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Adherence to care protocols for non-infection of the surgical site of the spine*

Adesão aos protocolos de atendimento para a não infecção de sítio cirúrgico de coluna

Cumplimiento de los protocolos de atención para la no infección del sitio quirúrgico de la columna vertebral

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Abstract: Objective: to evaluate adherence to treatment protocols for non-surgical site infection (NISC) of the spine and associated factors. **Method:** cross-sectional study conducted through the review of 60 medical records of patients undergoing spinal surgery from 2015 to 2019, its non-infection outcome and related conditions. The study was carried out in the first half of 2020. **Results:** some variables related to NISC were: antimicrobial prophylaxis from 30 to 60 min before surgery (RR= 0.97; p=0.026), normothermia (RR= 0.80; p =0.050), post-surgical hospitalization in the Intensive Care Unit (up to 3 days) (RR=2.00; p=0.040). The frequency of NISC was 83.3% (50/60) p= 0.728). **Conclusion:** only normothermia was a factor associated with non-infection for NISC in linear regression. It is noteworthy that adherence to work processes is essential to protect against infections, reduce adverse events and ensure safety.

Descriptors: Infection Control; Spine; Surgical Wound Infection; Prevention Measures; Patient Safety

Resumo: Objetivo: avaliar a adesão aos protocolos de atendimento para a não infecção de sítio cirúrgico (NISC) de coluna e os fatores associados. **Método:** estudo transversal realizado por meio da revisão de 60 prontuários de pacientes submetidos à cirurgia de coluna de 2015 a 2019, seu desfecho de não infecção e as condições relacionadas. O estudo foi executado no primeiro semestre de 2020. **Resultados:** algumas variáveis relacionadas para NISC foram:

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profilaxia antimicrobiana de 30 a 60 min antes da cirurgia (RR= 0,97; p=0,026), normotermia (RR= 0,80; p=0,050), internação pós cirúrgica em Unidade de Terapia Intensiva (até 3 dias) (RR=2,00; p=0,040). A frequência de NISC foi de 83,3% (50/60) p= 0,728). **Conclusão:** apenas a normotermia foi fator associado a não infecção para NISC na regressão linear. Ressalta-se que a adesão aos processos de trabalho é primordial para a proteção das infecções, reduzir eventos adversos e garantir a segurança.
Descritores: Controle de Infecções; Coluna Vertebral; Infecção da Ferida Operatória; Medidas de Prevenção; Segurança do Paciente

Resumen: Objetivo: Evaluar la adherencia a los protocolos de tratamiento de la infección del sitio no quirúrgico (NISC) de la columna y los factores asociados. **Método:** estudio transversal realizado mediante la revisión de 60 historias clínicas de pacientes sometidos a cirugía de columna entre 2015 y 2019, su desenlace no infeccioso y afecciones relacionadas. El estudio se realizó en el primer semestre de 2020. **Resultados**: Algunas variables relacionadas con NISC fueron: profilaxis antimicrobiana de 30 a 60 min antes de la cirugía (RR = 0,97; p = 0,026), normotermia (RR = 0,80; p = 0,050), internación posquirúrgica en la Unidad de Cuidados Intensivos (hasta 3 días) (RR = 2,00; p = 0,040). La frecuencia de NISC fue del 83,3% (50/60) p = 0,728). **Conclusión:** solo la normotermia fue un factor asociado a la no infección por NISC en regresión lineal. Es de destacar que la adherencia a los procesos de trabajo es fundamental para proteger contra infecciones, reducir los eventos adversos y garantizar la seguridad.
Descriptores: Control de Infecciones; Columna vertebral; Infección de heridas quirúrgicas; Medidas de prevención; Seguridad del paciente

Introduction

Health care-related infections (HAI) are acquired by patients during care and represent the most frequent adverse event in the context of patient safety worldwide.[1-2] Surgical site infections (SSI) are the type of HAIs often monitored and common in low- and middle-income countries. Although less frequent in high-income countries, it remains the second type of HAI in Europe and the United States (USA).[1] An infection prevalence survey found that of the infections that affected hospitalized patients in 2015, 19.3% were related to surgical procedures.[3] The infectious events related to these procedures, according to the World Health Organization (WHO), would be preventable in up to 60% with the application of preventive measures.[1]

