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INFECTION CONTROL PRACTICE DURING ANESTHESIA

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ABSTRACT

Anesthesia providers commonly cross-contaminate their workspace and subsequently put patients at risk for a health care–acquired infection. The primary objective of this project was to determine if education and implementation of standardized infection control guidelines. **Methods:** Patient care–related to hand hygiene of nurse anesthetists was observed in 3 areas of anesthesia practice before and 3 weeks and 3 months after staff education, **Results:** There were a total of 95 observations performed during the 3 observation periods. When compared with preimplementation baseline data, there was an increase in the number of providers compliant with hand hygiene practices after airway instrumentation (P = .000). **Conclusions:** Education, visual reminders, and standardized infection control guidelines were shown to improve compliance with infection control best practices in a group of nurse anesthetists.

KEYWORDS: Infection, Anesthesia.

INTRODUCTION

Recognition of the importance of infection-control risks in health care settings is a major element in endeavors to enhance the quality of medical care. It is estimated that 5 to 10 percent of the hospitalized patients in the U.S. acquire one or more health careassociated infections (HAIs), which are a contributory cause in more than 90,000 deaths and result in excess health care expenditures of $4.5–$5.7 billion a year.[1]

The four most prevalent infections, responsible for greater than 80 percent of HAIs, are: urinary tract infections (35) percent of cases, generally catheterassociated); surgical site infections (20 percent of cases, but accounts for one third of the costs associated with HAIs); bloodstream infections (15) percent, the majority being intravascular-catheter-related); and pneumonia (15) percent, usually ventilator-associated, but to which is attributed 25 percent of HAIassociated mortality).[2]

Significantly, the etiologic organisms in 70 percent of these infections are resistant to one or more antibiotics. However, appropriate anesthesia practices can reduce the incidence of infection related to these and other causes of HAI.

Anesthesia providers traditionally have a poor compliance rate with hand hygiene as well as frequent contact with the patient's bloodstream through intravenous (IV) access.[3] Studies have found that pathogenic microorganisms can be cultured from the anesthesia workspace and equipment, including IV stopcocks, the anesthesia gas machine, anesthesia supply cart, keyboards, syringes, and other items contacted by the provider.[4] IV stopcock contamination is an important source for bacterial entry into the bloodstream, but it is a modifiable risk.[5] Intraoperative hand hygiene improvement programs, education, and easier access to hand sanitizer could increase provider compliance, decrease transmission, and prevent HAIs.[6] The ready availability and accessibility of hand sanitizer alone have been shown to improve compliance with hand hygiene. Cross-contamination can also be reduced by changing gloves after patient contact and before touching the work environment.[7]

A cost-effective practice such as double-gloving prior to endotracheal intubation, with the removal of the outer glove immediately after the procedure, dramatically reduces contamination of the workspace. IV medication administration via a stopcock should follow an aseptic technique. Scrubbing a stopcock port for 15 seconds with an alcohol swab and allowing it to dry for 15 seconds before attaching a syringe with clean hands reduce the risk of bacterial entry into the bloodstream. Designating separate areas within the workspace for clean**.**[8]

They have been demonstrated that anesthesia providers can reduce thespread of pathogenic organisms through evidence-based interventions; however, standard protocols to reduce or prevent anesthesiarelated cross-contamination are uncommon.[9] To decrease the risk of HAIs in the clinical setting, Several articles published in recent years have highlighted the concern

about transmission of infections through anesthesia machines, mostly focusing on certain aspects of it, as may be the transmission of an infection through intravenous or airway, etc. Increasingly there are items that promote Institutional Control Policy Infection related to the global job of the anesthesiologist and anesthesia societies include some rules or guidelines for action on cleaning, decontamination, disinfection and sterilization of equipment and anesthetic equipment.[10]

About reading an article in which he insists on the need for hygiene even in Laryngoscope Handles and lack of recommendations in the American guidelines, we considered the policy literature search or guidelines related to hygiene, decontamination and infection transmission in the workplace of anesthesiologists.

BACKGROUND

Minimizing the risk of infection to patients Measures to protect patients against the acquisition of related infections anesthetic procedures should be considered:

- The risks associated with invasive procedures
- Risks or potential risks associated with airway management.

In both cases, appropriate measures should be applied sterility, disinfection and decontamination of all equipment used. One microbiólogo must be consulted on all matters requiring clarification. The **handwashing** by professionals Anesthesiology (physician/nurse) is the most important control measure. Should be washed before handling a new patient or equipment to use in each new patient, after finishing with a patient, provided that contamination and before any invasive procedure. Gloves should be discarded after procedures, to minimize contamination of the workplace. Hands should be washed before and after using gloves.[11]

Invasive Procedures

Invasive procedures should be performed with an aseptic technique.

