



Original contribution

Profile of anesthetic infection control in Taiwan: a questionnaire report[☆]

Richard C.H. Or MD (Senior Anesthesiologist)^a, Teng K. Hsieh MD (Staff Anesthesiologist)^b,
Kuo M. Lan MD (Staff Anesthesiologist)^b, Fu C. Kang MD (Lecturer)^b,
Ying H. Chen MD, MSc (Lecturer)^b, Edmund C. So MD (Assistant Professor)^{b,c,d,*}

^aDepartment of Anesthesiology, Kuang Tien General Hospital, Dajia Branch, Taichung, Taiwan

^bDepartment of Anesthesiology, Chi-Mei Medical Center (Yung Kang and Lui Yin), Taiwan

^cInstitute of Basic Medical Science, National Cheng Kung University, Tainan, Taiwan

^dDepartment of Nursing, Chung Hwa University of Medical Technology, Tainan, Taiwan

Received 28 September 2007; revised 7 June 2008; accepted 14 June 2008

Keywords:

Anesthesiologists;
Disinfection;
Infection control
guidelines;
Nurse anesthetist;
Perioperative infection
control;
Personal hygiene

Abstract

Study Objective: To evaluate compliance of anesthesiologists and nurse anesthetists with personal hygiene and anesthetic equipment disinfection procedures in Taiwan.

Design: Survey instrument.

Setting: Anesthesiologists and nurse anesthetists working in medical and non-medical centers in Taiwan.

Participants: 81 anesthesiologists and 181 nurse anesthetists working in medical and non-medical centers.

Measurements and Main Results: Questionnaires were sent to 500 anesthesiologists and nurse anesthetists in Taiwan. Two hundred sixty-two (52%) completed questionnaires (127 from medical centers and 135 from non-medical centers). Completed questionnaires were divided into two groups: those from medical centers (Group A) and those from non-medical centers (Group B). There was no significant difference in personal hygienic practices (wearing gloves and washing hands) between Groups A and B. There were significant differences between anesthesiologists and nurse anesthetists in wearing gloves (65.3% vs. 82%; $P = 0.001$) and hand washing (52.6% vs. 70.4%; $P = 0.003$). Medical center anesthesiologists and nurse anesthetists performed better than their non-medical-center counterparts when using disinfection procedures and disinfectants for laryngoscope blades and the cleaning of fiberoptic scopes.

Conclusions: Teaching programs should include anesthesia infection control in the curriculum for anesthesiologists and nurse anesthetists.

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1. Introduction

In the United States, 6% of hospitalized patients contract nosocomial infections annually at a cost of approximately US \$5-10 billion [1,2]. Prevention of

[☆] Support for this study was departmental only.

* Corresponding author. Department of Anesthesia, Chi-Mei Medical Center, Yung Kang City, Tainan 710, Taiwan. Tel.: +1 886 6 281 2811x53354; fax: +1 886 6 283 0122.

E-mail address: edmundsotw@mail.chimei.org.tw (E.C. So).

nosocomial infections may help decrease Taiwan's National Health Insurance costs. Successful infection control requires proper hygiene techniques and an understanding of the modes of disease transmission, including patient-to-patient (cross-infection) [3-6], surface-to-patient [7-11], and patient-to-health-care workers. Patients can bring dangerous bacteria into the operating area. Patients with chronic diseases or poor immunity are more prone to contracting postoperative infections. In the operating room (OR), anesthesiologists and nurse anesthetists may act as vectors for disease transmission, especially when performing invasive procedures. This study evaluated whether anesthesiologists and nurse anesthetists in Taiwan are using correct disinfection methods and practicing proper personal hygiene.

2. Materials and methods

2.1. Participants and procedures

Questionnaires were mailed to 500 randomly selected anesthesiologist and nurse anesthetist members of the Taiwan Society of Anesthesiologists (TSA) and the Taiwan Association of Nurse Anesthetists (TANA). At the time of the survey, about 300 anesthesiologists and 600 nurse anesthetists were registered. Retired anesthesiologists and nurse anesthetists, and those not actively performing anesthesia were excluded from this study. A cover letter explaining the importance of the survey accompanied the questionnaire.

2.2. Instruments

Hospitals in Taiwan are reviewed every two years by the Taiwan Department of Health for certification and hospital classification. To be qualified as a medical center, a hospital must provide complete medical services and have 100% specialist service in every department. The annual record of the hospital medical staff's publication in major international journals is considered crucial for certification as a medical center.

The questionnaire consisted of two sections [Appendix A]. The first section contained 4 questions about personal hygiene practices, and the second section asked 5 questions about procedures used to disinfect anesthetic equipment. The questionnaires were entirely anonymous so as to prevent reporting bias. To assure anonymous participation, no additional mail was sent nor were follow-up attempts sent to non-responding members.

