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Complicated Surgical Wounds and Associated Factors in Oncology Patients

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The objective of this study was to identify the occurrence of complicated surgical wounds (CSWs) and to analyze the associated factors in hospitalized patients at an oncology institution. This was an epidemiological, observational, cross-sectional, descriptive, and correlational study conducted in the intensive care and hospitalization units forming part of a large cancer hospital. Sociodemographic and clinical data were collected from medical records and physical examinations of the skin. Associations between the dependent variable (presence of CSWs) and the independent variables were obtained by chi-square tests and odds ratio (OR) calculations with a 95% confidence interval. Logistic regression (LASSO) was used to verify the possible predictors of the outcome. The sample consisted of 341 patients, specifically individuals who are White (46.9%), married (53.4%), and men (58.1%) with an average age of 59.2 years. Complicated surgical wounds were present in 3.2% of patients, and the most frequent types of complications were dehiscence (40%), infection (26.7%), and fistula (20%) present in the abdominal (40%), cephalic (26.7%), and cervical (13.3%) regions. Senile purpura, diaper use, and infection were the clinical variables associated with the occurrence of CSWs ($p = .044$, $p = .001$, and $p < .001$, respectively). Based on the logistic regression, the presence of infection ($p < .001$; OR = 90.8; 95% CI [18.42, 538.79]) persisted as a predictor of the occurrence of CSWs. From these observations, recommendations regarding best practices for the prevention of CSWs are made, specifically for patients with cancer.

A surgical wound (SW) is an acute wound defined as an intentional and controlled opening of the skin, performed in a surgical environment using cutting instruments that can reach from superficial to deep tissues, and is then closed programmatically by primary intention approximating the wound margins using different closing techniques and materials (Singh, Young, & McNaught, 2017). Closure of these wounds aims to ensure intimate contact between the margins and to provide support and stability throughout the healing process (Janis & Harrison, 2016). In certain cases, such as in the presence of infection or wound tension, SWs may be left open for a delayed closure by second intention, with local management, or by third

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intention (i.e., delayed primary closure following topical treatment) (Salcido, 2017; Sorg, Tilkorn, Hager, Hauser, & Mirastschijski, 2017).

According to Greaves, Ashcroft, Baguneid, and Bayat (2013), acute wounds are those that follow the physiological and temporal sequence of the healing process (with appropriate cell migration, innervation, and angiogenesis); however, they could become chronic following changes in this process due to risk factors and complications (Martin & Nunan, 2015). In the case of SWs, phenomena such as seroma, hematoma, dehiscence, local ischemia, necrosis, surgical site infection (SSI), and SW-related fistulas cause delayed healing that characterize complicated surgical wounds (CSWs) (Scalise et al., 2016; World Union of Wound Healing Societies [WUWHS], 2016).

A seroma is the result of fluid extravasation caused by an inflammatory process in the surrounding tissue. Seromas are more prevalent in surgical procedures where there is dead space (i.e., residual tissue void after tissue loss). Dead space may occur following tissue necrosis, infection, or surgical debridement of nonviable tissue. Seromas often occur after procedures such as lymphadenectomy where they can reach an incidence of 85% in breast and abdominal interventions (WUWHS, 2016).

A hematoma is an abnormal collection of blood in the SW subcutaneous space. Its onset may be related to inadequate hemostasis, coagulation disorders, anticoagulant consumption, mechanical stress, or trauma in surgically manipulated tissues (Kosins, Scholz, Cetinkaya, & Evans, 2013). The presence of a hematoma may impair the healing process by exerting pressure on surrounding tissues. Because of the swelling, inflammation, and irritation of adjacent organs and tissues, a postoperative hematoma is also a risk factor for infection (Hess, 2010).

Dehiscence is the rupture or separation of the components of a previously closed superficial or deep SW. Dehiscence is not always a consequence of SSI; however, it constitutes a risk factor for its onset (Sandy-Hodgetts, Carville, & Leslie, 2015). Dehiscence may be caused by technical errors such as placing the suture too close or too far from the SW margin or closing the wound under too much mechanical tension (Sandy-Hodgetts, Ousey, & Howse, 2017).

