

Description of Nosocomial Infection Prevention Practices by Anesthesiologists in a University Hospital

Daniel Kishi ¹, Rogério Luiz da Rocha Videira, TSA ²

Summary: Kishi D; Videira RLR – Description of Nosocomial Infection Prevention Practices by Anesthesiologists in a University Hospital.

Background and objectives: Anesthesiologists play an important role in the prevention of nosocomial infections. In anesthetic practice, physiologic barriers are routinely breached, allowing patient contamination with microorganisms and the consequent development of infection. The lack of adherence to recommended practices can facilitate transmission of microorganisms. It is important to describe prophylactic practices of anesthesia-related nosocomial infections performed by anesthesiologists.

Methods: Structured questionnaires were distributed to be answered voluntarily and anonymously by anesthesiologists.

Results: Among 112 anesthesiologists, 75% answered the questionnaire. Surgical mask is used by 95.2% of anesthesiologists, 96.3% wear gloves frequently, 98.9% wear sterile gloves for neuraxial block, 91.3% use sterile technique for central venous puncture, 95.1% wash their hands between cases, 91.6% try to maintain the endotracheal tube sterile, 96.3% discard the prefilled propofol syringe at the end of each anesthesia, 30% clean the vials before using it in the neuraxial blocks, and 19.8% clean the vials before intravenous use.

Conclusions: Respondents showed good adherence to practices of nosocomial infection prophylaxis and to improve them educational multidisciplinary campaigns are necessary.

Keywords: Infection Control; Universal Precautions; Asepsis; Anesthesia.

[Rev Bras Anesthesiol 2011;61(2): 177-187] ©Elsevier Editora Ltda.

INTRODUCTION

Anesthesiologists play an important role in the prevention of nosocomial infections. In anesthetic practice, invasive procedures that breach physiologic barriers, such as tracheal intubation, venous access, or neuraxial blocks are routinely performed allowing contamination of patients with microorganisms and development of infection. Non-adherence to recommended practices can facilitate transmission of microorganisms from the anesthesiologist to the patient, from the patient to the anesthesiologist, and between patients ¹.

Hygiene practices of professionals, adequate cleaning of equipment, and adequate execution of invasive procedures are among important aspects for the reduction of the risk of transmission of infections ².

Hygiene practices related to the anesthetic procedures have been investigated in different countries, such as United States, United Kingdom, New Zealand, and France ³⁻⁶.

METHODS

After approval by the Institutional Ethics Committee of the Hospital das Clínicas of Faculdade de Medicina of Universidade de São Paulo, questionnaires were distributed to anesthesiologists who work in the operating suite of the Instituto Central of that hospital.

The questionnaire was translated and freely adapted from prior studies on prevention of perioperative infections ^{4,5} and it was voluntarily and anonymously answered by anesthesiologists (Questionnaire).

One hundred and twelve questionnaires were distributed to anesthesiologists between September 2007 and August 2008.

Anesthesiologists from the Anesthesiology Division of the Hospital das Clínicas de São Paulo were included in this study as, a convenient, non-random population.

Exclusion criteria were: 1. Anesthesiologists who are not routinely involved in intraoperative care of surgeries conducted at the operating suite; 2. Refusal to answer the questionnaire or to sign the informed consent.

RESULTS

Out of the 112 questionnaires distributed, 84 were answered, which indicates that 75% of the professionals participated in the study. Routine use of eye protection was reported by 21.2% of anesthesiologists, while 95.2% always or frequently wear a surgical mask; 96.3% wear general procedure gloves, while 84.1% use them for venous cannulation; 98.8% wear sterile gloves for the neuraxial block, and 87% wear them for peripheral nerve blocks. Sterile technique including hand wa-

Received from the *Disciplina de Anestesiologia Faculdade de Medicina da Universidade de São Paulo (USP)* – Study performed at *Hospital das Clínicas (HC) of Faculdade de Medicina of USP (FM/USP), Brazil.*

1. Anesthesiologist
2. Anesthesiologist of HC da FM/USP

Submitted on July 13, 2010.
Approved on September 9, 2010.