2.3. Statistical method

The questionnaires were divided into two groups (Groups A and B) according to their sources, medical center (A) or

non-medical center (B). Categorical variables were analyzed using frequency distribution, χ^2 , or Fisher's exact tests. Statistical significance was set at $P < 0.05$. Data were checked in the hospital statistics room.

3. Results

A total of 262 (52.4%) completed questionnaires were received: 127 (25.4%) from Group A and 135 (27%) from Group B. Eighty-one (32.4%) anesthesiologists and 181 (72.4%) nurse anesthetists responded.

3.1. Personal hygiene practices

There was no significant difference in personal hygiene practices (wearing gloves and masks, hand washing between patients, and reusing syringes) between Groups A and B (Figs. 1 and 2).

3.1.1. Personal hygiene practices compared between anesthesiologists and nurse anesthetists

Eighty-two percent of nurse anesthetists reported that they frequently or always wear gloves during anesthesia compared with 65.3% of anesthesiologists ($P = 0.001$; χ^2 test; Fig. 3), and 70.4% of nurse anesthetists reported that they frequently or always wash their hands before performing anesthesia compared with 52.6% of anesthesiologists ($P = 0.003$; χ^2 test; Fig. 3). More than 90% of anesthesiologists and nurse anesthetists reported frequently or always wearing a mask during anesthesia. Only about 6% of anesthesiologists and nurse anesthetists reported frequently or always using syringes more than once. In general, more nurse anesthetists than anesthesiologists complied with standard personal hygiene practices.

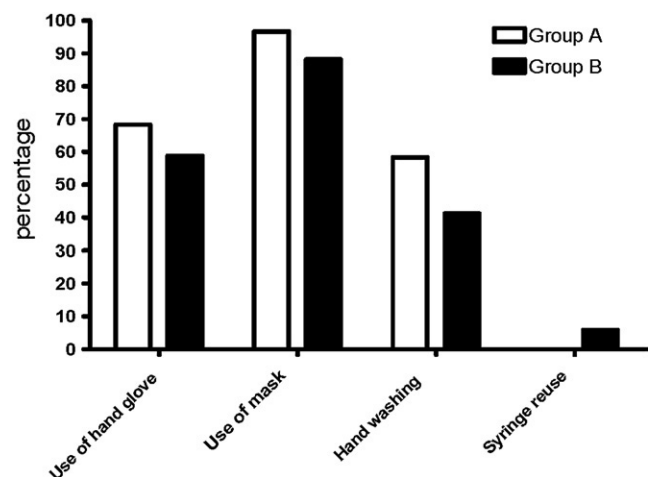


Fig. 1 Personal hygiene practices of anesthesiologists in Groups A and B. There were no statistically significant differences between Group A (medical center) and Group B (non-medical center).

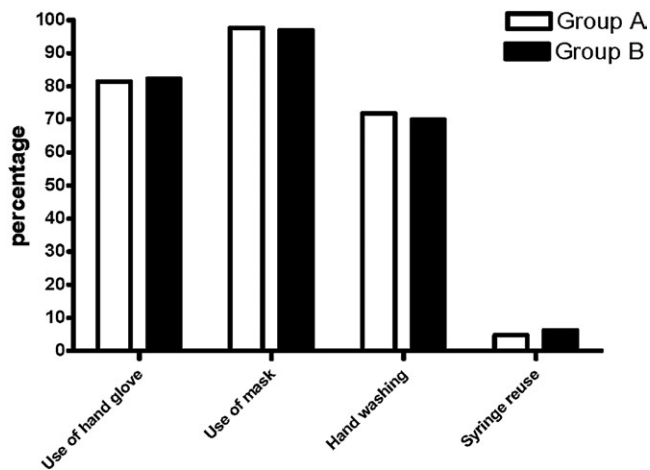


Fig. 2 Personal hygiene practices of nurse anesthetists between Groups A and B. There was no statistically significant differences between Group A (medical center) and Group B (non-medical center).

3.2. Anesthetic equipment disinfection

3.2.1. Disinfection protocols for laryngoscope and fiberoptic

More members of Group A than Group B complied with disinfection protocols for laryngoscope blades (Group A: 80.6% vs. Group B: 68.8%; $P = 0.026$), sterilizing laryngoscope blades (Group A: 89% vs. Group B: 79.6%; $P = 0.019$), and cleaning fiberoptic (Group A: 61% vs. Group B: 45.2%; $P = 0.004$; Fig. 4).

