Cogitare Enfermagem

ORIGINAL ARTICLE

SURGICAL SITE INFECTION: ARE SURVEILLANCE AND RISK PREVENTION MEASURES INSTITUTIONALLY APPLIED?

Larissa Bianca Leite Batista[1], Sabrina Bianca Azevedo Silva[2], Dulce Aparecida Martins[3], Maristela Oliveira Lara[4], Thabata Coaglio Lucas[5]

ABSTRACT

Objective: this study aimed to evaluate measures of surveillance and prevention of surgical site infections in a philanthropic institution in the interior of Minas Gerais.

Method: quasi-experimental study with pre-intervention, intervention and post-intervention period. We used Pearson's Chi-Square test when the expected value was >5 and Fisher's exact test for the expected value <5. The Bonferroni correction was applied for multiple comparisons ($p<0.01$).

Results: the trichotomy was performed with a slide for removal by 66% of professionals. The patient's temperature was significant ($p=0.03$) when associated with the professional category. 84% of the surgeons did antimicrobial prophylaxis prior to surgical incision. In the post-intervention phase, there was a reduction of 84.6% of the professionals who prepared the skin before the surgical incision.

Conclusion: the present study generated quality indicators for the surgical center and, in the absence of follow-up protocols, underestimated adverse events resulting from surgery.

DESCRIPTORS: Surgicenters; Surgical Wound Infection; Antibiotic Prophylaxis; Guideline Adherence; Public Health Surveillance.

HOW TO REFERENCE THIS ARTICLE:

Batista LBL, Silva SBA, Martins DA, Lara MO, Lucas TC. Surgical site infection: are surveillance and risk prevention measures institutionally applied? Cogitare enferm. [Internet]. 2019 [access "insert day, monh and year"]; 24. Available at: http://dx.doi.org/10.5380/ce.v24i0.62968.

[1]Nurse. Federal University of the Jequitinhonha and Mucuri Valleys. Diamantina, MG, Brazil.
[2]Nurse. Coordinator of the Surgical Center of the Santa Casa de Caridade. Diamantina, Minas Gerais, Brazil.
[3]Nurse. PhD in Biomedical Sciences. Professor of Nursing, Federal University of the Jequitinhonha and Mucuri Valleys. Diamantina, MG, Brazil.
[4]Nurse. PhD in Public Health. Professor of Nursing, Federal University of Jequitinhonha and Mucuri Valleys. Diamantina, MG, Brazil.
[5]Nurse. PhD in Mechanical Engineering / Bioengineering. Professor of Nursing, Federal University of the Jequitinhonha and Mucuri Valleys. Diamantina, MG, Brazil.

ARTIGO ORIGINAL / ARTÍCULO ORIGINAL

INFECÇÃO DO SÍTIO CIRÚRGICO: MEDIDAS DE VIGILÂNCIA E PREVENÇÃO DE RISCO SÃO INSTITUCIONALMENTE APLICADAS?

RESUMO

Objetivo: o objetivo deste estudo foi avaliar as medidas de vigilância e prevenção de infecções de feridas cirúrgicas em um hospital filantrópico no interior de Minas Gerais.

Método: estudo quase-experimental realizado nas fases pré-intervenção, intervenção e pós-intervenção. O teste qui-quadrado de Pearson foi utilizado quando o valor esperado era >5 e o teste exato de Fisher para o valore previsto <5. A correção de Bonferroni foi aplicada para múltiplas comparações (p<0,01).

Resultados: a tricotomia com lâmina para remoção foi realizada por 66% dos profissionais. A temperatura do paciente foi significativa (p=0,03) quando associada à categoria profissional. 84% dos cirurgiões realizaram profilaxia antimicrobiana antes da incisão cirúrgica. Na fase pós-intervenção, houve redução de 84,6% dos profissionais que preparavam a pele antes da incisão cirúrgica.

Conclusão: o estudo gerou indicadores de qualidade para o centro cirúrgico e, na ausência de protocolos de acompanhamento, subestimou eventos adversos provenientes da cirurgia.

DESCRITORES: Centros Cirúrgicos; Infecção da Ferida Cirúrgica; Antibioticoprofilaxia; Fidelidade a Diretrizes; Vigilância em Saúde Pública.