An SSI refers to a local inflammatory and systemic response to microbial colonization that occurs after the surgical procedure at the surgical site (Riou, Cohen, & Johnson, 1992). The infection develops within 30 days after the surgical procedure (or within 1 year when implants are used). The infection may involve the skin and/or subcutaneous tissue (superficial incisional infection), and/or soft, deep tissues (e.g., fascia, muscle, bone: deep incisional infection), and/or any part of the deep anatomy (i.e., organs and spaces) (Young & Khadaroo, 2014).

A fistula is an abnormal or surgically made passage that connects two epithelialized surfaces, one of which is a viscus. The other surface may be a viscus, skin, or overlying soft tissue. Fistulas may occur as the result of trauma or surgical complications (75%–85%) or may develop spontaneously (15%–25%) from inflammatory bowel disease, malignancy, radiation therapy, and other gastrointestinal pathologies (Nurses Specialized in Wound, Ostomy and Continence Canada, 2018).

According to the *Global Guidelines for the Prevention of Surgical Site Infection* (World Health Organization, 2016), the global incidence rate of SSIs is higher following cancer procedures (17.2%; 95% CI [15.4, 19.1]) than after orthopedic (15.1%; 95% CI [10.2, 20.6]) and general surgical (14.1%; 95% CI [11.6, 16.8]) procedures. Considering that the incidence of cancer has increased exponentially in recent years and surgical treatments are the main curative alternative, the importance of studying SW complications in this specific population is highlighted (Miller et al., 2019).

Systemic factors that may favor the onset of complications in SWs are advanced age, malnutrition, obesity, smoking, presence of concomitant infection elsewhere in the body, immunosuppression, corticosteroid and cytotoxic drug usage, diabetes mellitus, prolonged hospitalization, and debilitating and consumptive diseases such as neoplasms (Borges et al., 2016; Paunović, 2018; Spira et al., 2018). In patients with cancer, the weakness of the cellular and humoral immune system causes slowing or alterations in immune responses (Rolston, 2017). Local factors that may lead to SW complications include inadequate blood perfusion, presence of devitalized tissue, presence of intrathecal collections, microbial colonization in tissues, and mechanical stress (Sandy-Hodgetts et al., 2015).

Surgical intervention in patients with cancer has five purposes: (i) diagnosis and staging; (ii) prophylactic treatment; (iii) curative treatment; (iv) palliative treatment; and (v) metastasis control. Surgery is the primary treatment of solid tumors and the most effective method for treatment of localized cancer. Most surgical procedures are elective, and risk factors for complications are addressed using prophylactic protocols. However, the theoretical probability of complications is higher in patients with cancer because of their fragile state and the need for increased emergency procedures due to late diagnosis or rapid disease progression (Avritscher et al., 2014).

Only a limited number of studies have explored CSWs in hospitalized patients with cancer, which justifies the need for this study. The objective of this study was to identify the occurrence of CSWs and to analyze the demographic and clinical factors associated with its occurrence in hospitalized patients at an oncology institution.

METHODS

This was an observational, cross-sectional, descriptive and correlational study, forming part of an epidemiological study on the prevalence of skin lesions conducted in the intensive care and hospitalization units at a large cancer hospital. The study was conducted in a private, nonprofit hospital that provides cancer care to adult and pediatric patients and also forms part of the Brazilian public health system. The facility consists of three towers with an average of 385 active adult beds per day, without division by subspecialties.

The study population included adult patients admitted during the data collection period. The sample consisted of patients who met the inclusion criteria of being 18 years or older and being admitted to the intensive care and hospitalization units. All patients agreed to participate in the study by signing the informed consent form. In cases where patients were unable to sign the form, the patient's responsible caregivers were asked to sign the form. The length of hospitalization for patients included in the study was not determined. Data were collected on nine consecutive days between November 23 and December 1, 2017.

Patients were interviewed to obtain sociodemographic data, which were also supplemented or collected from medical records and from the caregivers in cases where the patients were unable to respond to the interview. Information related to clinical characteristics was obtained from patient records. The patients also underwent a general physical examination (for inspection and palpation of the skin) and a dynamic examination (for physical mobility). Physical mobility was assessed by observing the patients for a few minutes while walking straight through the ward. Physical mobility of intensive care unit patients was not evaluated.