Correspondence to:
Dr. Daniel Kishi
Rua Serafim Dias Machado nº 171
Vila Maria
12209-240 – São Jose dos Campos, SP, Brazil
E-mail: dk3www@yahoo.com

Table I – Amount and Percentage of Answers of the Questionnaire (n = 84)

	Never	Rare	Always	Freq
	N	%	N	%
Do you wear goggles?	62	73.8	22	26.2
Do you wear a mask in the operating room?	4	4.8	80	95.2
Do you wear gloves?	3	3.7	79	96.3
Procedure gloves – Venous cannulation	13	15.9	69	84.1
Sterile gloves – Neuraxial blocks	1	1.2	80	98.8
Sterile gloves – Peripheral blocks	10	13.0	67	87.0
Do you wash your hands and wear a cap, mask, sterile gown and gloves for central venous access?	7	8.8	73	91.3
Do you wash your hands between cases?	4	4.9	78	95.1
Do you wash your hands before neuraxial blocks?	21	25.9	60	74.1
Do you wash your hands after removing your gloves?	9	11.0	73	89.0
Do you try to maintain the endotracheal tube sterile?	7	8.4	76	91.6
Do you change the filter in the ventilation system between patients?	4	4.9	78	95.1
Do you use a prefilled propofol syringe/dipropofusor to administer medication to more than one patient?	81	98.8	1	1.2
Do you refill the prefilled propofol syringe/dipropofusor for the same patient?	39	47.6	43	52.4
Do you use a three-way stopcock for IV injection of drugs?	3	3.7	79	96.3
Do you clean the vials of drugs with alcohol before using them?				
Intravenous drugs	65	80.2	16	19.8
Neuraxial drugs	56	70.0	24	30.0

shing, mask, headwear, sterile gown, and sterile glove was reported by 91.3% of anesthesiologist (Table I).

Ninety-five per cent of anesthesiologists wash their hands between cases, 89% wash their hands when removing the gloves, and 74.1% wash their hands before a neuraxial block.

The endotracheal tube is maintained sterile by 91.6% of anesthesiologists, and 95.1% change the filter of the ventilation system between patients.

Prefilled propofol syringe was discarded at the end of each anesthesia by 98.8% of anesthesiologists; however, 52.4% refill the propofol syringe for the same patient.

A three-way stopcock is used for intravenous infusion of drugs by 96.3%; however, only 30% reported cleaning vials of drugs with alcohol for use in the neuraxial blocks, while 19.8% clean vials before intravenous administration.

DISCUSSION

Compared to other studies, such as that of Tait et al. in the United States³, with 44% of participation, El Mikatti et al. in the United Kingdom⁴, with 68%, and Ryan et al. in New Zealand⁵, with 61%, the participation of anesthesiologists in the present study (75%) can be considered favorably.

The data presented here shows good adherence to practices of prophylaxis of nosocomial infections, which can be favorably compared to studies in other countries.

In this study, 73.8% of those interviewed never or rarely wear protective goggles. The only study in which this item was mentioned, performed by Ryan et al.⁵ in New Zealand

(NZ), reported similar rates, 63%. Regarding the mask, we observed a proportion similar to the American study of Tait et al.³ (94.9%) and higher than that of the United Kingdom (UK – 68.3%)⁴ and New Zealand (59.5%)⁵. A higher proportion of anesthesiologists reported wearing gloves (96.3%) than that of the studies of Tait et al.³ (USA – 86.3%), El Mikatti et al.⁴ (UK – 54%), and Ryan et al.⁵ (NZ – 84.2%). Regarding neuraxial block, a similar proportion to that of the study of Ryan et al.⁵ (NZ), i.e., 98.8% vs. 99.3%, reported wearing sterile gloves, indicating a well established practice in both countries, but this data is not available in the other studies. Adherence in our institution (91.3%) to the sterile technique, with sterile cap, mask, gloves, and gown for central venous access was lower than that reported by Tait et al.³ (USA), but higher than that reported by El Mikatti et al.⁴ (UK) and Ryan et al.⁵ (NZ), with 70.4% and 70%, respectively (Table II).

Washing hands between cases, a simple procedure that can prevent transmission of microorganisms with the best cost/benefit relationship⁷, was reported by 95.1% of anesthesiologists in the present study, compared to 83.9%, in the study of El Mikatti et al.⁴ (UK), and 93.7%, in the study of Ryan et al.⁵ (NZ). Adherence to this practice is lower before neuraxial blocks (74.1%); despite this, it represented more than double of that observed by Videira et al.⁷ (32%) in a prior study performed in Brazil. According to a recent recommendation of the ASA (American Society of Anesthesiologists), before a neuraxial block, one should wash his/her hands, wear sterile gloves, cap, and mask covering the mouth and nose, besides using individual packages in skin preparation, and remove all jewelry; however, the recommendation of

wearing a sterile gown and changing masks before a new case is uncertain ⁸.

