UNE ÉTUDE DESCRIPTIVE EXAMINANT LES PRINCIPES DES TECHNIQUES ASEPTIQUES AU SEIN DU PERSONNEL EN SOINS PÉRIOPÉRATOIRES LORS DE CHIRURGIES

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RÉSUMÉ

Contexte : On s'attend à ce que les infirmières et les infirmiers en soins périopératoires démontrent une adhérence rigoureuse aux principes aseptiques afin de prévenir les infections de sites opératoires (ISO) étant donné qu'un manquement à ces principes présente un risque grave d'infection pour les opérés.

Méthodes : Une enquête descriptive a été menée à l'aide d'un échantillon de commodité de 87 membres du personnel en soins périopératoires pour décrire le respect déclaré par les intéressés aux principes aseptiques durant les chirurgies.

But : Le but de cette enquête était d'examiner les pratiques des instrumentistes en soins périopératoires en ce qui a trait à l'asepsie chirurgicale.

Résultats : Un pourcentage assez important de participants ont indiqué qu'ils n'observent jamais ou rarement de manquement dans le champ stérile lors de chirurgies, relativement aux systèmes de drainage ouvert par aspiration (46,6 %; n = 41), aux systèmes de drainage fermé par aspiration (46,6 %; n = 41), au matériel de suture (39,7 %; n = 35), à l'utilisation d'instruments chirurgicaux (37,5 %; n = 33) et aux implants prothétiques (56,8 %; n = 50). Les instrumentistes en soins périopératoires étaient moins susceptibles de porter des couvre-chaussures lors d'interventions chirurgicales que les techniciens en salle d'opération (M = 3,42 et 4,17; mdn = 3,00 et 5,00 respectivement; p = 0,026).

Conclusions : Les résultats ont indiqué des domaines d'observance et de non-observance aux principes aseptiques. En raison du fait que le rôle des infirmières et des infirmiers en soins périopératoires est primordial pour maintenir l'intégrité chirurgicale et améliorer les résultats positifs pour les patients, une adhérence rigoureuse aux principes d'asepsie chirurgicale est essentielle pour prévenir les ISO et autres complications.

Les normes de l'AIISOC relatives à cet article figurent dans la publication Normes, lignes directrices et énoncés de positions pour la pratique de soins infirmiers périopératoires autorisés (9e édition) de l'Association des infirmières et des infirmiers de salles d'opération du Canada (AIISOC) de juin 2009, section 2, p. 138 à 142, Normes 7.1 à 7.5.

A DESCRIPTIVE STUDY EXPLORING THE PRINCIPLES OF ASEPSIS TECHNIQUES AMONG PERIOPERATIVE PERSONNEL DURING SURGERY

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ABSTRACT:

Background: Perioperative nurses are expected to demonstrate strict adherence with asepsis principles to prevent surgical site infections (SSIs) as breaching of these principles poses a serious risk of infection to surgical patients.

Methods: A descriptive survey was conducted with a convenience sample of 87 perioperative personnel to describe self-reported compliance with the principles of asepsis during surgery.

Purpose: The purpose of this study was to examine the practices of perioperative scrub personnel with surgical asepsis.

Results: A sizable percentage of participants indicated that they never or rarely observe breaches in the sterile field during surgery with regards to open suction drain systems (46.6%; n = 41), closed suction drain systems (46.6%; n = 41), suture material (39.7%; n = 35), use of surgical instruments (37.5%; n = 33), and prosthetic implants (56.8%; n = 50). Perioperative scrub RNs were less likely to wear shoe covers during surgical procedures than ORTs (M = 3.42 and 4.17; mdn = 3.00 and 5.00 respectively; p = .026).

Conclusions: The findings showed areas of compliance and noncompliance with the principles of asepsis. Given that the role of the perioperative nurse is paramount in maintaining surgical integrity, and enhancing positive patient outcomes, strict adherence to surgical asepsis is vital to prevent SSIs and other complications.

