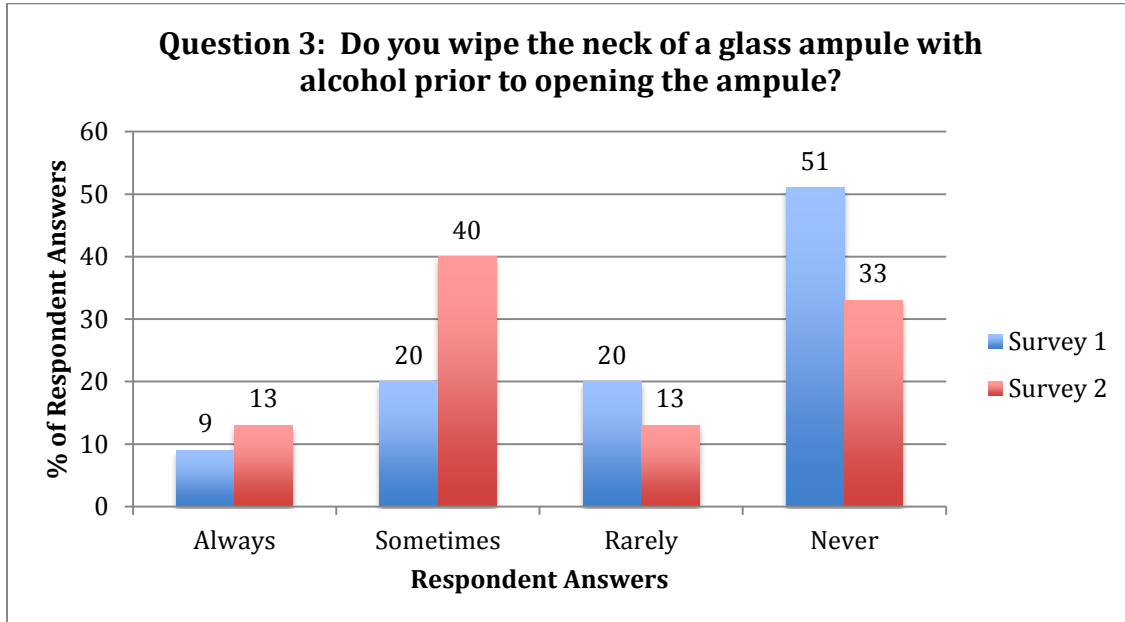


Figure 4

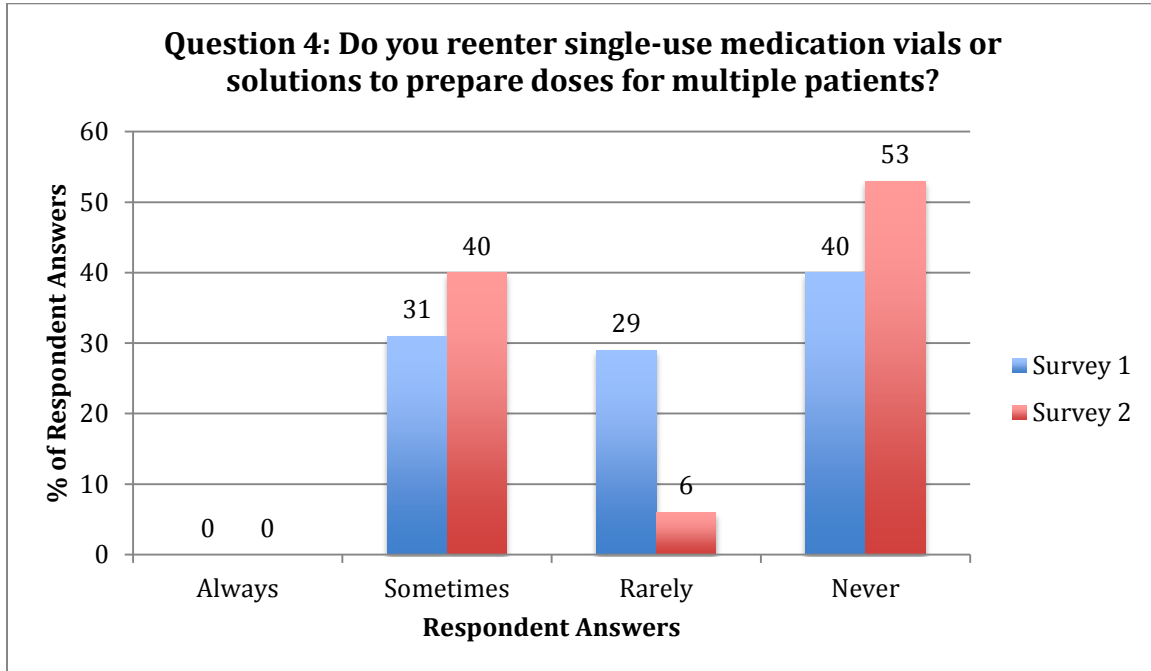