Although advances have been made in infection control practices in relation to the structure of care, sterilization methods and surgical technique, SSI remains a relevant cause of morbidity, prolonged hospitalization, and death.[1] SSI is associated with a mortality rate which can range from 3% to 75%.[4] The SSI is among the most costly HAIs, with an estimated annual cost of US$3.3 billion, and is associated with almost 1 million additional hospital days annually.[5-6] In 2014, in the United States, 14.2 million surgeries were performed and, on average, hospital costs for admissions with surgical procedures are more than double the costs for admissions without surgical procedures and spine surgeries are among the procedures of higher cost.[7]

Risk factors are associated with SSI in spinal surgery. Thus, the prevention of these infections is complex and requires the integration of a series of preventive measures before, during and after surgery. The risk elements that stand out are: age, smoking, lack of glycemic control before, during and after surgery, inadequate nutritional status, diabetes mellitus, previous uncontrolled diseases, infections in other sites, length of stay in the healthcare environment in the pre- and post-operative, improper skin preparation, breaking of aseptic techniques, inadequate hand hygiene, iatrogenics in the surgical act, number of invasive procedures, levels of surgery, prostheses and orthotics and factors related to the environment.[8] Other measures applied to surgical procedures they can also influence infection rates. Among them: the use of prophylactic antibiotics outside the protocol standards (30 to 60 min before the incision) and the maintenance of the antibiotic 24 hours after the surgery, the lack of body temperature control during the surgery, and breaks in the surgical technique. Also, the extended time of the procedure and weaknesses in the sterilization of materials, furniture and environment disinfection.[9-10]

Although infection prevention and control are actions developed by a multidisciplinary team, nursing has a prominent position due to its participation in the vast majority of work processes related to prevention, and therefore, it is considered a strategic service to reduce infection rates.[11] Nursing actions in the control and prevention of infections, based on knowledge and scientific update, define attribution of responsibilities in care to achieve quality levels of care development. The care team is responsible for these measures and, in view of this, it is necessary to identify the weaknesses and related risk factors to promote health education in order to expand awareness actions and avoid adverse events. The evaluation of work processes is also important to provide feedback to educational practices and strengthen infection prevention protocols according to the epidemiological profile.[12]

WHO and the National Health Surveillance Agency (ANVISA) Brazil have carried out awareness campaigns and established manuals to guide the measures. This way, these protocols must be applied and monitored in all health services. One of the recommendations to assist in this process of care and evaluate surgical care is the implementation of a Surgical Safety Checklist (LVSC) and checklist related to health care, which advocate the prevention of surgical site infection, improvement of work teamwork and communication, and measurement of care through indicators of processes and results of surgical care.[1-2]

In this context, the question is: are surgical site infection prevention measures being developed in clinical practice? Therefore, the aim of this study was to assess adherence to protocols for non-surgical site infection (NISC) of the spine and associated factors.

Method

Cross-sectional study, carried out by reviewing 60 medical records of patients undergoing spinal surgery from 2015 to 2019 and their non-infection outcome (Figure 1) in a teaching hospital in Santa Cruz do Sul, Rio Grande do Sul, Brazil. This research was carried out by members of the Infection Control Commission, using data from electronic and physical medical records to fill out a specific instrument (data collection form) with standardized variables. Patients undergoing arthrodesis, fracture, dislocation, disc herniation and laminectomy surgery performed by a single surgical team were included. Data collection and evaluation took place in the first semester of 2020. All patients were evaluated during hospitalization and 90 days after discharge. Exclusion criteria were patients with previous surgical infection. They were monitored during hospitalization and up to 90 days after discharge by the infection control service.

This is a study in which patients undergoing spinal surgery were evaluated in relation to the outcome of non-surgical infection and adherence to care protocols. Over the years of research, SSI prevention protocols were revised and implemented in the institution. The implantation of care with preoperative bathing with chlorhexidine the night before the procedure and surgical antibiotic prophylaxis, infused during anesthetic induction for 30 to 60 minutes before the incision; and the additional dose if the procedure lasts for more than 4 hours, with use time of 24 hours, took place in 2012. As for normothermia, maintenance of temperature (T) greater than or equal to 35.5ºC, in the post- immediate surgery and blood glucose less than 200 mg/dl, measured at 6 am on the first postoperative day, were established in 2016, with revision in 2017. In 2018, with the implementation of the LVSC in the institution, the check was established antimicrobial prophylaxis and in 2019, blood glucose control.