3.2.2. Tourniquet and protective-restraint sterilization

Tourniquets used for intravenous (IV) injection or IV catheter set-up were reported as frequently or always sterilized by 11% of the members of Groups A and B. Protective restraints used on patients' arms and legs during surgery were reported as frequently or always

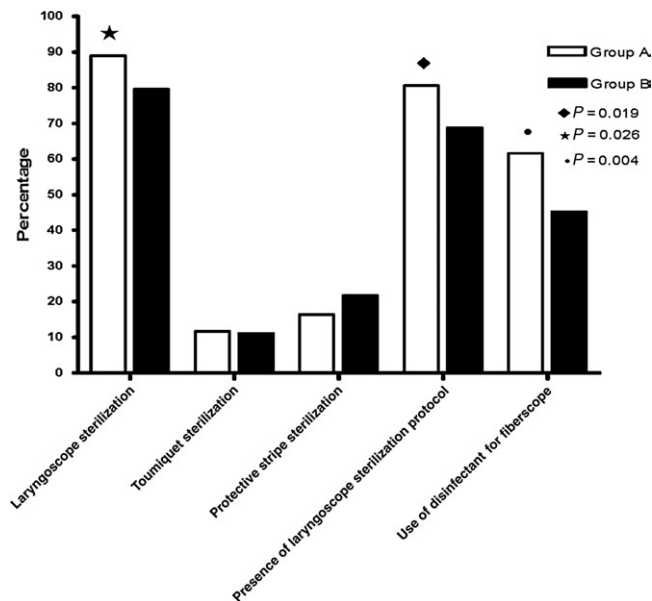


Fig. 4 Sterilization of anesthetic equipment between Groups A (medical center) and B (non-medical center). There were significant differences between the groups in laryngoscope sterilization ($P = 0.026$), presence of a protocol for laryngoscope sterilization ($P = 0.019$), and fiberoptic sterilization ($P = 0.004$).

sterilized by 21% of the members of Group A and 16.4% of Group B ($P = 0.010$).

4. Discussion

Anesthesiologists and nurse anesthetists play a major role in perioperative infection control by practicing good personal hygiene and by properly disinfecting anesthetic equipment. We queried the personal hygiene practices of using gloves and surgical masks, hand washing, and reusing syringes, all of which are important for infection control. Gloves and masks are barriers to microorganisms and contaminants. They minimize the chances of exposing tissue as well as blood and other body fluids to infection [1]. The Occupational Safety and Health Association requires health care workers to wear gloves when handling bleeding patients and infectious materials [2]. Anesthesiologists with active herpes simplex lesions should wear masks and gloves to prevent transmitting the virus to patients during anesthesia [3]. Gloves should be disposed of after use to prevent transmitting pathogens from one patient to another or from one surface to another [2,4]. In this survey, more than 90% of the responding anesthesiologists and nurse anesthetists in Taiwan reported that they frequently or always wear a mask during anesthesia.

Reusing syringes between patients is an unacceptable practice, even if needles are changed [5]. Microorganisms can be introduced into the syringe during a plunger shaft pull [6] or by otherwise passing through the syringe barrel [7].

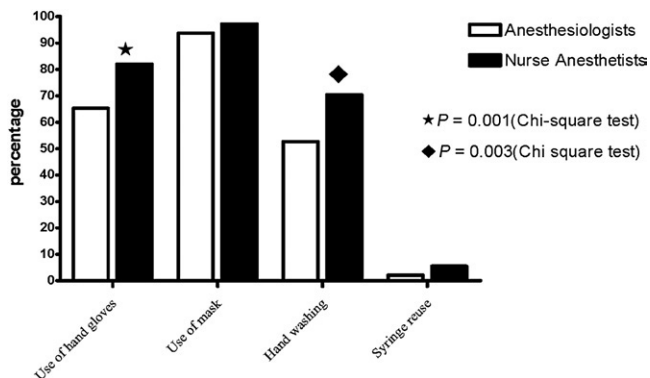


Fig. 3 Personal hygiene practices between anesthesiologists and nurse anesthetists. Nurse anesthetists had a higher compliance rate both in glove wearing ($P = 0.001$) and hand washing ($P = 0.003$) compared with anesthesiologists.

A case of multiple patient-to-patient transmission of human immunodeficiency virus (HIV) as a result of syringe reuse was reported in Australia [8,9], and transmission of hepatitis C virus (HCV) between two patients during colonoscopy as a result of a syringe reuse was reported in France [10]. In the present study, less than 6% of anesthesiologists and nurse anesthetists reported frequently or always reusing syringes. Laws prohibiting the multiple use of syringes in different patients need to be passed and enforced.