BACKGROUND:

Principles of asepsis are the cornerstones of best practices and positive patient outcomes during surgical procedures. Beyea[1] argued that the recognition of breaks, or breaches, of aseptic technique is paramount to maintaining surgical asepsis, protecting surgical patients, and preventing surgical healthcare associated infections (HAIs). It is incumbent upon perioperative nurses to uphold these principles to ensure the safety of surgical patients. The National Patient Safety Goals of the Joint Commission on the Accreditation of Healthcare Organizations[2] consider HAIs to be sentinel events that must require root cause analysis by healthcare settings.

Surgical site infections (SSIs), a subset of HAIs, continue to be a serious complication of operative procedures,[3] accounting for 14 - 20% of all HAIs.[4,5] Normally, the skin is the first line of defense against infection that is usually breached during surgery, which opens the pathway for microorganism invasion.[6] Surgical asepsis is the primary intervention against the introduction of bacteria at the surgical site. This is a fundamental responsibility of perioperative nurses with regard to the prevention of SSIs.[7]

It is estimated that 2-5% of clean surgical cases, and up to 20% of abdominal surgical patients in the western world, including Canada, develop

SSIs.[8] In the first national point prevalence study in Canada, Gravel and colleagues (2007) suggested furthermore that the rate of SSIs among all Canadian patients was 2.5%. SSIs contribute significantly to increased treatment costs,[9,10] length of stay,[11] and increased mortality and morbidity of patients.[12,13] In the United States, the annual estimate of SSIs are 500,000 out of an approximately 27 million procedures, resulting in it being the third most commonly reported HAI[4,14] (after urinary catheter associated infections and pneumonia).[15] Although it is difficult to project the costs associated with SSIs, because each case varies depending upon the severity of the infection and the resilience of the patient, the aggregate annual cost, in the US, is estimated to run in the billions of dollars.[14,16] Cost implications related to SSIs have also impacted on insurance reimbursement policies in the US. As of October 2008 the Centers for Medicare and Medicaid Services (CMS) no longer reimburse hospitals for costs associated with HAIs.[17]

Several initiatives have been launched to combat the increasing risk of developing SSIs in hospitalized patients. The Institute for Healthcare Improvement (IHI) in the United States, for instance, started several initiatives including the *100,000 Lives, 5 Million Lives, the Surgical Infection Prevention Project* (SIPP), and the *Surgical Care Improvement Project* (SCIP). The SCIP project provides a list of preventive measures that the perioperative team can take to reduce SSI associated morbidity and mortality.[18] In Canada, the Canadian Patient Safety Institute, along with a number of provincial and national partnering organizations, launched the *Safer Healthcare Now!* initiative. This initiative was responsible for the development of the "SSIs getting started kit" for healthcare providers.[19] Despite these initiatives, and advancements in infection control and prevention strategies, SSIs continue to be a common problem in North American hospitals.[3,20,21]

Given that 40% to 60% of surgical site infections are preventable,[22] it is important that perioperative personnel exercise strict adherence to aseptic principles in order to minimize the rate of such infections. Gruendemann reported that 75% of perioperative practices are aimed at the prevention of infections. Prevention of SSIs should start at the operating suite, where scrub personnel assume the responsibility for managing the sterile field and surgical instruments while circulating nurses control the environment and coordinate the aseptic activities of the surgical team. Perioperative nurses are, therefore, in a good position to serve as the first line of defense against surgical site infections.[1] Despite this pivotal role of perioperative personnel, breaching of aseptic principles continues to be a common problem among surgical patients.[14] The purpose of this study was to document self-reported compliance, by perioperative personnel who function in a scrub role capacity, with the principles of asepsis during routine surgeries. The overall aim of the study was to determine if perioperative personnel routinely follow the standards associated with "best practices" of asepsis.