The predictor variables associated with NISC, according to the literature[1-2,8,10,13] and collected for the analysis were: age, gender, presurgical admission, presurgical admission to the intensive care unit (ICU), control glycemic levels before surgery, glycemic control after surgery, performing a procedure before surgery, preoperative bathing, preoperative bathing with chlorhexidine, oral hygiene with chlorhexidine, skin degermation with chlorhexidine, skin antisepsis with a combined gluconate solution. 2% chlorhexidine and 70% isopropyl alcohol, skin antisepsis with chlorhexidine and povidone iodine, antimicrobial prophylaxis (30 to 60 min before incision), extended prophylaxis (> 24 hours), normothermia (35.5 to 38.3°C), drains up to 24 hours postoperatively, postoperative stay in the ICU, postoperative stay in the ICU for up to 3 days, total stay up to 10 days, total stay for 11-20 days, total stay for 21-30 days, total stay for more than 30 days.

Some factors were combined in order to assess the outcome of non-infection: length of stay (pre-surgical admission less than or equal to 24 hours, non-presurgical admission to the ICU, post-surgical admission to the ICU within 3 days, total admission of up to 10 days); preoperative patient hygiene (preoperative bath with chlorhexidine and oral hygiene with chlorhexidine); blood glucose control, prophylaxis and normothermia (glycemic control before and after surgery; 30 to 60 min prophylaxis before the incision; normothermia, body T between 35.5 and 38.3°C).

In the analysis of the variables, those that fit as adherence to surgical infection prevention protocols (described as "yes") were considered adequate, and those that do not meet this requirement were considered inadequate, as well as the absence of records in the medical records in relation to the analyzed element (described as “no”).

For classification of SSI of the central nervous system, the criteria established by ANVISA were used.[2] The collected data were compiled into a database in the Excel program and statistically analyzed using the Statistical Package for the Social Sciences program (SPSS IBM, Armonk, USA), version 23.0. Frequencies and proportional distributions of reported cases were analyzed. Variables such as proportions and continuous variables normally distributed as means with standard deviations were evaluated. Used parametric tests for data with normal distributions and non-parametric tests for data without normal distributions. Means were compared using Student's t tests and proportions with chi-square tests.

Effect measures were used as difference of means or difference of proportions, with their respective 95% confidence intervals (95% CI). To determine the significant factors for NISC, the relationship between non-ISC and risk factors was analyzed in this study population using univariate analysis. Multiple linear regression was applied to variables that presented $p < 0.20$ in order to consider protective factors for the outcome. A p value < 0.05 was considered significant.

The project was submitted, via the Brazil platform, for consideration by the Research Ethics Committee (CEP) and approved under opinion number 3.629.429 on October 8, 2019. In addition, in compliance with the Guidelines and Regulatory Norms for Research Involving Human Beings (Resolution CNS 466/12- 510/2016 - 580/2018, of the Ministry of Health).