INFECCIÓN DEL SITIO QUIRÚRGICO: SON LA VIGILANCIA Y LA PRENVENCIÓN DE RIEGOS MEDIDAS INSTITUCIONALES APLICADAS?

RESUMEN

Objetivo: el objetivo del estudio fue evaluar las medidas de vigilancia y prevención de infecciones de heridas quirúrgicas en un hospital filantrópico del interior de Minas Gerais.

Método: estudio cuasi experimental que se realizó en las fases pre intervención, intervención y pos intervención. Se utilizó la prueba chi cuadrada de Pearson cuando el valor ideal era >5 y el test exacto de Fisher para valor previsto <5. La corrección de Bonferroni se aplicó para múltiples comparaciones (p<0,01).

Resultados: la tricotomía con lámina para remoción se realizó por 66% de los profesionales. La temperatura del paciente fue significativa (p=0,03) cuando asociada a la categoría profesional. De los cirujanos,84% realizaron profilaxia antimicrobiana antes de la incisión quirúrgica. En la fase tras intervención, hubo reducción de 84,6% de los profesionales que preparaban la piel antes de la incisión quirúrgica.

Conclusión: el estudio generó indicadores de cualidad para el centro quirúrgico y, en su ausencia de protocolos de acompañamiento, subestimó eventos adversos provenientes de la cirugía.

DESCRIPTORES: Centros Quirúrgicos; Infección de la Herida Quirúrgica; Profilaxis Antibiótica; Adhesión a Directriz; Vigilancia en Salud Pública.

INTRODUCTION

The surgical center is a complex sector and it performs anesthetic procedures with a high degree of invasion, which is one of the main determinants for the occurrence of Infections Related to Health Care (IRHC), mainly Surgical Site Infections (SSI)[1-2]. In the United States and Europe, SSI are second in the ranking of health-related infections, the mortality rate is approximately 0.4% to 0.8%, and 5% to 10% in more complex surgeries[3-4].

In Brazil, SSI was considered a major risk factor associated with patient safety and has an incidence of 14% to 16% of infections identified in patients admitted to health care facilities[5].

There is still no well-established consensus between pre, intra and post operative control measures for SSI prevention, but multimodal preventive intervention programs based on international and national guidelines have been established as the Guidelines of the Center for Disease Control and Prevention (CDC, 2017), of the National Institute for Health and Care Excellence (NICE, 2017) and the World Health Organization (WHO, 2016) [4,6-7]. These guidelines aim to reduce SSI rates, underreporting and establish safe surgical protocols in surgical centers according to the reality profile of each country.

Several studies have evaluated these guidelines for SSI prevention adapted for each specific type of surgery, problems and possible interventions[1,8-9]. These studies showed the chances of occurring these incidents in surgical centers such as adverse events associated with SSI, and the interest of health institutions in adopting specific guidelines to each type of surgery.

However, there is a gap in the applicability of all recommendations that still require studies and are not well established as to the increase of the Fraction of Inspired Oxygen (FIO2) through face mask during the perioperative period[7]. Or the application of antiseptics immediately before closing the surgical incision[7]. Such practices in the prevention of SSI still require the validity of scientific studies to obtain results of impact on the SSI evaluation criteria. In this sense, the multiprofessional team of the surgical center may not understand how to verify the evaluation indicators and the precise surveillance criteria for SSI control.

In this context, this study had the following research question: Does the multiprofessional team of the surgical center of the present study know and apply the current national and international measures for SSI prevention in their daily service practice? The aim of this study was to evaluate measures of surveillance and prevention of surgical site infections in a philanthropic institution in the interior of Minas Gerais.

METHOD

A quasi-experimental study performed in a surgical center of a philanthropic hospital in the interior of Minas Gerais from December 2017 to July 2018.

The population of this study included physicians, residents, nurses and nursing technicians of both sexes, independent of the age group and the time they have worked in the sector, responsible for the technical or clinical conduction of the surgeries. The sample was based on the representative sample of the multi-professional team from the surgical center, considering a level of significance of 95% and a design error of 5%, adopting a 50% study rate. The total final calculation was 39 participants.

We excluded from this study, professionals who were on medical leave, maternity leave, holidays or days off during the research and those not found after the third attempt to contact them.

