

Patient Risk Factors for Mechanical Wound Complications and Postoperative Infections after Elective Open Intestinal Resection

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Abstract

Background: Few studies focused on the construction of preoperative patient surgical risk profile using only patients' personal, social history, and comorbidity profiles.

Objective: To identify risk factors for mechanical wound complications and postoperative infections in patients' preoperative profiles.

Design: Quantitative retrospective cohort study using 2009–2011 Health Care Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) databases.

Patients: 56,853 patients who underwent elective open intestinal resection.

Measurements: Predictors of mechanical wound complications and postoperative infections in patients' personal, social history, and comorbidity profiles.

Results: Patients age 18–39 were more likely to suffer mechanical wound complications compared to patients age 65–79 (OR = 1.9, 95% CI [1.5, 2.4], $p < .01$) and to patients age 80 and over (OR = 2.9, 95% CI [2.2, 3.8], $p < .01$). Patients age 18–39 were also more likely to suffer postoperative infections compared to patients age 65–79 (OR = 1.4, 95% CI [1.1, 1.6], $p < .01$) and to patients age 80 and over (OR = 2.0, 95% CI [1.6, 2.6], $p < .01$). Other most significant predictors included male gender, fluid and electrolyte disorders, pulmonary circulation disorders, and weight loss, as well as patients with comorbidities. All statistically significant predictors with positive estimates for postoperative infections were also statistically significant predictors of mechanical wound complications.

Conclusions: Individual patient risk profile can be constructed using preoperative patient profiles for improving perioperative care coordination and patient care quality. Postoperative infections were associated with mechanical wound complications in patients undergoing elective open intestinal resection.

Keywords: preoperative patient profiles, patient risk profiling, surgical risk profile, mechanical wound complications, postoperative infections

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Introduction

Open intestinal resection poses unique challenges to the perioperative care team. Many patients undergoing open intestinal resection are at risk for perioperative complications, such as pulmonary compromise, wound dehiscence, intra-abdominal infection, anastomotic leak, and postoperative ileus, ⁽¹⁻⁶⁾ resulting in increasing mortality and morbidity as well as increasing length of stay and cost. ⁽⁷⁻⁹⁾ Surgical site infection (SSI) still accounts for the most common hospital-associated infection (HAI) at 31% of all HAIs in hospitalized patients, despite the advances in infection control mechanisms and preoperative antibiotic prophylaxis. ^(10, 11) Patients' predisposing conditions may play an important role in the development of SSI. ⁽¹²⁾ Although preoperative assessment or so-called preoperative "clearance" has been instituted in the routine preoperative process, there is no specialty/procedure specific preoperative patient risk profiles constructed during the process for patient risk stratification and planning.

Over the years, there have been some risk assessment models developed for surgical patients. These risk assessment models provided conceptual frameworks about the study of risk factors correlated with adverse outcomes in surgical patients and the development of clinical prediction rules for surgical patients. These surgical risk assessment models included the American Society of Anesthesiologists' Physical Status (ASA PS) model, ⁽¹³⁾ the Acute Physiology and Chronic Health Evaluation (APACHE) model, ⁽¹⁴⁾ the physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) models, ^(15,16) and the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) models. ⁽¹⁷⁾ The multifactorial index of cardiac risk in noncardiac surgery and the revised cardiac risk index are cardiac focused risk assessment models. ^(18, 19) Despite the development and application of these risk assessment models for surgical patients, few studies focused on the construction of an individual patient surgical risk profile using only preoperative patient personal domain profile, social history domain profile, and comorbidity domain profile. Assessing the impact of preoperative patient profiles on surgical outcomes of open intestinal resection

may assist in developing a specialty/procedure specific preoperative patient risk-profiling tool for the construction of an individual preoperative patient risk profile. This preoperative patient risk profiling process may significantly contribute to patient risk stratification, surgical planning, and surgical care coordination for managing surgical patients in the perioperative period.

Methods

Data Source

This study used data from the 2009-2011 Health Care Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) databases. The NIS databases contain approximately eight million hospital admissions, inpatient care, and discharge information from approximately 20% stratified samples of community hospitals in the United States annually. ⁽²⁰⁾ The 2009-2011 HCUP NIS databases contained a total of 23.6 million cases. This study was approved by the Institution Review Board (IRB) at Nova Southeastern University.