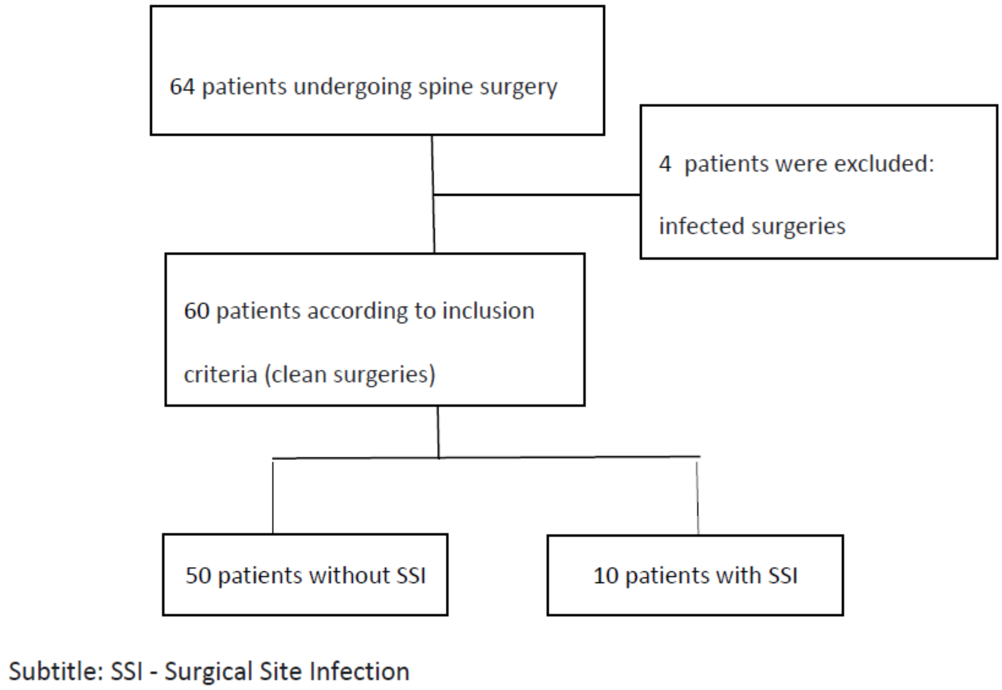

Figure 1 - Flowchart of patients undergoing spinal surgery, Santa Cruz do Sul, RS, Brazil (2015 to 2019)

Results

The 60 patients were classified according to the outcome of non-operative site infection (NISC) and surgical site infection (SSI) (Figure 1). Patients with NISC had the following characteristics: male sex 32 (64%) (RR = 0.90; p= 0.406; 95% CI 0.01 - 0.38), with a mean age of 54.94 years (± 17.49) (95% CI 49.06 – 62.07). NISC patients were analyzed according to the associated variables for NISC (Table 1 and Table 2), which were: oral hygiene with chlorhexidine (RR = 1.03; p = 0.023; 95% CI 0.00 - 0.23), antimicrobial prophylaxis from 30 to 60 min before surgery (RR= 0.97; p=0.026; 95% CI 0.00 - 0.40), normothermia (T between 35.5-38.3°C) (RR= 0.80; p=0.050; 95% CI 0.00 - 0.46), post-surgical admission to the ICU (up to 3 days) (RR=2.00; p=0.040;

95% CI 0.06 - 0.84), hospital stay for more than 30 days (RR=0.69; p=0.017; 95% CI 0.03 – 0.54). The frequency of NISC was 83.3% (50/60) p=0.728; 95% CI 0.00 - 0.33).

In the Tables below, associated variables for NISC will be addressed, described as yes the indicators of adherence to the protocol.

Table 1 - Univariate analysis of associated factors for pre-surgical NISC, Santa Cruz do Sul, Rio Grande do Sul, 2020.

	Without ISC * (n =50)		p - Value[‡]	RR[§] (CI[‖] 95%)
	Yes[†]	No[†]		
Pre-surgical hospitalization >[¶] 24 hours	35 (70.0)	15 (30.0)	0.522	1.08 (0.87 – 1.36)
Pre-surgical hospitalization in ICU**	17 (34.0)	33 (66.0)	0.338	1.12 (0.87 – 1.45)
Glycemic control before surgery	22 (44.0)	28 (56.0)	0.728	0.96 (0.76 – 1.21)
Procedure before surgery	6 (12.0)	44 (88.0)	0.497	0.89 (0.58 – 1.34)
Preoperative bath	33 (66.0)	17 (34.0)	0.717	1.04 (0.82 – 1.34)
Water/soap/chlorhexidine bath	14 (28.0)	36 (72.0)	0.067	1.07 (0.85 – 1.35)
Oral hygiene with chlorhexidine	6 (12.0)	44 (88.0)	0.023	1.03 (0.74 – 1.43)
Chlorhexidine degermation	37 (74.0)	13 (26.0)	0.275	0.87 (0.71 – 1.06)
Chlorhexidine antisepsis and isopropyl alcohol	10 (20.0)	40 (80.0)	1.000	1.00 (0.78 – 1.33)
Chlorhexidine antisepsis	27 (54.0)	23 (46.0)	0.351	0.90 (0.72 – 1.12)
Chlorhexidine antisepsis and PVPI	13 (26.0)	37 (74.0)	0.068	1.27 (1.11 – 1.47)
Antimicrobial prophylaxis (30 to 60 min before incision)	8 (19.5)	33 (80.5)	0.026	0.97 (0.69 – 1.36)

[*] SSI: Surgical Site Infection. [†] n (%). [‡]Chi-square test. [§]RR: Relative Risk. [‖]IC: Confidence Interval. [¶]>: larger[**]ICU: Intensive Care Unit.