Five instruments were used for the data collection process: (i) sociodemographic data forms; (ii) clinical data forms: diagnosis of hospitalization, previous and current treatments, alcohol intake and smoking, comorbidities, visual and auditory changes of pain and tactile sensitivity, changes in sleep and rest patterns, emotional stress, gait, bruising, edema in lower and upper limbs, body mass index, and medication use. Physical mobility was assessed during dynamic physical examinations; (iii) CSW classification when present: dehiscence, infection, hemorrhage, and fistula (Scalise et al., 2016; WUWHS, 2016); (iv) Pressure Ulcer Scale for Healing (PUSH) in its Brazilian Portuguese version (de Santos, Azevedo, da Silva, Carvalho, & de Carvalho, 2005); and (v) the Verbal Numerical Scale (VNS) to assess intensity of pain (Hjermstad et al., 2011).

The PUSH considers three parameters for evaluating the wound-healing process and intervention outcomes: (i) wound area in square centimeters (values range from 0 to >24 cm^2) and scores ranging from 0 to 10 depending on the area; (ii) the amount of exudate present in the wound classified as absent, small, moderate, and large corresponding to scores from 0 (absent) to 3 (large); (iii) and the appearance of the wound bed defined as the type of tissue prevalent in the wound (necrotic tissue, slough, granulation tissue, epithelial tissue, and closed wound). These tissues correspond to the scores 0 (closed wound), 1 (epithelial tissue), 2 (granulation tissue), 3 (slough), and 4 (necrotic tissue). When summed, the subscores for these parameters generate a total score between 0 and 17. Decreasing scores indicate improvement in the healing process, whereas increasing scores indicate deteriorating wound conditions (de Santos et al., 2005). When using the VNS for pain assessment, a score of 0 corresponds to no pain and that of 10 to the worst imaginable pain (Hjermstad et al., 2011).

For sample characterization, results were calculated in relative and absolute frequencies. For univariate analysis, associations between the dependent variable (presence of injury) and the independent variables were obtained via the chi-square test and by calculating the odds ratio (OR) with a 95% confidence interval. For multivariate analysis, the Least Absolute Shrinkage and Selection Operator (LASSO) logistic regression model was used to choose the variables to be tested in the model. To assess the quality of regression, the ROC (receiver operating characteristic) curve was used. The relationship between the area under the ROC curve and the accuracy classifies logistic regression as excellent (0.80–0.90), very good (0.70–0.79), good (0.60–0.69), and poor (0.50–0.59) (Mossman, 2013). For the other analyses, tests with a significance level of 5% ($p \leq .05$) were considered statistically significant.

The frequency of occurrence of CSWs was calculated from the number of individuals affected by the complication. In addition, for improved interpretation, the proportion (percentage) in relation to the studied population (adults hospitalized with cancer) at a determined moment (time of data collection) was calculated according to the following formula: Occurrence ratio = [(Number of patients with CSWs)/(Total number of patients)] × 100. Because of the impossibility of being able to identify the total number of patients with uncomplicated SWs during the data collection phase, and thus highlighting them as patients at risk of developing CSWs, the proportion expressed here does not constitute a prevalence rate but rather a frequency rate of the problem in the studied population, which can be used for the identification and initial analysis of the problem and its tendency (Giesecke, 2017).

The study was approved by the Research Ethics Committee of Data Collection Institution (No. 2088/15, CAAE: 46697115.5.0000.5432).

RESULTS

From the 385 beds that were available at the cancer hospital, 369 patients were evaluated because 16 beds were

empty at the time of the data collection. From these, 341 patients were included in the study and 28 (7.6%) were excluded because one patient was hemodynamically unstable, two patients had already been evaluated in the intensive care unit, and 25 patients refused to participate in the study (Figure 1).