The dependent variable was called "risk prevention of SSI", which included the

following outcomes: preoperative bathing; decolonization with mupirocin ointment with or without body wash with chlorhexidine gluconate for prevention of Staphylococcus aureus infection in nasal carriers; preoperative antibiotic prophylaxis; hair removal; preparation of the surgical site; hand preparation for surgery; perioperative oxygenation and normothermia.

The independent variables were as follows: a) demographic: professional category, age and time of performance. b) Knowledge about evidence-based practices for SSI prevention.

To include these variables in the database, the collection occurred in three distinct phases:

Phase 1: Pre-intervention:

Moment 1: consisted of interviews with the multi professional team. The proposed research instrument was developed according to evidence-based practices for prevention of SSI[4,6-7].

The main researcher conducted the face to face interview, considering the time and availability of the professional, in a separate place from the other professionals of the team. The average interview time was 15 minutes. The interviews were recorded and transcribed.

Moment 2: Direct observation of the multi professional team during the care work, in which we used a data collection instrument elaborated by the researchers of this study. In the Informed Consent Term the professionals were informed that they would be observed in their daily practice.

Undergraduate students in nursing, properly trained carried out the observation, in a way that the professionals did not associate the reason for the presence of the observer with the accomplishment of this study, to soften the Hawthorne effect. In the observation sessions all professionals who were included in the current study were observed in the morning and night shifts, from Monday to Friday, with an average duration of three hours for each physician and resident professional and 1 hour for each nurse and nursing technician.

Phase 2: Intervention period: it was an educational intervention with the multi professional team. We carried out a dynamic ludic intervention through educational games based on interactive and ludic dynamics based on the theoretical and practical knowledge of the team about SSI prevention measures.

This intervention goal was to apply an active participatory methodology to understand what the professionals knew, what would be new for them and how they could apply the current SSI prevention measures in the sector.

Phase 3: Post intervention period: evaluation of the impact of the strategies implemented in phase 2 of the study on adherence to the measures to prevent surgical site infection.

Thus, thirty days after the intervention, we performed the direct observation of the all professionals again, using the same time of observation for each professional, method and observation instrument of phase 1.

Data analysis was tabulated and processed in the statistical program Statistical Package for Social Science (SPSS) version 21.0. We presented the Mean ± Deviations for parametric quantitative variables and median and quartiles for nonparametric variables. We used Pearson's Chi-Square test when the expected value was >5 and Fisher's exact test for the expected value <5. The Mann-Whitney test analyzed the non-parametric quantitative variables. The significance level was of 5%. Considering the Bonferroni correction, significant differences were only with $p< 0.01$. The Mc Nemar test was used to compare the pre and post-intervention period.

The present study was approved with opinion number 2,485,475 by the Research Ethics Committee of the Federal University of the Jequitinhonha and Mucuri Valleys.

RESULTS

The average age was 36 years old, with Q1;Q3 = 30;46 years old. The median age was not significant ($p>0.05$) in any of the groups of variables. The average professional performance and time in the surgical center performance was 9.5 ± 6.0 and 8.0 ± 6.0 respectively.

Table 1 shows the distribution of the professional category versus the variables related to the prevention of SSI of phase 1.

Table 1 – Distribution of the professional category versus the variables related to the prevention of surgical site infection in the pre-intervention phase. Diamantina. MG, Brazil, 2018 (continues)

Variables	Professional Category				P-value
	Nurse (n=2) n %	Nursing Technician (n=15) n%	Surgeon (n=19) n %	Resident (n=3) n%	
Trichotomy					
Blade for removal	2(100)	1(7)	2(11)	0	0.56
Electric trichotomizer	0	14(93)	17(89)	3(100)	
Professional doing trichotomy					
Nursing Technician	2(100)	15(100)	10(53)	0	0.001*
Surgeon	0	0	5(26)	0	
Resident	0	0	4(21)	3(100)	
Antimicrobial prophylaxis					0.453
Before the incision	2(100)	11(73)	16(84)	3(100)	
After the incision	0	3(20)	1(5)	0	
No prophylactic use	0	1(7)	2(11)	0	0.153
Nasal ointment for *Staphylococcus aureus*					
Yes	0	0	1(6)	1(33)	0.234
No	2(100)	7(47)	1(26)	2(67)	
Not known	0	8(53)	13(68)	0	
Skin Preparation					0.308
Chlorhexidine gluconate + alcoholic	2(100)	14(93)	18(63)	2(67)	
Alcoholic chlorhexidine gluconate	0	1(7)	1(7)	1(33)	
Iodopovidone aqueous	0	0	0	0	
Iodopovidone alcoholic	0	0	0	0	
Aqueous chlorhexidine gluconate	0	0	0	0	
Moment of skin preparation					0.178