Table 2 - Univariate analysis of associated factors for trans- and postoperative Santa Cruz do Sul, Rio Grande do Sul, 2020.

	Without ISC[*] (n =50)		p - Value[‡]	RR[§] (CI[‖] 95%)
	Yes[†]	No[†]		
Glycemic control after surgery	27 (54.0)	23 (46.0)	0.817	1.03 (0.84 – 1.25)
Extended antimicrobial prophylaxis ≤[¶] 24 hours	4 (8.0)	46 (92.0)	0.120	1.22 (1.08 – 1.38)
Normothermia (body temperature between 35,5 and 38,3ºC[**])	27 (54.0)	23 (46.0)	0.050	0.80 (0.63 – 1.00)
Drain after 24 hours after surgery	47 (94.0)	3 (6.0)	0.103	0.89 (0.68 – 0.93)
Post surgical admission to the UTI[¶]	15 (30.0)	35 (70.0)	0.069	0.80 (0.59 – 1.06)
Post surgical admission to the ICU[¶] up to 3 days	12 (80.0)	3 (20.0)	0.040	2.00 (0.83 – 4.83)
Total hospitalization up to 10 days	14 (28.0)	36 (72.0)	0.230	1.17 (0.96 – 1.42)

Total hospitalization of 11 - 20 days	18 (36.0)	32 (64.0)	0.327	1.12 (0.91 – 1.39)
Total hospitalization of 21 - 30 days	11 (22.0)	39 (78.0)	0.889	1.12 (0.78 – 1.33)
Total hospitalization >[‡‡] 30 days	8 (16.0)	42 (84.0)	0.017	0.69 (0.44 – 1.07)

[*] SSI: Surgical Site Infection. [†] n (%). [‡]Chi-square test. [§]RR: Relative Risk. [||]IC: Confidence Interval. [¶]≤: lesser equal. [**]ºC: Degrees Celsius. [††]ICU: Intensive Care Unit. [‡‡]>: larger.

In Table 3, some random elements were associated in relation to the hospitalization characteristics, preoperative hygiene of the patient and glycemic control, normothermia and prophylaxis. Both associations showed no significant difference as a protective factor for NISC.

Of the patients with NISC, the mean preoperative hospital stay was 9.56 days (± 10.20), 15 (30%) patients were transferred to the ICU postoperatively, with a mean of 2.6 (+ 2 .03) days of hospital stay and the average hospital stay was 19.58 (+14.17) days.

Of the 22 variables analyzed, seven weaknesses were found in relation to the records in the medical records regarding adherence to the protocols of prevention measures: preoperative bath 17/50 (34%) and preoperative bath with 20/50 chlorhexidine (40%) and body normothermia between 35.5 to 38.3ºC 23/50 (46%). The overall protocol adherence rate for NISC was 37.4%.

Table 3 – Univariate analysis of associated factors for NISC, Santa Cruz do Sul, Rio Grande do Sul, 2020.

	Without ISC[*] (n =50)		**p - Value[‡]**	**RR[§] (IC[||] 95%)**
	Yes[†]	**No[†]**		
Pre-surgical admission ≤[¶] 24 hours; No pre-surgical admission to the ICU**; Post surgical admission to the ICU** up to 3 days; total time of admission up to 10 days	12 (24.0)	38 (76.0)	0,327** (0.00 – 0.29)	1,14 (0.92 – 1.40)
Pre-operative bath with chlorhexidine; oral hygiene with chlorhexidine	6 (12.0)	44 (88.0)	0,857** (0.01 – 0.28)	1,03 (0.74 –1.43)
Glycemic control before and after surgery; Prophylaxis 30 to 60 min before incision; normothermia (body temperature between 35,5 and 38,3ºC[††])	7 (14.0)	43 (86.0)	0,734** (0.00 – 0.42)	1,05 (0.53 – 1.33)

[*]SSI: Surgical Site Infection. [†] n (%). [‡]Chi-square test. [§]RR: Relative Risk. [||]IC: Confidence Interval. [¶]≤lesser equal. [**] ICU: intensive Care Unit. [††] ºC: Degrees Celsius [‡‡]>: larger.

Normothermia was the only variable that maintained an association as a factor associated with NISC (RR, 0.16; 95% CI, -0.920 – -0.015) (Table 4). The other variables presented p>0.20 in the regression model.

Table 4 - Regressão linear múltipla de variáveis preditoras para NISC, Santa Cruz do Sul, Rio Grande do Sul, 2020.