The sample was characterized by individuals who are White (46.9%), married (53.4%), and men (58.1%) with an average age of 59.2 years (*SD* = 15.1; age range = 21–70 years). Table 1 shows distribution of the demographic variables in patients with CSWs compared with those without CSWs, thus highlighting race as a statistically significant variable associated with CSWs. The variable "race" had four categories: White, Brown, Asian, and Black. The incidence of CSWs was higher in Asian people and absent in Black people (occurrence rates: Asians = 0.22; White = 0.018; Brown = 0.074; Black = 0). The statistically significant difference between races was not explored further because this variable was not a significant predictor of CSWs in the regression model.

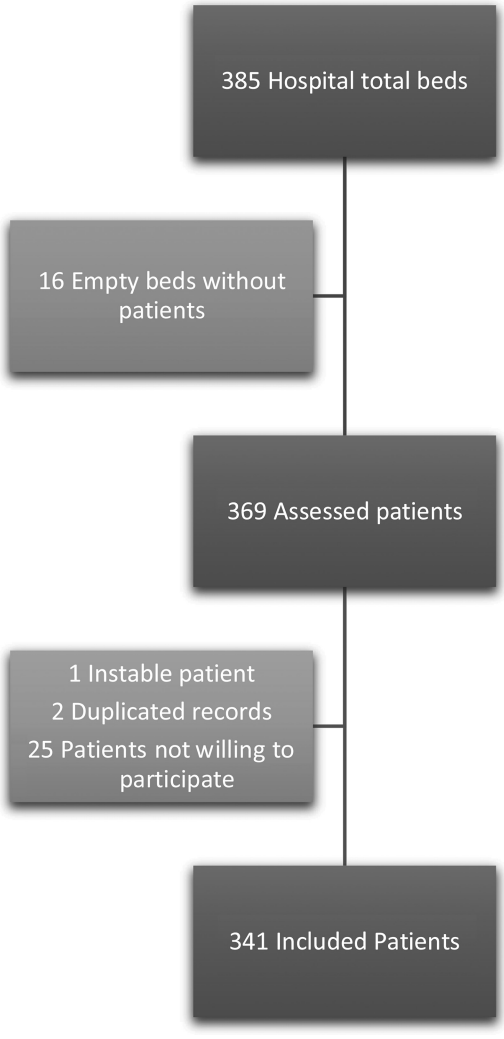

FIGURE 1. Flow chart of patients' inclusion in the final sample size.

The occurrence of CSWs was identified in 11 (3.2%) patients. The clinical characteristics of patients affected by some type of complication are presented in Table 2, which highlights the predominance of senile purpura, diaper use, and the presence of infection as statistically significant variables in patients with CSWs compared with those without CSWs. The distribution of CSWs by cause is shown in Table 3.

The observed CSWs were mostly located in the abdominal (*n* = 6; 54.5%) and cephalic (*n* = 3; 27.3%) regions, followed by the neck (*n* = 1; 9.1%) and trochanter (*n* = 1; 9.1%) in smaller proportions. The most frequent type of complication was surgical dehiscence (*n* = 6; 54.5%), followed by infection (*n* = 3; 36.4%) and fistula (*n* = 2; 27.3%).

The average PUSH score was 10 (*SD* = 4), with scores 10 and 14 being the most frequent at the time of evaluation (*n* = 2; 18.2% each). This result indicates that most CSWs comprised an area greater than 0.3 cm^2 and that exudate and some type of devitalized tissue were present.

In the NVS, patients with CSWs (*n* = 10; 90.9%) reported pain with a mean intensity of 5 (*SD* = 2), categorized as moderate, of which five patients (45.5%) reported pain at the time the dressing was applied, two (18.2%) reported pain during dressing removal, one (9.1%) reported pain during position changes, and two (18.2%) reported having continuous pain.

Multivariate analysis showed that the presence of infection ($p < .001$; OR = 90.8) can be used as a predictor of CSWs (Table 4) with an area under the ROC curve of 0.723 (95% CI [0.568, 0.877]), which is considered a good result (Mossman, 2013).

DISCUSSION

The present investigation evaluating CSWs in 341 hospitalized patients with cancer showed that infections were present in 3.2% of the patients. This overall observed occurrence is lower than the occurrence rate of 9.86% reported by Oh (2012) in patients with gastric cancer after a gastrectomy. In addition, the authors of an American cohort of 8,351 patients undergoing radical cystectomies between 2003 and 2013 reported a 10% rate of wound and soft-tissue complications (Krasnow et al., 2017).