Vascular cannulation

The site of the pipe is a gate input potential of microorganisms in the subcutaneous tissue and circulation. The anesthetist should wash their hands and wear approved protective gloves. The skin should be disinfected with adequate preparation before cannulation and conducted in a manner that ensures that the tip and shaft of the cannula remain sterile.[12]

The central venous cannulation

The insertion of central venous catheters and pulmonary artery carries added increased risks of infection for the patient. The central venous cannulation should be performed using a full aseptic technique, including the use of mask, gown and sterile gloves, and using a sterile field surrounded by sterile fields required.

Anestesia Regional

When carrying out regional blocks, should wash their hands and wear gloves, disinfect the skin with proper preparation and conduct the proceedings so that the needle remains sterile. When a spinal or epidural is performed and a permanent catheter put regional, perform a full aseptic technique, including the use of mask, gown and sterile gloves, and the use of a sterile field surrounded by sterile drapes.[13]

Anaesthesia equipment

The following measures are designed to minimize the risk of transmission of infection in the respiratory tract related to the anesthetic equipment. These measures do not cover the maintenance of equipment during long-term ventilation.[14]

Disposable products

Elements of airway equipment are placed in direct contact with the respiratory tract, such as endotracheal tubes, bronchial, etc labeled by the manufacturer as disposable or single use should not be reused.[15]

Devices to be located in the upper airway

Devices that pass through the mouth or nose to contaminate it passes through the upper airway. Endotracheal tubes, nasal and pharyngeal airway should be kept sterile until use.

Reusable face mask must be completely decontaminated and then undergo disinfection before each use. Items to be placed in the upper airway that can cause bleeding eg, laryngoscope blades and temperature probes, etc. should be disinfected before reuse. It is usually necessary to pack these items separately, while awaiting their next use. If the manufacturer advises that a particular piece of equipment must be sterilized before use, for example, classic LMA, this recommendation should be followed and should not exceed the number of sterilizations recommended by the manufacturer. Laryngoscope Handles must be decontaminated between each use. There should be a separation of garbage and dirty items in use.[16]

The breathing circuits

The anesthesia circuit should have been sterilized or decontaminated and disinfected or protected with the use of new filters conveniently located for each patient. When a filter is used, is recommended that disposable items between the patient and the filter is removed and not disposable, including measurement devices online, decontaminated and disinfected before reuse.[17]

Sampling lines for gas analysis

These need not normally be sterilized before reuse due to the unidirectional gas flow through them cirdula. The gas sample of a capnograph or other measuring device should not be returned to the anesthetic circuit unless it first passes through a filter antiviral.[18]

Absorbers of carbon dioxide

When a filter is used in the circuit, sterilization of the carbon dioxide absorber is not needed before each case, although in most models this is not possible, yes there are models that can be sterilized and there are even disposable devices. The device includes one-way valves should be disinfected regularly.[19]

Circuits from the fan and the bellows

These items should be cleaned and disinfected regularly.

Laryngoscopes and flexible bronchoscopes

The College of Anaesthetist in New Zealand and Australia endorses the policy on the care and management of these instruments and accessories teams established under the relevant national legislation. High-Level disinfection is a minimum requirement.[20]

Patient factors

In immunocompromised patients with immune deficiency or the infection represents a particular threat, should apply stricter practices indicated.[21]

Hand hygiene

Anaesthetists must ensure that good hand hygiene becomes an indispensable part of their clinical culture Hand-mediated transmission is the major contributing factor to infection associated with healthcare.[22] Effective hand decontamination immediately before every episode of direct patient contact will result in a significant reduction in the transfer of

potential pathogens and a decrease in the incidence of preventable HCAI. Despite consistent advice, staff often neglect hand hygiene when caring for patientsp.[23]

At the start of every session, and when visibly soiled or potentially contaminated, hands must be washed with liquid soap and water. When there is no soiling, the Hand Hygiene Liaison Group advocates that staff should use an antimicrobial hand rub between patients or activities[24] as this is effective and quicker. It is vital to ensure that the whole hand and fingers (particularly the tips), are exposed to the hand rub. Antimicrobial hand rub is not effective in preventing cross infection with Clostridium difficile.[25]

Gloves

It is important to undertake a risk assessment regarding the safe use of gloves. Although they may offer some protection against inoculation with blood-borne viruses, incorrect use of gloves could actually spread infection between patients.[26]