Before paramentation	0	9(60)	13(68)	3(100)	
After paramentation	2(100)	6(40)	6(32)	0	
Who prepared the skin					0.79
Surgeon	0	1(7)	7(37)	2(67)	
Nursing technician	2(100)	14(93)	12(63)	1(33)	
Fraction of Oxygen when general anesthesia					
98/100	0	4(27)	3(16)	0	0.746
95/100	1(50)	3(20)	6(32)	2(67)	
90/100	1(50)	2(13)	5(26)	0	
Not known	0	6(40)	5(26)	1(33)	
Patient temperature during surgery					0.001*
35-36	0	1(7)	6(32)	0	
36,1-37,5	1(50)	2(13)	7(37)	2(67)	
Not known	1(50)	12(80)	6(31)	1(33)	
Hand preparation					0.334
Brushing with iodopovidone and water	0	0	0	0	
Brushing with chlorhexidine and water	2(100)	12(80)	14(74)	3(100)	
Brushing with antiseptic and alcohol 70% before insertion of a sterile glove	0	3(20)	3(16)	0	
Antiseptic and non-brushing water	0	0	0	0	
Common liquid soap and alcohol 70%	0	0	2(10)	0	
Time of surgical preparation of the hands					0.124
1 to 2 minutes	0	0	1(5)	0	
2 to 4 minutes	1(50)	1(7)	4(21)	0	
3 to 5 minutes	1(50)	14(93)	13(68)	3(100)	
Above 5 minutes	0	0	1(5)	0	
Pre-operative bath					0.291
Yes	0	8(53)	8(42)	3(100)	
No	2(100)	3(20)	5(26)	0	
Not known	0	4(27)	6(32)	0	

* Fisher exact test considering the Bonferroni correction

Table 2 shows the distribution of the number of global post-intervention observation opportunities of the multiprofessional team in relation to the measures of SSI prevention.

Table 2 – Distribution of the number of opportunities for observations after intervention of the multi professional team of the surgical center. Diamantina, MG, Brazil, 2018

Variables	Global opportunities for observations n (%)
Trichotomy	n=62
Blade for removal	41(66)
Eletric tricomizer	21(34)
Professional doing trichotomy	n=52
Nursing Technician	15(29)
Surgeon	16(31)
Resident	21(40)
Preparation of the patient's skin	n=101
Iodopovidone	0(0)
Alcoholic chlorhexidine gluconate	24(24)
Iodopovidone aqueous	0(0)
Aqueous chlorhexidine gluconate	1(1)
Chlorhexidine glucuronate + alcoholic	68(67)
Not performed	8(8)
Moment of skin preparation	n=101
Before paramentation	89(88)
After paramentation	12(12)
Who performs the preparation of the skin	n =63
Surgeon	16(25)
Instrumentalist	19(30)
Circulating nurses	21(33)
Resident	7(12)
Hands preparation for surgery	n=118
Brushing with iodopovidone and water	0(0)
Brushing with chlorhexidine gluconate and water	105(89)
Brushing with antiseptic and application of 70% alcohol before sterile glove	10(8.5)
Antiseptic and non-brushing water	3(2.5)
Common liquid soap and alcohol 70%	8(6.9)
Not performed	8(6.9)
Time of surgical preparation of hands	n=129
1 to 2 minutes	5(3.8)
2 to 4 minutes	69(53.4)
3 to 5 minutes	22(17)
More than 5 minutes	33(25.8)

Table 3 presents the direct observations obtained in Phase 1 to the direct observations in Phase 3.