It should be noted that the rates of occurrence of CSWs may vary according to the type and area of the surgery, as well as any presurgical treatments. Although the objectives of this study did not include evaluating adjuvant cancer treatments such as chemotherapy and radiotherapy, all patients investigated had some form of cancer.

The vulnerability of patients with cancer is explained by the physiological impairment caused by the disease. Events such as increased proteolysis and lipolysis and decreased muscle protein synthesis, concomitant with the mechanism of tumor proliferation, cause higher energy expenditure, which, when associated with increased

TABLE 1 Distribution of Sociodemographic Variables Related to CSW Presence

	Variables	Total, *N*	CSW				*p*[a]
			Present		Absent		
			n	%	*n*	%	
Gender	Male	193	5	2.5	192	97.5	.537
	Female	137	6	4.2	137	95.8	
Race	White	160	3	1.9	157	98.1	.012*
	Brown	27	2	7.4	25	92.6	
	Asian	9	2	22.2	7	77.8	
	Black	2	–	–	2	100	
Marital status	Married	175	7	3.8	174	96.1	.719
	Single	109	3	2.7	109	97.3	
	Divorced	19	1	5	95.0	19	
	Widower	21	–	–	21	100	
	Stable union	1	–	–	1	100	
CSW	***N***	**Mean**	***SD***	**Median**	**Min**	**Min–Max**	***p***[b]
No	328	59.2	15.315	61.0	21	91	.817
Yes	11	59.1	8.949	63.0	40	73	
Total	339	59.2	15.142	61.0	21	91	

Note. CWS = complicated surgical wound.
[a]Chi-square test.
[b]Mann–Whitney *U* test.
*$p < .05$.

nausea and emesis and even the onset of anorexia during treatment, reflects significant weight loss (cachexia), physical weakening, and immunosuppression (Caillet et al., 2017; Ryan et al., 2016).

Antineoplastic treatments such as chemotherapy and radiotherapy also have a major influence on the overall condition of patients with cancer due to possible secondary and/or adverse reactions such as hypersensitivity and toxicity, as well as collateral effects on noncancerous tissues (Marx, 2014). Chemotherapy may affect rapidly proliferating tissues such as skin epithelia, mucous membranes, appendages, and pheromones, thus increasing their susceptibility to injury and compromising their regenerative capacity (Lee et al., 2016). Radiotherapy can generate physicochemical changes in the intracellular environment of the affected tissue cells, inducing oxidative stress that can cause malfunction and tissue damage, whereas epithelial tissue (e.g., skin, mucosa) is moderately sensitive and germ cells and lymphocytes are highly sensitive (Moding, Kastan, & Kirsch, 2013).

Among patients identified with some form of CSWs, a statistically significant difference was associated with the presence of purpura. Purpura is purple skin or mucous lesions usually attributed to problems with platelets or blood vessels (Karadag, Parish, & Lambert, 2017). Platelet disorders may be quantitative, such as thrombocytopenia, or qualitative as a result of an acquired or inherited defect in the physiological function of platelets. The vascular causes of purpura may be due to inflammation, vascular fragility, or microvascular occlusion, leading to local ischemia characterized by irregular and superficial red spots (Piccolo et al., 2018). In individuals with cancer, large-scale use of immunosuppressive medication, vitamin C deficiency, and infiltration of the skin by neoplastic cells are the main triggers (Charrot, Sellar, & Manson, 2017).

The association between the use of diapers and the occurrence of CSWs is scarce in the literature. In this study, most of the CSWs were located in the abdominal region ($n = 6$; 40%), a region that is covered by the diaper. Therefore, we can assume that a prolonged exposure to fecal and urinary excretions may lead to maceration, skin tears, and an increased risk of infection (Klunk, Domingues, & Wiss, 2014).

The current study identified surgical dehiscence as the most frequent complication ($n = 6$; 40%). In a Cuban study conducted between January and December 2014 on the frequency of postoperative complications in 179 patients who underwent surgery to remove solid tumors in the thoracic and gastrointestinal regions, the authors found that 30.2% of the patients developed postoperative complications, of which 10.1% resulted in wound dehiscence (Martos-Benítez, Gutiérrez-Noyola, & Echevarría-Víctores, 2016).