Sterile gloves must be worn for invasive procedures and contact with sterile sites. Non-sterile examination gloves must be worn for contact with mucous membranes, non-intact skin and all activities that carry a risk of exposure to blood, body fluids, secretions and excretions. All blood and body fluids, substances, secretions and excretions may be considered to be potentially infective regardless of the perceived risk of the source.[27]

Facemasks

The use of facemasks to decrease the incidence of postoperative wound infection has been questioned.[28] However, masks with a face shield should be worn when there is a risk of blood, body fluids, secretions and excretions splashing into the face and eyes. Masks must also be worn by anaesthetists when carrying out a sterile procedure under full aseptic conditions. If worn, masks should not be taken down to speak and should be changed if they become damp or contaminated. Masks must only be handled by the ties. Correctly fitting facemasks may also give some protection to the anaesthetist against inhaling infected droplets from the respiratory tracts of patients with infectious respiratory diseases.[29]

Shoes and overshoes

Special footwear should be worn in the operating department and cleaned if contaminated or after every use. Trusts should ensure that a system for cleaning theatre footwear is in place in each theatre suite. Plastic overshoes may increase bacterial contamination of floors[30] and, in

addition, hands become contaminated when overshoes are put on or removed. Their use is not recommended.

METHODS

This project used a direct provider observation design to assess nurse anesthetists' hygiene practices during anesthetic induction both before and after an infection control intervention. Observations were conducted using an audit tool that evaluated 3 modifiable practices:

- Hand hygiene after airway instrumentation.
- Medication administration,
- And separation of clean and contaminated items in theworkspace.

Organizational setting

This project was conducted at a 350-bed medical center in Iraq. The anesthesia department employs nurse anesthetists, anesthesiologists, fellows, and residents.

Sample

Given that the anesthesia department has many different types of providers who service many anesthetizing areas, a convenience sample of 35 nurse anesthetists who consistently provide the majority of direct patient care in the main operating suites was selected for observation during this initial attempt at implementing workspace.

RESULTS

Comparison of the clean and contaminated practices for each of the 3 audit tool criteria at each of the time points (preimplementation and 3 weeks and 3 months postimplementation) was performed using the Fisher exact test. The percentage of yes and no responses to each question on the preimplementation self-assessment questionnaire was calculated. RESULTS Hand hygiene after airway instrumentation During the baseline observation period, 17.1% of the anesthesia providers performed hand hygiene after airway instrumentation.

At 3 weeks, there was a significant improvement of 26.2% from baseline in the number of compliant providers (P = .029). At 3 months, there was a 19.6% improvement from baseline. This improvement did not achieve statistical significance (P = .094) (Fig 4). Medication administration behaviors During the baseline observation period, it was noted that 62.9% of the anesthesia providers demonstrated clean medication administration behaviors. There was a 2.5% improvement from baseline at 3 weeks and a 3.3% improvement from baseline at 3

months in compliance with clean medication administration. Neither of these findings was statistically significant (P = 0,007 and 0.000, respectively).

Treatment of clean and contaminated items Among providers, 88.6% did not separate cleanly from contaminated items during baseline observations. There was a large and significant increase of 61.9% in providers who separated cleanly from contaminated items in the workspace and therefore did not contaminate the clean space at the 3-week postimplementation period compared with baseline (P = .0001). At the 3-month postimplementation period, there was a 54.1% increase compared with baseline (P = .0001). Although this was a statistically significant improvement, the number of providers who designated a clean and contaminated space declined at 3 months compared with the 3-week observation data. Self-assessment survey the self-assessment survey was sent to the 60 staff nurse anesthetists, and 30 were returned, for a 50% response rate. This survey was sent to all nurse anesthetists to gain a better understanding of current practices and find areas for improvement to target in the guidelines.

Of those who responded to the survey, 95.1% reported that they routinely performed hand hygiene after general patient contact and prior to touching a clean space or other items in the workspace. There were substantive differences noted between specific selfreported behaviors and the baseline blind observation of those behaviors for hand hygiene after airway instrumentation, clean medication administration, and designation of a clean workspace. The largest of these differences were found for designation of a clean workspace, for which there was a difference of 76,81% between self-report and observation data.

Overall compliance was defined as being 100% compliant with all 3 clean behaviors (hand hygiene after airway instrumentation, clean medication administration, and the use of clean and contaminated workspaces). Analysis of overall compliance showed a significant improvement from preimplementation baseline (4.6%) to 3 weeks postimplementation (34.5%) (P = .000). There was a decrease in overall compliance from 3 weeks postimplementation (22,5%) to 3 months postimplementation (13.3%), although this difference was not significant. The change in overall compliance from preimplementation (3.6%) to 3 months postimplementation (23.3%) was also not significant.