METHODS:

Design:

A cross-sectional, self-report descriptive survey was performed using a convenience sample of 87 perioperative personnel, who function in a scrub role capacity, in two operating suites of a large urban tertiary, teaching medical center. The two operating suites were located in different areas of the hospital. While one suite was designated for general surgery the other was specific to trauma surgeries. While the general surgery suite had 27 operating rooms the trauma surgery suite had 12 operating rooms. The rooms in the general surgery suite were dedicated primarily to a category of surgeries such as women's health, gastroenterology, orthopaedic, and cystoscopies. The rooms in the trauma suite were used for emergency surgeries, routine orthopaedics adjustments, and overflow of routine surgery. Most of the nursing staff members were dedicated to certain rooms and/or specific categories of surgical procedures. However, it was possible that a staff member would be assigned to other operating rooms

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and/or suites when it was deemed necessary. The inclusion criterion for participation required that a participant be a registered nurse (RN) or technician (ORT) practicing in the scrub role during sterile surgical procedures as part of their job description. Although there were approximately 250 full time equivalent (FTE) employees among the surgical healthcare workers, only 128 were eligible for inclusion of this study. A power analysis for .80, alpha of 0.05, and a medium effect size required a minimum sample of 64 participants to compare RNs and ORTs on specific asepsis principles (as outlined in Table 3). Of the 128 FTE eligible for participation in this study, 87 volunteered to participate for a response rate of 68%.

Data Collection and Instrumentation:
Upon ethical clearance from the Western Institutional Review Board® (Olympia, WA, USA), permission was granted by the Surgical Department Chairs and the Director of Perioperative Nursing to survey the participating nursing staff in the operating suites. The research team, consisting of three people (the lead primary investigator and two research assistants), attended a staff meeting during which the principal investigator described the study and invited all staff members who met the inclusion criteria to participate. A research team member provided those who opted to participate with a written informed consent form and an oral explanation about the study and the nature of their participation. Those who signed the informed consent were given two questionnaires to complete:

(1) a demographic data sheet; and

(2) the "Aseptic Technique Surveillance in Perioperative Procedures Survey", which was specifically developed for the purpose of this study.

The demographic data sheet solicited information about the age of the participant, gender, number of years working in the operating room, number of hours worked per shift per day, average number of hours worked per week, education level, basic nursing education, and job position category.

The "Aseptic Technique Surveillance in Perioperative Procedures Survey" was developed to rank best practices of asepsis among perioperative personnel. The survey was developed using the Centers for Disease Prevention and Control Guidelines for Prevention of Surgical Site Infection and the Association of periOperative Registered Nurses (AORN) standards of practice.[23] Standards and guidelines related to best practices of asepsis were extrapolated from the aforementioned documents and used as items in the survey. The survey comprised 47 items in which the participant rated the frequency of compliance with each item using a 5-point Likert scale (i.e., always, most of the time, some of the time, rarely and never). The content of the survey was examined by three infection control professionals who judged the relevance and clarity of each of the 47 items. This process resulted in no revisions being made to the survey. As the intent was not to treat the survey as a psychometric measure of an overall concept, no validity and reliability testing was necessary. Individual items in the survey were, instead, treated as independent units of analysis (i.e. stand-alone variables) in order to provide OR nurses and administrators with specific areas through which they could assess and evaluate their practice. This goal would not have been attainable if data on survey were analyzed within the context of one overall score.

A member of the research team provided each participant with a copy of the survey and allowed them to complete the survey form in private. A member of the research team was, however, present in the OR to answer any questions or concerns that the participant may have had. Completion of the survey was not based on a single procedure observation. Each participant was, instead, instructed to complete the survey considering their overall practice in the OR. Completion of the survey was estimated to take between 10 and 15 minutes. Upon completion the participant placed the survey into a sealed envelope and handed to the research team member. The research team member delivered the sealed envelopes to the research office on a daily basis where they were stored in a locked filing cabinet by the principal investigator (PI). Data

were then entered into a password protected computer by a nursing research assistant. To ensure confidentiality of responses, all data entries were coded so that no personal identifiers were disclosed or used.

Data Analysis:
The Statistical Package for Social Science computer program (version 15; SPSS Inc., Chicago) was used to analyze the data. Descriptive statistics were used to describe the characteristics of the study participants. Data from the Aseptic Technique Surveillance in Perioperative Procedures Survey were analyzed using frequencies, mean, and median descriptive statistics. Given that aseptic practices were measured at an ordinal scale (i.e. 5-point likert scale), comparisons in the scrub role between RNs and ORTs were analyzed using the Mann-Whitney U test.[24] Significant differences between RNs and ORTs were established using an alpha of .05, power of .80 and a moderate effect size.