TABLE 2 Distribution of Clinical Variables According to CSW Presence

Clinical variables	Categories	Total, *N*	CSW				*p*[a]
			Present		Absent		
			n	%	*n*	%	
Corticosteriod use	No	250	8	3.2	242	96.8	1
	Yes	89	3	3.4	86	96.6	
Antihypertensive use	No	271	9	3.3	262	96.7	1
	Yes	68	2	2.9	66	97.1	
Analgesic use	No	96	1	1	95	99	.191
	Yes	243	10	4,1	233	95.9	
Antidepressant use	No	225	9	4	216	96	.347
	Yes	113	2	1.8	111	98.2	
Antihistamine use	No	325	11	3.4	314	96.6	1
	Yes	14	–	–	14	100	
Immunosuppressant use	No	293	10	3.4	283	96.6	1
	Yes	46	1	2.2	45	97.8	
Anti-inflammatory drug use	No	297	11	3.7	286	96.3	.372
	Yes	42	–	–	42	100	
Anticoagulant use	No	251	9	3.6	242	96.4	.735
	Yes	88	2	2.3	86	97.7	
Diuretics use	No	292	10	3.4	282	96.6	1
	Yes	47	1	2.1	46	97.9	
Antibiotic use	No	188	7	3.7	181	96.3	.76
	Yes	151	4	2.6	147	97.4	
Alcoholism	No	324	11	3.4	313	96.6	1
	Yes	15	–	–	15	100	
Smoker	No	329	11	3.4	318	96.7	1
	Yes	10	–	–	10	100	
Presence of ecchymosis	No	228	5	2.2	223	97.8	.189
	Yes	113	6	5.3	107	94.8	
Presence of hematoma	No	219	8	3.7	211	96.3	.752
	Yes	122	3	2.5	119	97.5	
Dry and desquamated skin	No	293	10	3.4	283	96.6	1
	Yes	48	1	2.1	47	97.9	
Senile purpura	No	330	9	2.7	321	97.3	.044*
	Yes	11	2	18.2	9	81.8	
Edema in upper extremities	No	309	11	3.6	298	96.4	.699
	Yes	32	–	–	32	100	
Edema in lower extremities	No	279	9	3.2	270	96.8	1
	Yes	62	2	3.2	60	96.8	
Infection	No	333	6	1.8	327	98.2	.001**
	Yes	9	5	62.5	4	44.4	

(*continues*)

TABLE 2 Clinical Variables Distribution Related to CSW Presence (*Continued*)

Clinical variables	Categories	Total, *N*	CSW				*p*[a]
			Present		Absent		
			n	%	*n*	%	
Use of support devices	No	337	11	3.2	326	96.7	1
	Yes	5	–	–	5	100	
Use of orthopedic shoes	No	339	11	3.2	328	96.8	1
	Yes	2	–	–	2	100	
Use of indwelling urinary catheter	No	297	9	3	288	97.0	.64
	Yes	44	2	4.5	42	95.4	
Use of drainage	No	296	8	2.7	288	97.3	.166
	Yes	45	3	6.7	42	93.3	
Use of diaper	No	254	3	1.2	251	98.8	.001**
	Yes	87	8	9.2	79	90.8	
Use of adhesives on the skin	No	27	–	–	27	100	1
	Yes	314	11	3.5	303	96.5	

Note. CWS = complicated surgical wound.
[a]Chi-square test.
*$p < .05$. **$p < .001$.

A retrospective survey of the American College of Surgeons National Surgical Quality Improvement Program identified the overall unplanned surgical reoperation rate associated with postoperative complications. In total 1,941 patients were included in the study. The overall unplanned reoperation rate within 30 days after the initial surgical procedure was 14.2% (n = 275). Independent risk factors for unplanned reoperation after extensive head and neck cancer surgery included being Black, having disseminated cancer, having a longer intraoperative time, having experienced postoperative wound dehiscence, and being ventilator dependent up to 48 hr after surgery (Sangal et al., 2018).

