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Effectiveness of a preventive program of surgical site infection in a hospital of second level attention

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Abstract

Objective: To gauge the effectiveness of a preventive model of surgical site infections into a hospital of second level attention in Nuevo León, Mexico. Methods: A preventive actions model was designed, focused to reduce the rate of surgical site infections, which were made during the preoperative, transoperative and postoperative moments. The risk factors for the acquisition of surgical infection were observed, looked out, monitored and controlled using checklists. Results: It was possible to reduce the rate of surgical sire infections in 3%, decreasing the number of cases considerably compared to the previous similar period of the study. More attachment to the preventive model, smaller cases of infection (r=-0.61, p <0.05). Conclusions: A strict model of preventive actions like observation, surveillance, monitoring and control of risk factors for infections of surgical place, it could be effective in the decrease of the rate of surgi-cal wound infections.
Keywords: Surgical wound infection. Surgical nursing. General surgery.

Introduction

The infection of surgical wound (SWI) is one of the most frequent adverse events in healthcare facilities. SWI´s are estimated to represent between 15 and 30% of all infections in-hospital, with a mortality rate between 0.6 and 1.9% .[1-3] Each SWI supposes an average increase of 7 days of hospital stay, a fact that significantly increases the costs of care.[4] The SWI is defined as an infection occurred at or near the surgical incision, during the first 30 days after surgery (or up to a year on implanted patients). SWI´s are classified according to area affecting: (1) superficial, which affects skin and subcutaneous tissue; (2) deep tissue, affecting soft tissue deep tissues and; (3) organ-cavitary, the which affect any structure anatomically manipulated during surgery.[5,6]

Regarding the risk factors that can cause SWI, it was found: prolong hospital stay before or after surgery, unsubstantiated prescription of antimicrobials, poor antiseptic cleansing of the patient's skin before surgery, and other unhealthy oversights such as poor hand hygiene.[7]

Likewise, some risks are intrinsic to the patient, which are: the complexity of their diseases, nutritional status, smoking, obesity and old age.[8] Considering that a patient with SWI has five times more risk of dying that an uninfected patient, in addition his medical attention generates expenses around Fifty thousand MXN($2625,00 dollars), added to the loss of expectation of health, set in the surgical procedure itself, strategies of surveillance are necessary, prevention and control of this type of infection associated with medical care.[7] In this area, Molina-Cabrillana and cols., measured the influence of a system of monitoring and continued control of surgical wounds together with a program of antibiotic prophylaxis in a population of patients operated on, for hip and knee arthroplasty. Adherence to the recommendations of adequate antibiotic prophylaxis was shown to decrease the risk between 2 and 6 times from SWI.[9]

According to Ruiz-Tovar and Badia, the adherence to systematized preventive measures manages to decrease the SWI rate;[10] the most important preventive aspects are: the non-elimination of body hair on surgical site, decontamination of the skin with alcoholic solutions antiseptics, correct use of systemic antibiotic prophylaxis, maintenance of normothermic, glycemic control during the operative time, limitation of blood transfusions and restriction of intraoperative intravenous supply.[10]

Tabla 1. Análisis comparativo de las cifras de ISQ antes y durante de la implementación del modelo de prevención

Indicatory	First month		Second month		Third month		Fourth month		Fifth month		Sixth month		$\bar{x}$	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Cases of SWI	60	64	56	59	64	52	59	49	61	46	62	48	60.33	*53
SWI rate	11.11%	10.44%	10.37%	9.62%	11.85%	8.48%	10.92%	7.99%	11.29%	7.50%	11.48%	7.83%	11.17%	*8.64%

A=Before prevention model period (n=3239)
B=Implementation of preventive model period (n=3677)
*Significance t test ($p<0.05$).

The objective of this study was determine the effectiveness of a preventive SSI model based on the strict surveillance of security measures in the moments before, during and after the surgical intervention, in order to be able to decrease the rate of SWI in a secondary level public care hospital.