Figure 5

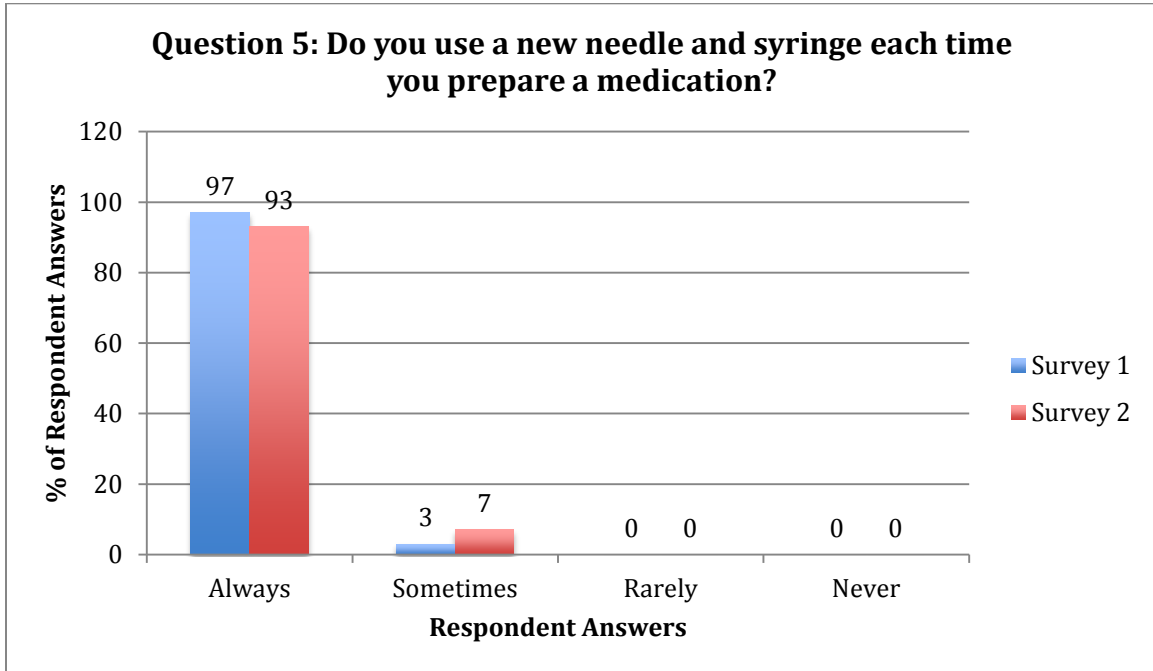


Figure 6

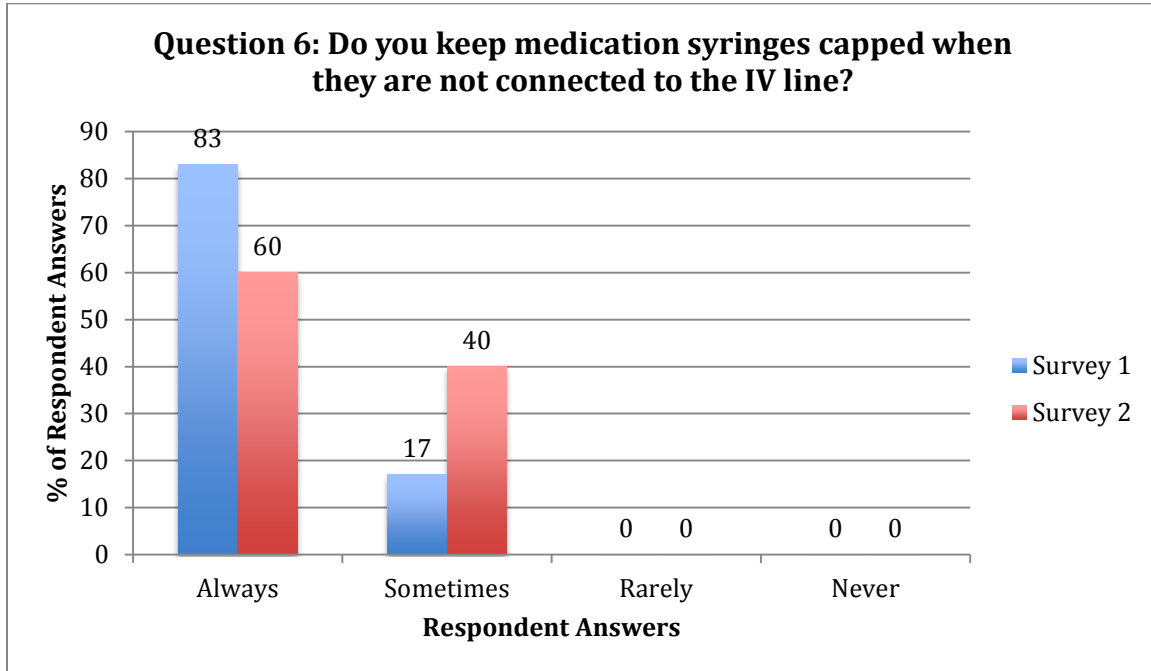