An SSI is a well-known complication following therapeutic procedures of most medical specialties. Although the overall rate of SSIs is relatively low, it is the most common health care-acquired infection, adversely affecting expected patient outcomes and increasing costs of public and private health care systems worldwide (Abbas & Pittet, 2016). According to the results obtained in the present study, 4% of the overall rate of CSWs was due to SSIs.

Another sign of the presence of SSIs, which may be closely linked to SW dehiscence, is a high lesion severity score obtained through the PUSH as evaluated in the present study (total score = 10; SD = 4). This score is only achieved with wounds that have an area greater than 0.3 cm^2, moderate to large amounts of exudate, and when the most prevalent cell types are senescent and necrotic (Gustinelli Barbosa, Paggiaro, de Carvalho, Isaac, & Gemperli, 2018).

The last outcome found in patients with CSWs in the present sample was fistulas. The highest occurrence rate of CSWs occurred in the abdominal region, accounting for 54.5% (n = 6) of the total cases. From these data, it is possible to infer that a portion of abdominal CSWs is related to the formation of an enterocutaneous fistula (ECF). Virtually any intra-abdominal

TABLE 3 Distribution of CSW by Cause

Type	CSW present		Occurrence rate (N = 341), %
	n	%	
Dehiscence	6	54.5	1.76
Infection	3	27.3	0.88
Fistula	2	18.2	0.59
Total	11	100	3.22

Note. CSW = complicated surgical wound.

TABLE 4 Logistic Regression for Surgical Site Complication Prediction

Coefficients	OR	95% CI		*p*
		Low	High	
(Intercept)	0.018	0.007	0.038	<.001
Infection presence	90.833	18.417	538.793	<.001

Note. Dependent variable: Presence of complex surgical wound (yes). LASSO method was used for variables selection in the model.

procedure can result in an ECF, especially in patients with a higher associated risk (e.g., patients with neoplasms) undergoing procedures that intentionally or involuntarily damage the bowel wall (de Campos-Lobato & Vogel, 2010). Approximately 10%–20% of all small bowel fistulas arise spontaneously in association with inflammatory processes (5%–50%), malignancy (2%–15%), radiotherapy (2%–5%), and infectious diseases (2%–5%) (de Vries et al., 2018).

Pain control is a key element for successful postoperative recovery. Inadequate pain management after surgical interventions has been correlated with poor functional recovery. In addition, continuous postoperative pain may activate the pituitary–adrenal axis, leading to immunosuppression, operative wound infection, and incomplete wound healing (Stasiowska, Ng, Gubbay, & Cregg, 2015). Inadequate pain control can also reduce patient mobility, resulting in deep vein thrombosis, pulmonary embolism, and pneumonia (Yeung et al., 2014).

The patients in this study were evaluated for pain using the VNS and the majority of the sample reported moderate pain (VNS score = 5) at the time of dressing change. The presence of uninterrupted pain and pain experienced during patient repositioning were also reported. In a retrospective analysis performed at a teaching hospital with an oncology service in Calgary, Canada to quantify the effectiveness of perioperative pain control in a prospective cohort of 41 patients undergoing head and neck surgery with immediate reconstruction with free skin flap, the researchers found that VNS median pain scores ranged from 0 to 4.5, with the highest mean score being 6 on the first postoperative day (Hinther et al., 2018).

LIMITATIONS

One limitation of the study is the potential influence from other variables, such as socioeconomic status. The oncology hospital where the data were collected offers free services for the whole population and also services people with complementary health insurance, so the socioeconomic status of the study participants may vary. However, the study did not explore economic variables. Information regarding the participant's level of education was collected, but more than 90% of the data were missing; thus, it was not included in the statistical analysis.

CONCLUSION

A total of 3.2% of CSWs were observed and their appearance was associated with the presence of infection, SW dehiscence, and fistulas. The results of this study showed that SSI, SW dehiscence, and the presence of fistulas may lead to CSWs, which can compromise the patient's full recovery. Knowing and managing these factors can reduce modifiable risks, decreasing the burdens that CSWs impose on patients, health care professionals, caregivers, and the health system.

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