The results suggest effective care with airways contamination, since 91.6% of anesthesiologists try to maintain the endotracheal tube sterile, and 95.1% change the filter of the ventilation system between patients. This care was considerable lower in the study of El Mikatti et al. ⁴ (UK – 7.2%), while in the study of Ryan et al. ⁵ (NZ), 97.1% reported this change. This suggests an improvement in practice in the last decade, although the places of the studies were different (Brazil, UK ⁴, and NZ ⁵), but this item was not analyzed in the American study.

Similar to the study of Ryan et al. ⁵ (NZ), the prefilled propofol syringe was not used in different patients, revealing an adequate practice; however, more than half of those interviewed frequently refill the syringe for the same patient, but the studies undertaken in the USA ³ and UK ⁴ did not report this data.

Although Hemingway et al. ⁹ have shown that cleaning the exterior of vials with alcohol can reduce contamination of the contents, the majority of anesthesiologists does not clean vials before using them, which increases the risks of drug contamination.

Adhesion to prophylactic practices of nosocomial infection reported in the present study was comparatively better than that observed in prior studies.

Some aspects, such as cleaning drug vials with alcohol, are still well below which is desired, indicating that this practice should be stimulated.

To improve hygiene practices, it is possible to suggest placement of signs and charts in anesthesiologist work stations, besides a procedures manual, available in electronic form and as an easy access booklet. Besides, manufactures of drugs used in our specialty could stimulate good clinical practice by printing on packages the recommendation of cleaning them before using them or adopting a sterile package for drugs used in neuraxial blocks.

Table II – Summary of the Main Data of the Studies on Hygiene Practices and Anesthesia (in percentage)

	Brazil 2009	New Zealand 2006	United Kingdom 1999	USA 1995
Goggles	73.8	63	-	-
Mask	95.2	59.5	68.3	94.9
Gloves	96.3	84.2	54	86.3
Sterile gloves for neuraxial blocks	98.8	99.3	-	-
Central venous access – Sterile technique	91.3	70	70.4	97.5
Wash hands between cases	95.1	93.7	83.9	-
Change the filter of the ventilation system	95.1	97.1	7.2	-
Does not reuse the prefilled propofol syringe in different patients	98.8	97.8	-	-

Questionnaire

- 0.1) Year of graduation from medical school:
- 0.2) Title of anesthesiologist a) Yes: b) No:
- 0.3) Master's Degree a) Yes: b) No:
- 0.4) PhD a) Yes: b) No:

- 1. How long have you been practicing anesthesiology?
 - a) 0 to 5 years
 - b) 5 to 10 years
 - c) 10 to 15 years
 - d) > 15 years
- 2. Do you wear goggles?
 - a) Never
 - b) Rarely
 - c) Frequently
 - d) Always
- 3. Why do you do not wear it frequently?
 - a) It is not available in the operating room
 - b) I wear glasses
 - c) fogging of the lenses gets in the way
 - d) It depends on the surgery
 - e) It does not fit on my face
 - f) Others:

- 4. Do you a wear mask in the operating room?
 - a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

Surgical mask	a) Never	b) Rarely	c) Frequently	d) Always
4.1) Tracheal intubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2) Extubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3) Neuraxial blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4) Peripheral blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5) Venous cannulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6) Central venous access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.7) BPI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 5. In which situations do you wear q mask covering your nose? (you can chose more than one answer)
 - a) Never
 - b) Whenever I am in the operating room
 - c) During tracheal intubation
 - d) Whenever performing neuraxial blocks
 - e) Whenever performing peripheral blocks
 - f) Whenever performing central venous access
 - g) Whenever the surgeon asks me to
- 6. Do you wear gloves?
 - a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

6.1) Do you change gloves between cases? Yes No

Procedure gloves	a) Never	b) Rarely	c) Frequently	d) Always
6.2.1) Tracheal intubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.2) Extubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.3) Neuraxial blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.4) Peripheral blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.5) Venous cannulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.6) Central venous Access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.7) BPI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sterile gloves	a) Never	b) Rarely	c) Frequently	d) Always
6.3.1) Tracheal intubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.2) Extubation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.3) Neuraxial blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.4) Peripheral blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.5) Venous cannulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.6) Central venous Access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3.7) BPI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Do you use sterile technique, i.e., washing your hands, wearing a cTMap, mask, sterile gown, and sterile gloves, for central venous puncture?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