Figure 7

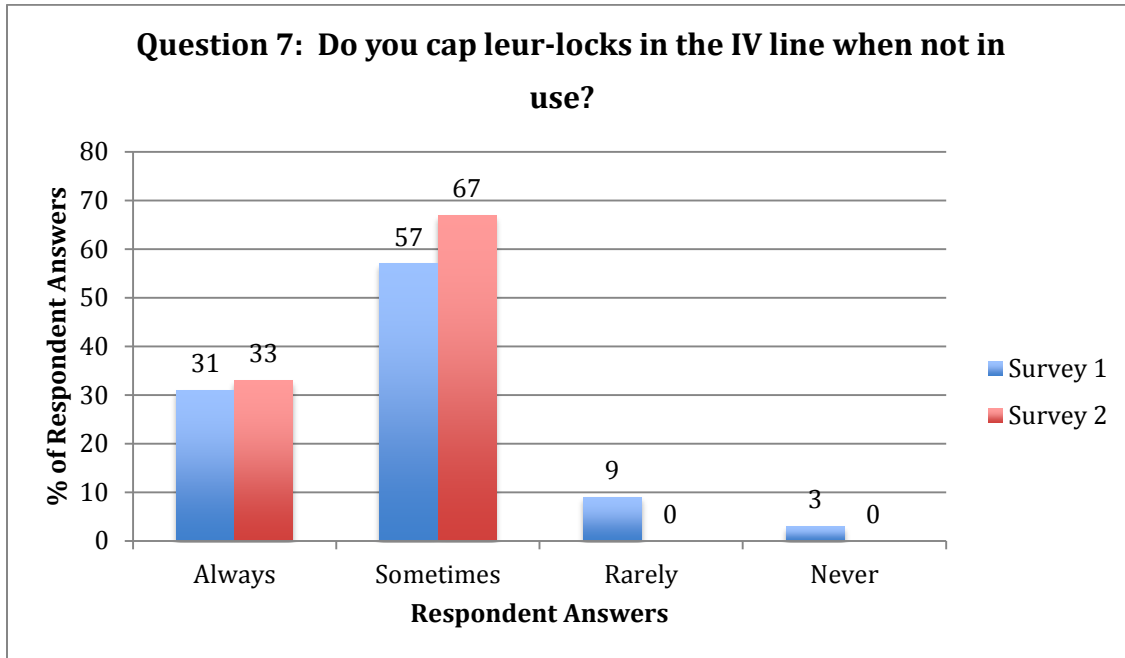
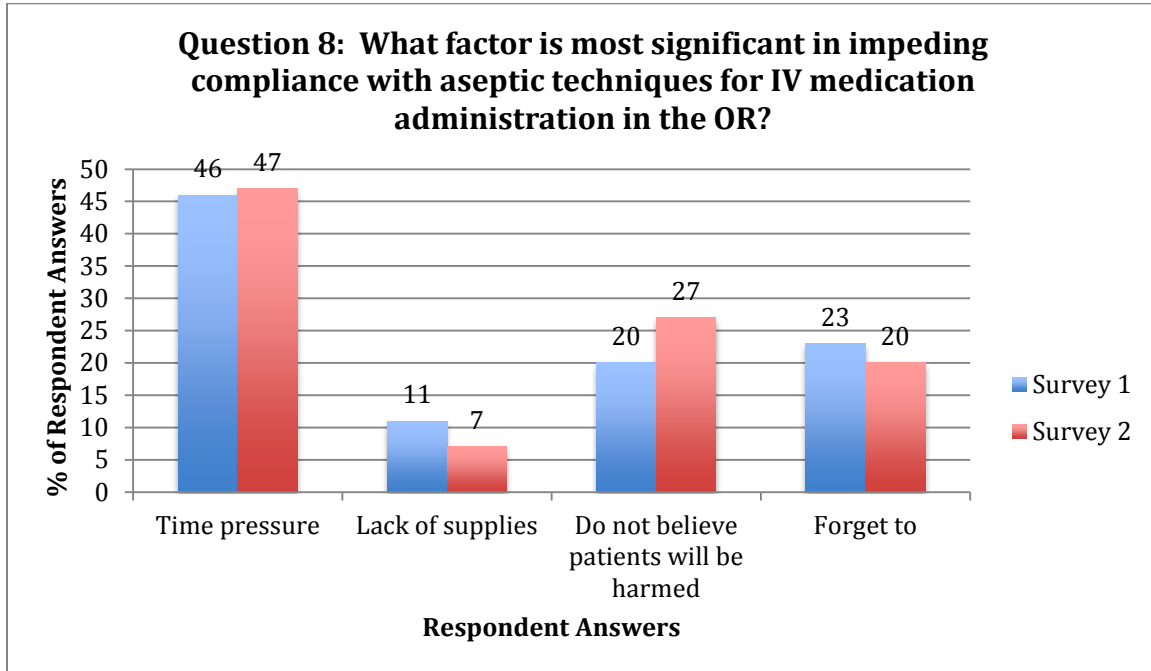