	Without SSI* (n =50)	p - Value‡	RR§ (IC‖ 95%)
Normothermia (body temperature between 35,5 and 38,3ºC)	27 (54)†	0.038	0.16 (-0.92 – -0.01)
Post surgical admission at ICU¶ up to 3 days	12 (80)†	0.148	0.10 (-0.36 – -0.87)

* SSI: Surgical Site Infection. † n (%). ‡Chi-square test. §RR: Relative Risk. ‖IC: Confidence Interval. ¶ICU: Intensive Care Unit.

Discussion

SSIs are frequent complications and one of the main causes of postoperative morbidity (prolonged hospital stay and use of antimicrobials) and mortality, in addition to direct and indirect costs.[14] Despite the implementation of preventive measures that control protective factors related to the patient, as well as independent factors (such as pre- and post-operative length of stay, glycemic control, body temperature and skin preparation, antibiotic prophylaxis and time of use of drains) infection in spinal surgery is relevant.[15-16] To control these factors it is necessary to implement measures in order to reduce these risks. In a study of spine surgeries, an increase in protection of 82% for NISC was observed after the administration of care packages.[17] In this research, in the analysis of associated factors, there was no greater safety for NISC, as frailty became evident. The application of the protocol of infection prevention measures related to the surgical site in the study participants. This classification of inadequate makes the associated analysis difficult, as all analyzed elements need to be appropriate.

In this analysis, the factors for NISC were oral hygiene with chlorhexidine, antisepsis with chlorhexidine and povidone iodine, antimicrobial prophylaxis from 30 to 60 min before the incision, normothermia, shorter postoperative stay in the ICU, however, in linear regression only normothermia remained as an independent variable. Normothermia is a recommendation of several organizations.[1-2,15] However, in a recent meta-analysis there was no association with SSI,[18] putting these concepts in doubt again. In the analysis of the other variables that make up the package of measures, there is no evidence of a relation to the protective factor for NISC, which was also found in another study.[19]

Perioperative oral hygiene using chlorhexidine reduces postoperative infections of the lower respiratory tract and surgical site. Postoperative decontamination is a strategy that is also relevant. It is an easy intervention and can be performed by the patients themselves, especially in high-complexity surgeries.[18,20]

The skin preparation solution is an important factor in preventing SSI and iodine-based compounds can be similar to chlorhexidine. There are controversies in studies and several products with different presentations and concentrations for this purpose with similar outcomes.[21-23]

A study highlights that patient who did not receive antibiotic prophylaxis were 2.57 times more likely to develop SSI compared to those who received antibiotic prophylaxis.[24] Adequate administration time is critical for the effectiveness of prophylaxis, and the prolonged form can be harmful, as it promotes resistant bacteria and increases the incidence of complications and added costs. Resistance to this class of drugs is a threat to global public health and one of the main causes is the excessive use of antibiotics.[25]

This study was not able to statistically demonstrate as an independent protective factor for NISC the length of hospital stays in the ICU before and after surgery. An investigation concluded that there was no significant association between preoperative length of stay in the ICU and risk of SSI, but confirmed that the length of postoperative stay was significantly associated.[26] Yet another study in patients undergoing cardiac surgery to pre-hospital stay Prolonged operative period was significantly associated with the development of SSI with an adjusted OR per day of 1.38 (95% CI: 1.02–1.86; p = 0.036).[27] These findings need to be considered in the clinical management of the patient, in order to optimize the patient's length of stay in the healthcare environment and avoid the unnecessary use of antibiotics.

Postoperative glycemic control was adequate in approximately half of the patients analyzed. Strict monitoring by the surgical team is suggested, especially in those at high risk of SSI, and it is emphasized that this indicator is easy to measure and should be prioritized. The results of one study show that tight glycemic control immediately after surgery significantly reduces postoperative infection rates because these patients have a higher rate of postoperative hypoglycemia.[28]

Patients who presented NISC had a reduced hospital stay, which corroborates to assess the effectiveness of care and the quality and safety of surgical patient care. The monitoring and control of protective factors for NISC are part of the package of SSI prevention measures, allowing for the direction of the actions of professionals in the adoption of practices that reduce the incidence of infections and complications inherent to it. Nursing, as a member of a multidisciplinary team, can develop actions based on these protocols and for this it is necessary to expand and strengthen permanent education policies in order to early recognize the risk elements and establish strategies to minimize complications, ensure safety and the quality of care provided to the patient.[9]

For this, it is necessary to certify a set of actions that aim to increase the safety of surgical patients by encouraging adherence to good practices in their entirety. The weakness of the protocol agreement indicators in this study will be important to redirect the team's practice in relation to the need to improve surgical patient safety and infection prevention.