Table 3 - Distribution of surgical site infection prevention variables when comparing pre and post intervention periods. Diamantina, MG, Brazil, 2018

Variables	Pre-intervention n%	Post-intervention n%	P value*
Counting materials before and after surgery			
Yes	34 (87)	0	†
No	5 (13)	39 (100)	
Preparation of the skin before closing the surgical incision			0.105
Yes	13(33)	2(5)	
No	26(67)	37(95)	
Use of hand adornments			0.566
Yes	14(42.6)	13(33)	
No	24(57.4)	26(67)	
Team with apron / gown			†
Yes	39(100)	25(64)	
No	0	14(36)	
Checking equipment problems before surgery			0.132
Yes	33(85)	28(72)	
No	4(15)	11(28)	
Checking the validity of the materials before surgery			
Yes	37(95)	9(23)	0.587
No	2(5)	30(77)	

*Mc Nemar test, † not possible statistical analysis

DISCUSSION

The present study verified that the trichotomy was performed with a slide for removal by 66% of the professionals observed (Table 2). On the other hand, 93% of the nursing technicians and 89% of the surgeons used the electric trichotomizer to remove hair (Table 1).

National and international guidelines recommend trichotomy only when it interferes directly with the surgical site[4,6-7]. In addition, it should be performed with electric trichotomizer, in the smallest possible area immediately before the surgical procedure[4,7]. Although a strongly recommended practice[7], a randomized clinical trial found that there were no differences in the reduction of SSI rates comparing patients who had hair removed with an electric trichotomizer with those whose hair was not removed before surgery[10].

Nevertheless, a prospective cohort study on the incidence of SSI in knee arthroplasty

identified hair removal before surgery as a risk factor for the increased incidence of SSI (OR: 3.09, 95% CI: 2.90-30.26)[11]. Moreover, despite the use of the electric trichotomizer, the risk of infection still remained high when compared to those who did not have the hair removed[11].

Regarding the prophylactic use of antibiotics, NICE guidelines[6] recommend the use of antibiotic only in cases of clean procedures involving the use of prosthesis or implants and potentially contaminated and contaminated surgeries and disapprove prophylaxis for less complex surgeries and without the use of prostheses[6].

Different from this recommendation, a Brazilian descriptive study showed that in the daily practice of the surgical center the majority (76.6%) of the surgeries that used antimicrobial prophylaxis were clean and with minor risk of adverse events[12]. Although there is controversy over the use of antimicrobial prophylaxis for clean surgeries, it is well accepted for open heart surgeries, joint replacements, vascular prostheses and craniotomies[6,8-12].

In the current study, 11% of surgeons who did not use antimicrobial prophylaxis were professionals who carried out clean surgeries, such as cardiologists who performed myocardial revascularization, plastic surgery and neurosurgeons.

To avoid, however, prolonged use of antibiotics, CDC[7] and WHO[4], agree that, for clean and contaminated procedures, there is no indication for additional antimicrobial prophylaxis after the incision closure, even in the presence of drain[4,7].

Regarding the application of nasal ointment to patients with *Staphylococcus aureus*, 68% of the surgeons were not aware of this recommendation. Such recommendation is not advised by NICE guideline[6], as there is no reliable scientific evidence that its applicability contributes to the reduction of SSI. Besides, its routine application may lead to an increase in microbial resistance and future dissemination in the surgical center[9-11]. However, WHO[4] recommends that patients who undergo cardiac or orthopedic surgery and who present nasal colonization with *Staphylococcus aureus* should receive perinatal perioperative applications of 2% mupirocin ointment[4].

Although the application of 2% mupirocin in a short time can reduce the risk of SSI, it is still a gap in scientific knowledge whether such a preventive measure contributes to the non-acquisition of new colonization[5,9].

There was no significant association (p=0.308) between the preparation of the patient's skin and the professional category. Skin antisepsis, however, should be performed by the surgeon after surgical paramentation and not by another professional who is not following the maximum sterile protective barrier (Table 2). Such procedure performed by another professional may increase the risk of the surgical site contamination.

In addition, in the study institution they used degerming chlorhexidine glucoronate for skin antisepsis, followed by the alcoholic to prepare the skin of the patient. WHO recommends the use of chlorhexidine gluconate based alcoholic antiseptic solutions for the preparation of the surgical site[4]. In contrast, CDC recommends the use of alcoholic antiseptic solutions without specifying a type of antiseptic[7]. A study compared the incidence of SSI in two groups of preoperative patients undergoing hepatobiliary-pancreatic treatment after the use of chlorhexidine or iodopovidone prior to surgical incision[8]. The study revealed that there were no significant differences (p> 0.05) in the SSI rates when comparing the two groups[8].