Methodology

A quantitative study focused on an evaluative, cross-sectional and prospective design. A model for the prevention of surgical site infection, which included the following critical verification points;

(1) General preoperative measures in admission to hospital or hospitalization: The patient and treating physician sign preoperative recommendations in the back of the internment sheet. The patient arrives clean at hospital admission or bathes the day of surgery in hospital. Patient should have short nails, without enamel, or false nails. Patient should not have performed trichotomy of the surgical site at home. Patient should be free of any signs or symptoms of infection.

(2) Preoperative moment in operating room: Trichotomy with shaving razor, 20minutes prior to the surgical incision. Capillary glucose <200 mg / dl on admission to the surgical room. Give microbial prophylaxis, 30 to 60 minutes prior to surgical incision. Mechanical toilet with iodopovidone antiseptic solution 10% and antisepsis with 2% chlorhexidine.

(3) Intraoperative moment: Maintain the patient euthermic during surgery. In case of surgeries equal to, or greater than three hours, apply a second dose of prophylactic antimicrobial. Capillary glucose measurement in diabetic or high risk patients.

(4) Postoperative moment in recovery and hospitalization: Maintain the patient euthermic in the immediate postoperative period for all the patients. Ensure suspension of antimicrobial prophylaxis 24 hours after procedure in medical indications notes. Measurement of capillary glucose in diabetic patients and risk on day one and two of postoperative ration every 24 hours. Keep surgical wound covered the first 24 to 48 hours unless there is a specific indication.

The model was spread through a period of 45 days to all health personnel involved in surgical procedures through a workshop. A responsible person was appointed to observe every critical step , surveillance of those in charge of supervising the correct implementation, which in this case, nursing staff, operational and administrative personnel of the entire surgery department. A list of verification as a control procedure was implemented and everything was observed and reported as procedures were performed on the patient. In this same instrument, the clinical and sociodemographic information of the patient. To the patients who presented SWI, site culture was taken, according to the hospital epidemiological control.

The program was launched during the period from August 1, 2017 to January 31, 2018, in a secondary level of care hospital with 262 beds censused, in the State of Nuevo León, Mexico. All patients with scheduled surgery were included, excluding minors, emergency surgeries and those with previous SWI, as well as gynecology and obstetrics patients.

Cases were measured monthly basis and SWI, throughout a semester of study and compared with the figures of the immediate previous semester. To establish comparative analysis, parametric statistical tests of comparison of means (t and ANOVA) and to search for associations, correlation tests (Pearson's r). Ethical principles were respected established for scientific research in human beings, counting on the endorsement and approval opinion of the Local Committee Research and Ethics in Health 1912, with a registration number of 17 CI 19 046 129 before the Federal Commission for Protection against Health Risks (COFEPRIS).

Results

In total, 3861 cases of patients who required surgery, of which 3681 met the criteria for inclusion and 4 were eliminated due to death, leaving a final population of 3677, who applied for the prevention model from SWI. The range of age in the population was 54 ± 32 years old. There was a predominance of males, 58%, vs 42% of females. Adherence to the model was generally from lowest to highest, beginning in a 79% and reaching its highest point in the fifth month of application of model, with 92%, closing in the sixth month with 89%. The most frequent causes of failure to adhere were administrative issues like the lack of doctors signature on recommendations of preoperative measures, as well as the lack of evidence of capillary glucose monitoring and body temperature in intraoperative and postoperative period; Likewise, sometimes a lack of chlorhexidine to perform antisepsis. The level of adherence of the preventive model was related to the number of SWI cases, the higher the level of adherence, fewer the cases of wound infection ($r = -0.61$, $p <0.05$).

Regarding the number of cases and rates of Surgical Wound infection filed during the implementation period of the preventive model and the previous period, a decreased 2.53% was observed, that is, during the semester that this study lasted, the infection rate was 8.64% compared to a rate of 11.17% in the previous semester (see Table 1).