RESULTS:

Sample Characteristics
Table 1 displays the characteristics of the perioperative personnel in the sample and shows that the majority of participants were female (82.8%; n = 72). It also shows that the sample comprised 74.7% (n = 65) RNs and 25.3% (n = 22) ORTs. The majority of participants were between 30 and 59 years old (85.1%), while a lesser percentage (11.5%) were between 21 and 29 years old. The most frequent range of years cited for experience in the operating room was 12 years or greater (56.3%; n = 49). Forty nine (56.3%) participants had at least a baccalaureate degree, while 35.6% (n = 31) had an associate degree, and 8% (n = 7) had only a high school diploma.

Adherence to Aseptic Techniques:
Table 2 shows that a sizable percentage of participants indicated that they never or rarely observe breaches in the sterile field with regards to open suction drain system in which wound drainage is open to air (46.6%; n = 41) or closed suction drain system whereby vacuum or plastic conduits are used to drain fluids away from the wound by negative pressure (46.6%; n = 41). It also suggests that a sizable proportion either never or rarely observe breaches in the sterile field related to suture material (39.7%; n = 35), use of surgical instruments (37.5%; n = 33), prosthetic implants (56.8%; n = 50), and the practices of other scrub personnel (34.1%; n = 30). Table 3 demonstrates that perioperative scrub RNs were less likely to wear shoe covers during surgical procedures than ORTs (M = 3.42 and 4.17; mdn = 3.00 and 5.00

Table 1. Descriptive statistics of the characteristics of perioperative personnel who practice in the scrub role in the operating room

Variable	N (%)	Variable	N (%)
Age		**Number of years working in the operating room**	
21 – 29	10(11.5)	0 – 3	14(16.1)
30 – 39	20(23.0)	4 – 7	14 (16.1)
40 – 49	32(36.8)	8 – 11	10(11.5)
50 – 59	22(25.3)	12 +	49(56.3)
60 – 69	3(3.4)		
Gender		**Number of hours worked per shift per day**	
Female	72(82.8)	8	71(81.6)
Male	15(17.2)	12 or more	16(18.4)
Position category		**Average number of hours worked per week**	
Technician	22(25.3)	8 – 40	9 (10.3)
Nurse	65(74.7)	41 or more	78 (89.7)
Education level		**Basic Nursing Education**	
High School	7(8.0)	Not applicable	13(14.9)
Associate	31(35.6)	Associate Degree	25(28.7)
Baccalaureate	49(56.3)	Diploma in nursing	11(12.6)
		Baccalaureate	27(31.0)
		Masters	4(4.6)
		Other	7(8.0)

respectively; p = .026). However, there were no significant differences between the two groups in the remaining items of the questionnaire.

DISCUSSION:

The Aseptic Technique Surveillance in Perioperative Procedures Survey was a descriptive self-report survey to determine if perioperative personnel routinely follow the standards for best practices of asepsis. The findings suggested that a high proportion of participating scrub personnel never or rarely observed breaches of asepsis in the sterile field during surgery with regard to the use of products such as suction, sutures, instruments, and implants. The results also suggested that a high proportion of participants never or rarely observed breaches of asepsis committed by other individuals in the operating rooms.

Although scrub nurse personnel are not solely responsible for maintaining the sterile integrity of the products during use, they are responsible for observing and reporting any breaches in the sterile field during surgery. It is the ethical duty and professional responsibility of the scrub personnel to draw attention to or identify the occurrence of a break in sterile asepsis. Although the fulfillment of this responsibility may be uncomfortable and unpopular it is pivotal to preventing SSIs and other complications and thus should be enforced to maintain the integrity of surgical procedures and enhance positive outcomes. Surgical conscience is of utmost importance to ensure patient safety and compliance with standards of care.[25]

The findings showed that RNs and ORTs reported a high frequency of maintaining the principles of asepsis with regard to activities that directly related to them such as wearing gowns, using surgical head cover, performing hand scrub before surgery, and cleaning under the finger nails during scrubbing. These findings, suggest that OR personnel try to adhere to the standards of asepsis during surgery when it comes to activities and standards that directly affect them.