Regarding the preparation of the hands, most of the professionals brushed them with chlorhexidine and water to degerm their hands (Table 1 and 2). According to NICE[6], the surgical team should wash their hands before the first surgery using an aqueous antiseptic solution with a single-use brush to ensure that the hands and nails are visibly clean[6]. In subsequent surgeries, hands may be sanitized with alcoholic solutions containing residual chlorhexidine before wearing sterile gloves if the water quality is not safe[6].

A randomized experimental study compared three different antimicrobial agents for hand degerming[13]. They found that degermation performed with brushing, water and 4% chlorhexidine or hand rubbing without water in alcoholic solution with chlorhexidine gluconate, further reduced the microbial load of the hands when compared to brushing with water containing 10% Polyvinyl Pyrrolidone Iodine[13]. The traditional practice with the use of brushes and water could be rethought since only the friction of the hands with alcoholic solution with residual effect, reduced the microbial load of the hands more when compared to brushing with Polyvinylpyrrolidone 10% iodine[13]. CDC and WHO corroborate this discussion since the preparation of the hands by rubbing them with antiseptic is recommended by health agencies[4,7].

Regarding the variable normothermia, 80% of nursing technicians and 30% of surgeons did not know the patient's temperature during surgery, and they had not the routine to control this parameter (Table 1). We also found such reality in a survey-type study conducted in Massachusetts by nurses who, despite a low rate, 2.6% of the nurses interviewed said that monitoring the patient's temperature was not part of the routine of their sector[14].

We observed that in the sector, they used blankets of ordinary tissue to keep the patient warm, however, air conditioner was maintained between 16°C and 20°C in the surgery rooms, which could contribute to instability of body temperature.

CDC and NICE guidelines stress the maintenance of body temperature as a strong recommendation; however, they do not specify which methods could be used for optimal temperature maintenance[6-7]. Researches, in contrast, suggests that the least effective method to keep patients warm up would be heating blankets and that forced air and intravenous fluid heating devices would be the most effective[3,14-15].

Regarding the preoperative bath, technicians and surgeons were not sure how the routine of this practice worked.

CDC and WHO guidelines, however, recommend a preoperative bath with antimicrobial or non-antiseptic soap or at least an antiseptic agent the night before surgery[4,7]. The guidelines, however, do not clarify either the number of baths required or the break time before rinsing. These recommendations should be transmitted by the surgeon prior to surgery[16].

Regarding intraoperative oxygenation for SSI reduction, there are no scientific studies that show the critical point of fraction of oxygen. Although CDC and NICE do not establish an optimal level of FIO2, it is recommended to increase oxygenation in the immediate intraoperative and postoperative period in patients with normal physiologic lung function undergoing general anesthesia[6-7].

Alternatively, WHO recommends that adult patients undergoing general anesthesia with endotracheal intubation for surgical procedures should receive 80% of intraoperative FIO2 and, if possible, during immediate postoperative for 2 to 6 hours[4].

There are, however, some critical questions that CDC and WHO did not consider in their guidelines as: a) what is the normal physiological level of oxygenation of the tissues and organs of interest? Is it associated with the type of surgery? In the operative procedure, what would be the increase in FIO2, when enough oxygen already exists for the surgical tissue?[17].

High FIO2 should be used in patients who need it, that is, in those in which the lowest supply of oxygen cannot maintain oxygenation within safety margins[17]. In the operating room, the guidelines recommend directing oxygenation to a peripheral Oxygen Saturation (SpO2) ≥ 92%, However, surgical patients generally receive FIO2 between 0.4 and 0.8, resulting in saturation values ≥ 96% in almost all cases[17].

Based on this report, we can conclude that most surgical patients already receive

"high" FIO2, possibly resulting in supra-physiologic oxygenation[17]. Another point to consider is that atelectasis can trigger more easily during anesthesia and in the postoperative when breathing a high level of oxygen fraction. In addition, microscopically, the increase in arterial oxygen saturation may increase morbidity and mortality in patients with hyperoxia[17]. Therefore, monitoring FIO2 in patients submitted to general anesthesia still requires more reliable and specific scientific studies to validate the recommendation.