A recommended alternative to assist in the incorporation of care measures and expand the indicators of adherence to infection prevention measures protocols is the implementation of a checklist for checking and raising awareness of the teams through educational processes. For the application of these instruments, it is necessary, in addition to awareness, change in the perception of the surgical team and adjustment of workflows, but it is essential to standardize care in the checklist, in addition to strengthening communication between the team.

A systematic review studied the problems of applying the LVSC and highlights that implementation difficulties are multifactorial with relevant interference of clinical complexity. The main highlight is in relation to the quality versus productivity conflict in relation to workflows. It is important to establish a climate of security through the interaction of policies and care protocols strengthened by teamwork and professional communication.[29] This evidence was also highlighted in another study that signaled the weaknesses of a verification instrument that has filling vulnerabilities and stresses the importance of support from management and superiors in strengthening this additional barrier.[30]

Although many variables analyzed are not part of the checklist, these actions are recommended and validated in institutional protocols, appropriate to the reality of the service. Recording in medical records and in specific instruments for the prevention of infection is the responsibility of the care team and needs to be strengthened through the development of skills, as it is a way to qualify communication and ensure implementation in daily practice, as well as providing subsidies for a proactive performance of the team. Through this, it raises indicators to provide feedback to the educational processes of the care team, which are essential for infection control, and strengthens the safety culture by reducing related adverse events.

This study had as limitations the analysis with few participants, single center, which analyzed some care factors involving pre, trans and postoperative, not including the patient's physical state and risk factors, surgical team skills, behavior of care professionals trans operative, sterilization practices of surgical materials and other invasive procedures. Variables were not collected from some patients because they were not registered in the medical record, interfering with the assessment of work processes and signaling the need to review the management model and strengthen care actions to prevent infections. These data can be useful to redirect the practice, strengthen the LVSC and the checklist of prevention measures, in addition to offering quality care and safety to surgical patients.

Conclusion

Studies on this topic highlight that infections are caused by a variety of factors, and the control of each one of them is important, although in this research, only normothermia was found as a protective factor for NISC and it is insinuated that this outcome could be more comprehensive with greater compliance with protocols. It is noteworthy that adherence to surgical patient care processes is essential to protect against infections and adverse events, and ongoing education of the teams is essential for the adjustment of these measures, ensuring the quality of care provided.

Many of these actions are controlled and/or carried out by the nursing that accompanies the patient in the peri, trans and post-operative period, so it is responsible for reducing related complications. Lack of records and failure to perform procedures or checks related to risk factors were identified. These actions need to be based on scientific evidence and validated to ensure patient safety. For these practices to be part of a safe service, technical knowledge about the subject is necessary, which requires frequent review of topics and encouragement to adhere to these protocols.

It is noteworthy that the package of infection prevention measures is a set of criteria to obtain better care results and that the greatest probability of protection occurs with adherence to these norms in greater proportion than when applied in isolation. The importance of the nursing team's participation in the SSI prevention process is highlighted, as it provides assistance for a longer period of time to the patient, which represents a greater volume and criticality of care. It is expected that the weakness of the indicators of adherence to the protocols found in this study can serve as a basis for redirecting the practice. The nurse needs to assess the predisposing and risk factors for infection, in accordance with the protocols, and adopt preventive and educational measures for all subjects involved, through a collective awareness process, which provides for the execution of planned actions and records of the checking them in the medical records. This dynamic, in addition to strengthening the clinical practice of the nursing team, demonstrates the involvement in safety actions to reduce the occurrence of post-surgical complications. It is suggested to strengthen the LVSC and checklist of infection prevention measures that can offer benefits for professionals by strengthening communication and for the patient, quality of care and promotion of safety.

It is evident that the assessment of work processes was hampered by the lack of records and interfered with the quality and safety of surgical patient care, signaling the need to review the management model. These data can be useful for surgical planning, patient counseling, and efforts to improve safety. It is suggested that prospective and controlled, multicenter studies be carried out to prove positive results.

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