8. Is alcohol gel available for disinfection of the hands in the OR?
- a) Yes
 - b) No
 - c) I do not know

Wash hands	a) Never	b) Rarely	c) Frequently	d) Always
8.1) When beginning your day at the operating room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.2) Between cases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.3) Upon getting in close contact with secretions/ blood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.4) Before inducing general anesthesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.5) Neuraxial blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.6) Peripheral blocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.7) Venous cannulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.8) Central venous access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.9) Upon removing the gloves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Do you try to maintain the tracheal intubation tube sterile?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

10. Do you change the ventilation circuit:
- a) After each patient
 - b) Only after infected or high-risk patients
 - c) At the end of the day
 - d) Both b and c
 - e) Others:
 - f) I do not know

11. Do you change the filter in the ventilation system between patients?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

12. Laryngoscope blades are sterilized:
- a) After each patient
 - b) Only after infected or high risk patients
 - c) At the end of the day
 - d) Both b e c
 - e) Others:
 - f) I do not know

13. What type of processing is done with the laryngoscope blade between patients?
- a) Wash with water and soap
 - b) Clean with alcohol
 - c) High-level disinfection
 - d) Sterilization
 - e) Others:
 - f) I do not know

14. Is a disposable laryngoscope blade available?
- a) Yes
 - b) No
 - c) I do not know

15. After the anesthesia, the anesthesia equipment is cleaned with disinfection/germicide agent?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always
 - e) I do not know

16. Do you prepare syringes before beginning the day/ period to be used in several patients?
- a) Yes
 - b) No

17. Do you use a propofol syringe/diprofusor to administer medications to more than one patient?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

18. Do you refill the propofol syringe/diprofusor for the same patient?
- a) Never
 - b) Rarely
 - c) Frequently
 - d) Always

19. If yes, why do you refill the propofol syringe/ diprofusor for the same patient?
 a) Price of the syringe
 b) Limitations of the number of syringes of "Diprivan PFS"
 c) Other:

20. Do you use a syringe to administer medications to more than one patient? (except the diprofusor)
 a) Never
 b) Rarely
 c) Frequently
 d) Always

21. Do you use the three-way stopcock to administer drugs?
 a) Never
 b) Rarely
 c) Frequently
 d) Always

22. Do you clean the vials of medications with alcohol before using them?

Sterile gloves	a) Never	b) Rarely	c) Frequently	d) Always
22.1) Intravenous medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.2) Neuraxial block drugs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.3) Peripheral blocks drugs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Did you have a needle stick-cutting accident with blood in the last 12 months?
 a) Yes
 b) No. How many times?

24. Did you notify this accident?
 a) Yes
 b) No

24.1. If not, why?

- I. I did not consider the accident to be important
 II. I did not have time
 III. The notification does not make a difference
 IV. I collected the exams of the patient (HIV, HbsAg, HepC)
 V. Others

25. Have you been vaccinated against hepatitis B?
 a) Yes
 b) No

26. Do you know your immune status against hepatitis B?
 a) I do not know
 b) Protected against hepatitis B
 c) Not protected against hepatitis B
 d) Carrier of hepatitis B
 e) I would rather not answer this question

27. Do you recap the needle after collecting blood? (patient contact)
 a) Never
 b) Rarely
 c) Frequently
 d) Always

28. Do you recap the needle after applying medications through the infusion tubing? (without patient contact)
 a) Never
 b) Rarely
 c) Frequently
 d) Always

29. Do you usually work when you have:

	a) Never	b) Rarely	c) Frequently	d) Always
29.1) Respiratory infection (cold, flu, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.2) Gastrointestinal infection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.3) Herpes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.4) Psoriasis / dermatitis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.5) Other:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. Do you change your conducts if you know the patient is HIV positive?
 Yes No
 Comments:

31. Do you change your conducts if you know the patients has hepatitis B or C?
 Yes No
 Comments:

32. On a scale from 0 (none) to 10 (significantly), how do you consider the transmission potential of infectious agents of the anesthetic procedure for the patient?

0	1	2	3	4	5	6	7	8	9	10
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33. On a scale of 0 (none) to 10 (significant), how do you consider the transmission potential of infectious agents of the anesthetic procedure for the anesthesiologist?

0	1	2	3	4	5	6	7	8	9	10
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34. Do you have access to the nosocomial infection control manual?
 Yes No

35. Have you read the nosocomial infection control manual?
 Yes No

36. How would you grade the role of the nosocomial infection control commission in the operating room?

0	1	2	3	4	5	6	7	8	9	10
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37. Do you have any suggestions to improve patient and physician safety regarding transmission of infections during the anesthetic procedure?

Thank you for answering this questionnaire.