In order to avoid complications to patients, it is recommended to check the materials before the surgical incision and before the patient leaves the operating room[4]. In none of these stages the procedure performed was verbalized, they did not check and count the materials used, and did not discuss postoperative plans (Table 3).

Another point to note is that 100% of the professionals answered that they should wear an apron or gown in the operating rooms, however, 26% of the professionals entered the operating room, with the presence of the patient, without using an apron or gown.

The variable about whether the professional checks problems with the equipment at the beginning of surgery pointed out that problems with some instrument prior to surgery could influence the potential risk to SSI. As for example there were some rusty, broken instruments or the box of instrumentation wet before the surgery.

In addition, during the observation period, there were problems in the cautery pen and anesthesia equipment, specifically in the respiratory circuit.

In this study we could observe that, in the postoperative phase, there was a reduction of 84.6% in the rate of professionals who prepared the skin before the surgical incision. There is no proven scientific evidence that reapplication of antiseptic agents on the skin immediately before closing the surgical incision reduces the incidence of SSI. Thus, after intervention and knowing the guidelines, many surgeons opted to avoid this practice.

The present study presented limitations associated with the non-epidemiological follow-up of the prevalence or incidence of SSI in the institution studied. In addition, the reduced population number interfered in the analysis of assertion of the analytical results of this study. The results, nevertheless, allowed to evaluate the local reality and to emphasize the importance of active surveillance in the prevention of SSI, implementation of protocols and daily checklists of safe surgery.

CONCLUSION

We verified the need for a systematic monitoring of SSI prevention measures, since in the daily practice of the multiprofessional team, it did not occurred as established by national and international guidelines.

Despite evidence-based interventions prevent risks currently; there is no consensus on certain SSI prevention practices. Isolated practices of prevention are not enough to generate a positive image in reducing the overall risk of infection. The results of this study, however, generated sufficient quality indicators for the medical surgical team to change their behavior in relation to infection control measures, implanting a checklist of safe surgeries in the institution.

Future studies could implement checklist measures associated with experimental research on the rate of microorganisms in patients undergoing surgery.

REFERENCES

1. Westman M, Marttila H, Rahi M, Rintala E, Löyttyniemi E, Ikonen T. Analysis of hospital infection register indicates that the implementation of WHO surgical safety checklist has an impact on early postoperative neurosurgical infections. J Clin Neurosci. [Internet]. 2018 [access 5 jan 2019]; 53. Available at: https://doi.org/10.1016/j.jocn.2018.04.076.

2. Weiser MR, Gonen M, Usiak S, Pottinger T, Samedy P, Patel D, et al. Effectiveness of a multidisciplinary patient care bundle for reducing surgical-site infections. Br J Surg. [Internet]. 2018 [access 3 jan 2019]; 105(12). Available at: https://doi.org/10.1002/bjs.10896.

3. Tubre DJ, Schroeder AD, Estes J, Eisenga J, Fitzgibbons RJ. Surgical site infection: the "Achilles Heel" of all types of abdominal wall hernia reconstruction. Hernia. [Internet]. 2018 [access 4 fev 2019]; 22(6). Available at: https://doi.org/10.1007/s10029-018-1826-9.

4. World Health Organization (WHO). Global guidelines for the prevention of surgical site infection. [Internet] Switzerland: World Health Organization; 2016 [access 23 dez 2018]. Available at: https://www.who.int/gpsc/ssi-prevention-guidelines/en/.

5. Agência Nacional de Vigilância Sanitária (ANVISA). Medidas de Prevenção de Infecção Relacionada à Assistência à Saúde. [Internet]. Brasília: Ministério da Saúde; 2017 [access 12 out 2018]. Available at: https://www20.anvisa.gov.br/segurancadopaciente/index.php/publicacoes/item/caderno-5.

6. National Institute for Health and Care Excellence (NICE). Surveillance report 2017 – surgical site infections: prevention and treatment (2008) NICE guideline CG74. Londres: National Institute for Health and Care Excellence; 2017.

7. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surg. [Internet]. 2017 [access 12 nov 2018]; 152(8). Available at: https://doi.org/10.1001/jamasurg.2017.0904.

8. Park HM, Han SS, Lee EC, Lee SD, Yoon HM, Eom BW, et al. Randomized clinical trial of preoperative skin antisepsis with chlorhexidine gluconate or povidone-iodine. BJS Open [Internet]. 2017 [access 1 nov 2018]; 104(2). Available at: https://doi.org/10.1002/bjs.10395.