Our findings also showed that RNs and ORTs were not different in their practice with regard to observing and performing most activities pertaining to protecting asepsis during surgery except for wearing shoe covers. The results suggested that RNs were less likely to wear shoe covers than ORTs. This finding is concerning in light of the fact that standards of care for intra-operative attire include wearing shoe covers when exposure to blood or potentially infectious materials is anticipated.[26,27] Although shoe covers are not mandated in all situations, they are part of the operating room attire to prevent microorganism transmission through blood and body fluids. Splatters may occur and fall on the operating attire. In the absence of shoe covers, such splatter may carry a risk to the healthcare provider and present a potential for contamination. Previous research has, in fact, shown that, even after routine cleaning procedures, 63% of the reusable surgical boots have a presence of blood and contamination and that the majority of those boots had significant numbers of bacteria.[25]

CONCLUSION:

The Aseptic Technique Surveillance in Perioperative Procedures Survey findings suggest that RNs and ORTs were similar in their self-reported practices of asepsis while performing in the scrub role. Given that the data suggest that a number of participants do not observe for breaches to asepsis standards as often as one expects, it is important that perioperative personnel strictly adhere to these standards for both their personal safety and the safety of their patients. Challenges for the perioperative team continue to rise as our patient population increases in acuity and microorganism resistance. SSIs must be kept at bay and the number one defensive strategy should be vigilance and assertiveness when enforcing the principles of asepsis in the operating room.

The process of completing the survey was beneficial to raising awareness of asepsis practices. Even though this study was conducted in a large facility, the researchers recommend that it be replicated in a multisite study. The survey tool can be utilized in a variety of ways including self-assessment and peer review. Self-

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Table 2. Frequency of perioperative personnel responses in survey instrument

Variable	Never N(%)	Rarely N(%)	Some of the time N(%)	Most of the time N(%)	Always N(%)
Observe a breach in asepsis during surgery related to open suction drains	11(12.5)	30(34.1)	12(13.6)	2(2.3)	33(37.5)
Observe a breach in asepsis during surgery related to closed suction drains	12(13.6)	29(33.0)	11(12.5)	3(3.4)	33(37.5)
Observe a breach in asepsis during surgery related to suture materials	4(4.5)	31(35.2)	15(17)	4(4.5)	34(38.6)
Observe a breach in asepsis during surgery related to use of surgical instruments	5(5.7)	28(31.8)	20(22.7)	2(2.3)	33(37.5)
Observe a breach in asepsis during surgery related to prosthetic implants	23(26.1)	27(30.7)	4(4.5)	1(1.1)	33(37.5)
Observe breaks in the field by scrub personnel	2(2.3)	28(31.8)	15(17)	4(4.5)	39(44.3)
Keeps hands up and away from body	1(1.1)	0(0)	0(0)	6(6.8)	81(92.0)
Uses sterile towel to dry hands and forearms prior to donning gloves	1(1.1)	0(0)	0(0)	2(2.3)	85(96.6)
Water drips from tips of fingers toward elbow	3(3.4)	1(1.1)	1(1.1)	8(9.1)	75(85.2)
Wears sterile gloves	0(0)	0(0)	3(3.4)	15(17.0)	70(79.5)
Checks integrity of glove for holes/deformities	1(1.1)	1(1.1)	5(5.7)	8(9.1)	73(83.0)
Checks room for proper air exchange/pressures	12(13.6)	6(6.8)	12(13.6)	18(20.5)	40(45.5)
Cleans under fingernails without brush/with brush if first scrub	3(3.4)	1(1.1)	4(4.5)	16(18.2)	64(72.7)
Keeps OR room doors closed during the procedure	0(0)	0(0)	4(4.5)	13(14.8)	71(80.7)
Performs hand/forearm scrub and at least two minutes	1(1.1)	0(0)	7(8.0)	17(19.3)	63(71.6)
Uses surgical head cover	1(1.1)	0(0)	1(1.1)	2(2.3)	84(95.5)
Wears sterile gown	2(2.3)	1(1.1)	1(1.1)	11(12.5)	73(83.0)