Regarding the types of surgical wound infection detected, we found that the vast majority of these were superficial, being relevant the fact that during the period of implementation of preventive measures, the number of cases of surgical wound infections, was reduced from 362 in the semester prior to the study and 318 that occurred during the implementation of the same. That is to say, with the preventive measures of the study, 44 fewer cases of surgical wound infections than in the previous semester (see Table 2).

No association was found between the age and SWI. There was no type specific surgery that stood out in SWI figures, except for the placement of catheter in peritoneal dialysis, which presented a higher average of frequency in infection cases ($F = 0.0723$, $p < 0.05$). Diabetic patients presented a higher rate of SWI that non-diabetic patients ($t = 0.456$, $p < 0.05$). There was no correlation between the SWI and the nutritional status. According to epidemiological reports and monitoring, staphylococcus aureus and Escherichia coli were the microorganisms more frequently isolated from infected surgical sites, followed by Klebsiella, minor pseudomonas, Enterobacter and enterococcus (see Table 3).

Table 2. Infections type frequency detected in patients of a second level hospital

Type of infection	Cases		Rate	
	A	B	A	B
Superficial	311	292	9.60%	7.94%
Deep tissue	46	24	1.42%	0.65%
Organ-cavitary	5	2	0.15%	0.05%
Total	362	318	11.17%	8.64%

A=Before prevention model period (n=3239)
B=Implementation of preventive model period (n=3677)

Table 3. Frequency of microorganisms detected in SWI

Microorganism	Frequency of cases	Percentage
Staphylococcus aureus	112	35.22%
Escherichia coli	108	33.96%
Klebsiella	74	23.27%
Pseudomonasp	11	3.45%
Enterobacter	7	2.20%
Enterococo	6	1.88%
Total	318	100%

Discussion

One of the main obstacles to the implementation of the present model of prevention was the lack of adherence to pre-established actions and strategies, which complicated compliance with the required constant and strict monitoring. This difficulty has been mentioned in international studies like that of Alex Haynes et al., who by implementing a list of verification of 19 surgical security items, managing to reduce significantly the mortality rates and complications, not without highlighting how arduous can be to keep the programs prevention without the presence of a systematized monitoring, since the proposed actions will fade with time and work routine.[11] Without a control system, it is easy to fall into the practice of "doing for doing", which further hinders the culture of change of the professionals and adherence to guidelines of clinical practice.[12,13] In this sense, according to experience observed in the present study, the shortage of personnel exclusively for epidemiological surveillance, may be one of the main reasons why prevention programs do not manage to significantly impact the nosocomial infection rates. Is to say, even though hospitals have health personnel, they can be scarce or overloaded with administrative tasks that prevents you from keeping a precise monitoring. It would be worthed to assess this circumstance and invest in having a larger number of qualified health personnel, since the shortage, not only prevents compliance with institutional goals but it can also be a stress factor in work and poor quality of care to patients.[14] The main achievement of this project was to decrease the infection rate in the population study. Although in general terms it was just a two to three percentage points drop, in the difference between the number of cases compared with the last semester prior to the study, managed to be statistically significant. As the social demographic profile population of the subjects to whom surgery care is provided by the hospital is very similar, and for statistical control and purposes of its indicators, are measured every year, the comparison is established and the results are valid. One of the limitations of this work is the fact of a comparative analysis between the patients could not be established by previously hospitalized and those who came to surgery from home, in order to know if the preoperative hospital stay could be a factor to increase the risk of SWI, as mentioned by authors such as Izquierdo-Blasco and borators.[15]

Conclusion

Nursing interventions through a strict model of preventive actions for the observation, surveillance, monitoring and control of risk factors for SWI in 4 moments (2 preoperative, 1 intraoperative and 1 postoperative), could significantly decrease the number of cases of in surgical wounds infection in a secondary level of care hospital in Nuevo León, Mexico. The importance of establishing, maintaining and strengthening preventive programs within hospitals is evident, as well as, investing the necessary resources for their operation, in order to improve patient safety and decrease healthcare expenses.

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