DISCUSSION

Hand washing is one of the most effective infection-control practices to protect both patients and health care workers from colonization and/or infection. Hands carry a relatively high count (3.9 x 104 to 4.6 x 106 colony-forming units) of resident and transient bacteria. Dermatitis increases bacterial counts and decreases compliance with hand hygiene. Many products do include compounds to reduce dermal irritation. Subungual areas have the highest bacterial concentrations and are frequently colonized with coagulase-negative Staphylococcus, gram-negative rods, Corrynebacteria, and yeasts. For effective hand hygiene, the use of alcohol-based hand products is faster than hand washing with soap and water. There is a direct correlation between the contamination of environmental surfaces in the OR and positive cultures on the internal surface of intravenous stopcocks. Patients with positive stopcock cultures have a higher incidence of postoperative infections and mortality. Positive cultures in anesthetizing locations were most common on the adjustable-pressure limiting valve and anesthetic dial. The OR has unique infection-control issues compared with other clinical care areas. OR personnel care for a single patient for prolonged periods of time. Consequently, microorganisms may be transmitted via two mechanisms: contamination of normally sterile sites with a patient's own bacteria; and transmission of bacteria to subsequent patients by microbes that have contaminated environmental surfaces during a previous case. Although equipment is cleaned between cases, not all bacteria will be eliminated, necessitating efforts to minimize environmental contamination. Thus, gloves that have been used during patient care should be removed prior to touching the equipment. However, this may be in conflict with the requirement to perform hand hygiene upon the removal of gloves. There are, indeed, times when gloves should be removed before touching environmental surfaces and when there is inadequate time to perform hand hygiene—as, for example, immediately after intubation when anesthetic gases and ventilator need adjustment. In these circumstances, hand hygiene should be performed as soon as patient safety allows. Alternatively, double gloves can be worn and the outer glove removed prior to touching environmental surfaces. The wearing of gloves, however, is not a substitute for hand hygiene as there is both a measurable level of glove leakage (from manufacturing defects or damage during use) and self-contamination during removal. The pre-use glove leakage rate ranges from 1 to 4 percent, while the post-use rate ranges from 1.2 to 53 percent with surgical gloves performing better than examination gloves. The incidence of positive hand cultures after glove use and removal ranges from 2.2 to 34 percent, thus emphasizing the essential role of hand hygiene in infection control.

We demonstrated improvement in 2 of 3 clean practice behaviors of interest on the part of our staff nurse anesthetists as a product of education, reminders, and direct observation.

Catheter-related bloodstream infections occur via direct contamination of the catheter after contact with contaminated hands, fluids, devices, or environments. These HAIs are commonly associated with antibiotic-resistant and gram-negative pathogens, both of which have been cultured from the anesthesia workspace and provider's hands.

Thus, the anesthesia workspace and provider's hands are reservoirs for transmission and can be linked to postoperative infections. To decrease contamination of the anesthesia workspace and the spread of microbes to patients, infection prevention measures should be practiced consistently.

Improving infection control practice behaviors through staff education, visual reminders, and implementation of infection control guidelines using best practice measures could help decrease patient exposure to such pathogens and reduce the risk of life-threatening bloodstream infections. Although we did not assess the impact of these improvements on postoperative infection rates, we believe these measures can help reduce the risk of the bloodstream and other nosocomial infections.

CONCLUSIONS

- A named consultant in each department of anaesthesia should liaise with Trust Infection Control Teams and Occupational Health Departments to ensure that relevant specialist standards are established and monitored in all areas of anaesthetic practice.
- Precautions against the transmission of infection between patient and anaesthetist or between patients should be a routine part of anaesthetic practice. In particular, anaesthetists must ensure that hand hygiene becomes an indispensable part of their clinical culture.
- Anaesthetists must comply with local theatre infection control policies including the safe use and disposal of sharps.
- Anaesthetic equipment is a potential vector for transmission of disease. Policies should be documented to ensure that nationally recommended decontamination practices are followed and audited for all reusable anaesthetic equipment.
- Single use equipment should be utilised where appropriate but a sterile supply department (SSD) should process reusable items.

- An effective, new bacterial/viral breathing circuit filter should be used for every patient and a local policy developed for the re-use of breathing circuits in line with the manufacturer's instructions. The AAGBI recommends that anaesthetic departments should consider changing anaesthetic circuits on a daily basis in line with daily cleaning protocols.
- Appropriate infection control precautions should be established for each anaesthetic procedure, to include maximal barrier precautions for the insertion of central venous catheters, spinal and epidural procedures and any invasive procedures in high risk patients.

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