9. Badia JM, Casey AL, Rubio- Pérez I, Crosby C, Arroyo-García N, Balibrea JM. A survey to identify the breach between evidence and practice in the prevention of surgical infection: Time to take action. Int J Surg. [Internet]. 2018 [access 5 jan 2019]; 54(1). Available at: https://doi.org/10.1016/j.ijsu.2018.04.038.

10. Kowalski TJ, Kothari SN, Mathiason MA, Borgert AJ. Impact of Hair Removal on Surgical Site Infection Rates: A Prospective Randomized Noninferiority Trial. J Am Coll Surg. [Internet]. 2016 [access 2 jan 2019]; 223(5). Available at: https://doi.org/10.1016/j.jamcollsurg.2016.03.032.

11. Hijas-Gómez AI, Lucas WC, Checa-García A, Martínez-Martin J, Fahandezh-Saddi H, Gil-de-Miguel A, et al. Surgical site infection incidence and risk factors in knee arthroplasty: A 9-year prospective cohort study at a university teaching hospital in Spain. Am J Infect Control. [Internet]. 2018 [access 12 jan 2019]; 46(12). Available at: https://doi.org/10.1016/j.ajic.2018.06.010.

12. Tostes MF do P, Maran E, Raimundo LS, Mai LD. Prática da profilaxia antimicrobiana cirúrgica como fator de segurança do paciente. Rev SOBECC. [Internet]. 2016 [access 10 jan 2019]; 21(1). Available at: https://www.researchgate.net/publication/305217051_PRATICA_DA_PROFILAXIA_ANTIMICROBIANA_CIRURGICA_COMO_FATOR_DE_SEGURANCA_DO_PACIENTE.

13. Tsai JC, Lin YK, Huang YJ, Loh EW, Wen HY, Wang CH, et al. Antiseptic Effect of Conventional Povidone-Iodine Scrub, Chlorhexidine Scrub, and Waterless Hand Rub in a Surgical Room: A Randomized Controlled Trial. Infect Control Hosp Epidemiol. [Internet]. 2017 [access 2 jan 2019]; 38(4). Available at: https://doi.org/10.1017/ice.2016.296.

14. Giuliano KK, Hendricks J. Inadvertent Perioperative Hypothermia: Current Nursing Knowledge. AORN J. [Internet]. 2017 [access 16 ago 2018]; 105(5). Available at: https://doi.org/10.1016/j.aorn.2017.03.003.

15. Lau A, Lowlaavar N, Cooke EM, West N, German A, Morse DJ, et al. Effect of preoperative warming on intraoperative hypothermia: a randomized-controlled trial. Can J Anaesth. [Internet]. 2018 [access 3 jan

2019]; 65(9). Available at: https://doi.org/10.1007/s12630-018-1161-8.

16. Edmiston CE, Lee CJ, Krepel CJ, Spencer M, Leaper D, Brown KR, et al. Evidence for a standardized preadmission showering regimen to achieve maximal antiseptic skin surface concentrations of chlorhexidine gluconate, 4%, in surgical patients. JAMA Surg. [Internet]. 2015 [access 3 jun 2018]; 150(11). Available at: https://doi.org/10.1001/jamasurg.2015.2210.

17. Akca O, Ball L, Belda FJ, Biro P, Cortegiani A, Eden A, et al. WHO Needs High FIO2? Turk J Anaesthesiol Reanim. [Internet]. 2017 [access 08 jan 2019]; 45(4). Available at: https://doi.org/10.5152/TJAR.2017.250701.

Received: 23/11/2018
Finalized: 09/07/2019

Corresponding author:
Thabata Coaglio Lucas
Federal University of Jequitinhonha and Mucuri Valleys
MGT 367 Highway-Km583, 5000 – 39100000 - Diamantina, MG, Brazil
Email: thabata.coaglio@edu.ufvjm.br

Role of Authors:
Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - LBLB, SBAS, DAM, MOL, TCL
Drafting the work or revising it critically for important intellectual content - TCL
Final approval of the version to be published - LBLB, SBAS, DAM, MOL, TCL
Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - LBLB, SBAS, DAM, MOL, TCL