Figure 8





Aseptic Administration of IV Medications by Anesthesia Providers

Brittney Stewart, BSN, SRNA



Problem



- Approximately 440,000 patients develop healthcare acquired infections annually in the United States.
- Additionally, healthcare acquired infections cost approximately 30 billion dollars annually.
- Infections that occur after elective surgery account for a significant proportion of all healthcare acquired infections.
- (Krug et al., 2016)



+ Problem



http://img.medicalexpo.com/images_me/photo-g/70717-8767744.jpg

- Anesthesia providers recently were identified as a vector of horizontal bacterial transmission via intravenous access.
- Perioperative transmission of microbial pathogens can result from ineffective hand-washing, inadequate disinfection of IV port access points, and poor aseptic techniques during medication handling and preparation.
- (Gargiulo et al., 2016)



Problem



- Many studies show that anesthesia providers are still using unacceptable practices for administering IV medications aseptically to patients (Ford, 2013; Gounder et al., 2011; Hilliard et al., 2013; Loftus et al., 2015; Cole et al., 2015; Griffis et al., 2016).
- Infective agents cannot be seen and real-time testing for contamination is not available. The relative lack of feedback to anesthesia providers makes it difficult for them to appreciate the connection between practice and infection (Loftus et al., 2015).



Research Studies:

Medication vial tops and dust covers

- Hilliard et al. (2013) conducted a study where they sent out a two-question survey to anesthesia providers in the U.S. and performed an experimental model on a total of 42 medication vials.
- The survey questions included: 1) “Prior to removing the plastic flip-top cover, is the rubber stopper on a propofol vial sterile under routine conditions?” & 2) “Does the flip-top cover on a propofol vial create a sterile barrier which prevents contamination of the rubber stopper if the vial is exposed to an external contaminant?”
- The experimental model consisted of access diaphragms of medication vials that were sampled after routine handling, after exposure to aerosolized contamination with the dust cover on, and after submersion into a bacterial medium with the dust cover on.



http://www.newsworks.org/images/stories/flexicontent/1_photo-1x1200-1.jpg



Research Studies:

Medication vial tops and dust covers



- 52% of respondents declared that the access diaphragm was sterile in routine conditions
- 42% felt that or were unsure if the dust cover would prevent contamination when exposed to a contaminated environment
- Study showed that 2 of the 12 vials sampled after routine handling had microbial contaminants on the access diaphragm, no growth was found on any of the 25 vials exposed to aerosolized E. coli. Seven of the 15 vials in the submersion model were contaminated.
- (Hilliard et al., 2013)