Reports of gloves being perforated or torn during treatments have been documented [11,12]. Failure of health care workers to wash their hands and to obey other hand-hygiene guidelines could lead to nosocomial infections and the spread of multi-drug resistant microorganisms [11,13,14]. In fact, most nosocomial infections in intensive care units and post-anesthesia care units are caused by cross-contamination from microorganisms carried on the hands of health care workers [15,16]. Improvements in hand hygiene practices have a demonstrably positive effect on nosocomial infection rates [17,18]. In many cases, the spreading of hospital-acquired infections can be limited by the simple act of improving the hand-washing practices of health care workers [17,19]. Recommendations and guidelines for hand hygiene practices have been issued by professional organizations, including the American Society of Anesthesiologists (ASA), the Centers for Disease Control and Prevention (CDC) [20], the Association for Professionals in Infection Control and Epidemiology [21,22], the Health Care Infection Control Practices Advisory Committee [23], and the Association of Operating Room Nurses. In 2002, modifications were consolidated in "Guidelines for Hand Hygiene in Health Care Settings" [2].

Unfortunately, reports indicate that health care workers often fail to comply with published handwashing guidelines [2,24]. As few as 5% [25], and on average 48% [26], of all health care workers comply with standardized hand-hygiene practices. One 1995 study [27] reported that only 58% of practicing anesthesiologists always washed their hands after contact with patients considered "low risk" for HIV or HCV infection. A 1999 study [28] showed that only 14.5% of anesthesia providers always wear gloves and that only 36.4% wash their hands between cases [28]. The present study showed higher percentages: 52.6% of anesthesiologists and 70% of nurse anesthetists reported frequently or always washing their hands, and 65.3% and 82%, respectively, reported wearing gloves during anesthesia, but there were still 12.7% and 12% differences between handwashing and glove-wearing practices. One explanation for this finding may be that anesthesiologists in Taiwan do not participate in patient preparation such as placing electrocardiographic (ECG) leads or pulse-oximeter sensors. Therefore, anesthesiologists have less body contact with patients and thus are less aware of the patient-care precautions that require hand washing. Second, concepts of infection control are insufficiently emphasized in Taiwan's medical school curricula: infection control in anesthesia is not included in the specialist-training program

here. Another possible explanation for this result is that nursing education in Taiwan puts more emphasis on obedience and vocational commitment than does physician education, a fact that leads to a higher compliance rate by nurses.

Cleaning and sterilizing anesthetic equipment is another important issue in infection control. Contaminated surfaces increase the risk for disease transmission and nosocomial infection [29-31]. The CDC has published guidelines on procedures for disinfecting anesthetic equipment [32]. Items used in the respiratory tract, such as the anesthesia breathing circuit, face mask, laryngoscope blade, endotracheal tube, and oral airway, should be disposed of after use or else undergo high-level disinfection between patients. The tourniquets and protective stripes used in anesthesia are possible media for pathogen transmission and need to be cleaned and sterilized after each use. However, neither Group A (11%) nor Group B (21%) was especially compliant about sterilizing these pieces of equipment. The reason for such a low rate of disinfection may be a lack of specific guidelines.

The infection control policies of the National Health and Medical Research Council, Australian National Council on AIDS, ASA, American Society of Nurse Anesthetists, and the Association of Anesthetists of Great Britain and Ireland, all clearly agree that the apparatus and instruments used that could come in contact with blood or mucosa should be disposed of or, at a minimum, undergo decontamination and high-level disinfection before they are reused. In Taiwan, there are regulations that require the establishment of an infection control committee in all medical centers and regional hospitals. However, there is no strict regulation that requires such a committee.

5. Conclusion

Both anesthesiologists and nurse anesthetists in Taiwan need to improve their handwashing practices and should pursue a higher level of disinfection standards for their anesthetic equipment. It would be helpful if the TSA and the TANA published infection control guidelines for anesthesia personnel to comply with and ensure that they receive appropriate training and education about infection control in anesthesia.

Appendix A

Part I: Personal Hygiene Practice

1. Do you wear gloves while performing anesthesia?
 1. rarely
 2. occasionally
 3. frequently
 4. always

2. Do you wear surgical mask when performing anesthesia?
 1. rarely
 2. occasionally
 3. frequently
 4. always
3. Do you wash your hands before performing anesthesia?
 1. never
 2. rarely
 3. occasionally
 4. frequently
 5. always
4. Do you reuse syringe for multiple patients?
 1. never
 2. rarely
 3. occasionally
 4. frequently
 5. always

Part II: Cleaning and Disinfecting Anesthetic Equipment

1. Is there a protocol for laryngoscope blades cleaning in your hospital?
 1. Not sure
 2. No
 3. Yes
2. Do you use disinfectant to sterilize laryngoscope blades?
 1. never
 2. rarely
 3. occasionally
 4. frequently
 5. always
3. What kind of agents do you use to clean fiberoptic?
 1. water
 2. detergent
 3. disinfectant
4. Do you disinfect the rubber tourniquet used for setting up IV lines or intravenous injections?
 1. never
 2. rarely
 3. occasionally
 4. frequently
 5. always
5. Do you disinfect the operative table protective stripes for patients?
 1. never
 2. rarely
 3. occasionally
 4. frequently
 5. always

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