Table 3. Mann Whitney comparison of Registered Nurses and Operating Room Technicians survey results

Variable*	M ± SD	Median	Z	P*
Observe a breach in asepsis during surgery related to open suction drains			-.972	.331
RN	3.08 ± 1.503	3.00		
ORT	3.48 ± 1.620	4.00		
Observe a breach in asepsis during surgery related to closed suction drains			-.972	.342
RN	3.08± 1.514	2.00		
ORT	3.48 ± 1.648	4.00		
Observe a breach in asepsis during surgery related to suture materials			-1.201	.230
RN	3.26± 1.406	3.00		
ORT	3.70± 1.428	4.00		
Observe a breach in asepsis during surgery related to use of surgical instruments			-.515	.607
RN	3.28 ± 1.386	3.00		
ORT	3.52 ± 1.473	4.00		
Observe a breach in asepsis during surgery related to prosthetic implants			-1.306	.192
RN	2.78 ±1.682	2.00		
ORT	3.35 ± 1.722	4.00		
Observe breaks in the field by scrub personnel			-.609	.543
RN	3.51± 1.404	3.00		
ORT	3.74 ± 1.356	4.00		
Keeps hands up and away from body			-1.630	.103
RN	4.85 ± .565	5.00		
ORT	5.00 ± .000	5.00		
Uses sterile towel to dry hands and forearms prior to donning gloves			-.272	.786
RN	4.92 ± .510	5.00		
ORT	4.96 ± .209	5.00		
Water drips from tips of fingers toward elbow			-.524	.601
RN	4.77 ± .745	5.00		
ORT	4.57 ± 1.080	5.00		
Uses sterile gloves			-.772	.440
RN	4.78 ± .484	5.00		
ORT	4.70 ± .559	5.00		
Checks integrity of glove for holes/deformities			-.588	.557
RN	4.71 ± .678	5.00		
ORT	4.74 ± .864	5.00		
Checks room for proper air exchange/pressures			-.674	.501
RN	3.82 ± 1.457	4.00		
ORT	3.65 ± 1.402	4.00		
Cleans under fingernails without brush/with brush if first scrub			-.712	.477
RN	4.57 ± .918	5.00		
ORT	4.52 ± .898	5.00		
Keeps OR room doors closed during the procedure			-1.542	.123
RN	4.71 ± .579	5.00		
ORT	4.91 ± .288	5.00		
Performs hand/forearm scrub and at least two minutes			-.246	.806
RN	4.63 ± .651	5.00		
ORT	4.52 ± .947	5.00		
Uses surgical head cover			-1.210	.226
RN	4.58 ± .573	5.00		
ORT	5.00 ± .000	5.00		
Wears sterile gown			-.545	.586
RN	4.71 ± .843	5.00		
ORT	4.78 ± .422	5.00		
Wears shoe covers*			-2.230	.026
RN	3.42 ± 1.488	3.00		
ORT	4.17 ± 1.267	5.00		

Indicates statistical significance at an alpha of .05

reported behaviour calls attention to practice and follow up studies could be designed for actual practice behaviours. That is, future research may be conducted whereby members of the perioperative team could be visually observed during surgical procedures for their behavior toward aseptic techniques.

Given the descriptive self-reporting nature of this study, the researchers recognize that it is not without limitations. Although all perioperative nursing staff were invited to participate in the study, the potential for selection bias could not be eliminated because individual participants were able to self-select. In addition, the self-reporting nature of the study carries a potential for response bias and subjectivity on the part of the individual respondents. Despite these potential limitations, our findings shed light on the issue of breaching of the principles and standards of asepsis during surgery.

ORNAC Standards pertaining to this article can be found in the Operating Room Nurses Association of Canada (ORNAC) (June 2009). *Recommended Standards, Guidelines, and Position Statements for Perioperative Registered Nursing Practice* (9th edition). Section 2, pp 128 -132, Standards 7.1 - 7.5.

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