Research Studies: IV stopcocks



- Cole et al. (2015) conducted a study on collecting IV tubing stopcock sets at the time of patient discharge from same-day ambulatory procedures performed with and without propofol anesthesia.
- 150 IV tubing stopcocks were collected. Positive bacterial counts were recovered from 17.3% propofol anesthesia stopcocks and 18.6% of nonpropofol stopcocks.
- Found that there is an incidence and degree of IV stopcock bacterial contamination during anesthesia.
- (Cole et al., 2015)



Research Studies: IV stopcocks

- Loftus et al. (2011) conducted a study on 164 cases on transmission of bacteria to the IV stopcock and anesthesia environment (APL valve and agent dial).
- Study showed that intraoperative bacterial transmission to the IV stopcock set was identified in 11.5% (19/164) of cases, 47% (9/19) of which were of provider origin. They also identified bacterial transmission to the anesthesia environment in 89% of cases, 12% which were of provider origin.
- (Loftus et al., 2011)





Research Studies:

Medication preparation & handling



- Gargiulo et al. (2016) performed a microbiological audit of 303 cases in which anesthesia providers were asked to inject all bolus drugs, except propofol and antibiotics, through a 0.2-um filter. The authors then cultured microorganisms, if present, from the filter unit and from the residual contents of the syringes used for drawing up or administering drugs.
- The authors isolated microorganisms from filter units in 19 (6.3%) of 300 (3 cases were excluded). The authors collected used syringes at the end of each case and grew microorganisms from residual drug in 55 of these 2,318 (2.4%) syringes.
- (Gargiulo et al., 2016)

+ CDC & Bryan Medical Center Procedures for Preparation of IV Medications

- Always enter a medication vial with a sterile needle and sterile syringe, even when obtaining additional doses of medications for the same patient.
- The sterile syringe and needle should be used only once to administer a medication to a single patient, after which the syringe and needle should be discarded.
- This practice prevents inadvertent reuse of the syringe and protects healthcare personnel from harms such as needle stick injuries.

+ CDC & Bryan Medical Center Procedures for Preparation of IV Medications



- Medications in ampules
 - Cleanse neck of ampule with alcohol wipe
 - Wrap alcohol wipe around ampule and gently snap off top
 - Draw medication up with sterile syringe
- Liquid/powdered medication vials
 - Cleanse cap/rubber stopper of vial with alcohol wipe
 - Draw up medication with sterile syringe

+ CDC & Bryan Medical Center Procedures for Preparation of IV Medications



- Single-dose or single-use vials
 - Intended for parenteral administration that is meant for use in a single patient for a single case/procedure/injection
 - Single-dose or single-use vials are labeled as such by the manufacturer and typically lack an antimicrobial preservative
- There have been multiple outbreaks resulting from healthcare personnel using single-dose vials for multiple patients

<http://www.albosala.com/Assets/Files/General.jpg>

(CDC, 2011, & Bryan Medical Center Procedure Addendum MM.A.33 Injections, 2017)

+ CDC & Bryan Medical Center Procedures for Preparation of IV Medications

- Single-dose or single-use vials
 - Do not pool contents of single-use vials for future use
 - Multi-use vials usually contain an antimicrobial preservative to help prevent the growth of bacteria
 - These medications should be prepared in a dedicated medication prep area



<https://theanesthesiaconsultant.files.wordpress.com/2016/10/fentanyl.jpg?w=756>

(CDC, 2011, & Bryan Medical Center Procedure Addendum MM.A.33 Injections, 2017)

+ CDC & Bryan Medical Center Procedures for Aseptic Vascular Access

■ Vascular Access

- Clean access port or hub (recommend needleless/closed system) or injection site on IV line for 15 seconds and allow to air-dry for 30 seconds, using 2% chlorhexidine or isopropyl alcohol 70%.
- Keep drugs in sterile, capped, labeled syringes, accessible in clean area.
- Consider keeping ports covered with alcohol-containing port protectors, removing only for injection and replacing immediately, as well as per manufacturer recommendations (Griffis et al., 2017).



Balancing Asepsis with Patient Safety



- Barriers to aseptic administration of IV medications:
 - Production pressure
 - Overall task density
 - Overall focus on immediate threats to patients' safety
- Often it is a tough balance for anesthesia providers when trying to adhere to infection control recommendations while meeting important patient safety needs during anesthesia care (Griffis et al., 2017). Always try to follow aseptic techniques whenever possible.



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