Inclusion criteria

Patients aged 18 and above admitted for elective open intestinal resection from 2009 to 2011 in the NIS databases were included in the study. A total of 67,938 cases met the inclusion criteria. Patients under the age of 18 and non-elective cases were excluded in the inclusion selection process.

Exclusion criteria

This study excluded non-elective, laparoscopic, and robotic assisted cases. Cases that were converted to an open procedure from a laparoscopic approach as well as patients who were under the age of 18 were also excluded from the study. Cases with variables containing less than 5% missing values were also excluded from the study. For cases with variables containing more than 5% missing values, the missing values were recoded to the "other" category. 11,085 cases that met the exclusion criteria were excluded from a pool of 67,938 cases that met the inclusion criteria.

Predictor variables

The predictor variables included items provided in the NIS description of data elements in the patient profiles. ⁽²¹⁾ 1. Personal domain profiles: (1) age; (2) gender; (3) ethnicity; (4)

primary insurance status; (5) socioeconomic status. 2. Social history domain profiles: (1) smoking status; (2) alcohol abuse status; (3) illicit drug abuse status. 3. Comorbidity domain profiles. The comorbidities defined by the Agency for Healthcare Research and Quality (AHRQ) comorbidity measures were used in the study.⁽²²⁾ These comorbidity measures were created by the AHRQ based on the categories of comorbidity measures for use with administrative data developed by Elixhauser, et al.⁽²³⁾ These comorbidities are listed as follows⁽²²⁾: (1) acquired immune deficiency syndrome; (2) alcohol abuse (reported under social history domain); (3) deficiency anemia; (4) rheumatoid arthritis/collagen vascular diseases; (5) chronic blood loss anemia; (6) congestive heart failure; (7) chronic pulmonary disease; (8) coagulopathy; (9) depression; (10) diabetes mellitus, uncomplicated; (11) diabetes mellitus, with chronic complications; (12) drug abuse (reported under social history domain); (13) hypertension (combined uncomplicated and complicated); (14) hypothyroidism; (15) liver disease, (16) lymphoma; (17) fluid and electrolyte disorders; (18) metastatic cancer; (19) Other neurological disorders; (20) obesity; (21) paralysis; (22) peripheral vascular disorders; (23) psychoses; (24) pulmonary circulation disorders; (25) renal failure; (26) solid tumor without metastasis; (27) peptic ulcer disease, excluding bleeding; (28) valvular disease; (29) weight loss.

Tobacco dependence was added to the list of comorbidities. Although the impacts of tobacco dependence, alcohol, and drug abuse were reported in the social history domain, they were also included in the number of comorbidities. The number of comorbidities was divided into three categories: (1) no comorbidity; (2) 1-2 comorbidities; (3) 3 or more comorbidities.

Criterion variables

The criterion variables were two of the eight categories of in-hospital complications developed by Guller et al. with modifications.⁽²⁴⁾ They are listed as follows: 1. Mechanical wound complications: (1) non-healing surgical wound (989.83); (2) hematoma complicating a procedure (998.12); (3) seroma complicating a

procedure (998.13); (4) disruption of internal operation wound (998.31); (5) disruption of external operation wound (998.32); (6) persistent postoperative fistula (998.6); 2. Postoperative infections: (1) postoperative infection (998.5); (2) infected postoperative seroma (998.51); (3) other postoperative infection (998.59), including intra-abdominal postoperative abscess, stitch postoperative abscess, subphrenic postoperative abscess, postoperative wound abscess, and postoperative septicemia.

Statistical analyses

SPSS (version 22.0) was used for descriptive analysis and multivariable logistic regression analysis. Because SPSS (version 22.0) used in this study was not designed to perform multivariate (multiple criterion variables) logistic regression analysis in a single procedure, two multivariable logistic regression analyses were performed separately with the same set of predictor variables. In order to control for the overall (family wise) type I error (false positive) in a series of significance tests on the same set of data, a Bonferroni correction was done to adjust the alpha level at .01. Predictors generated from the multivariable logistic regression with a *p* value less than .01 were entered into a hierarchical logistic regression to control for possible confounding effects.

Results

56,853 patients aged 18 and above who underwent elective open intestinal resection from 2009 to 2011 were selected for the analysis from a pool of 67,938 cases that met the inclusion criteria in the 2009-2011 HCUP NIS databases. A total of 11,085 cases that met the exclusion criteria were excluded from the study. There were 8764 (15%) cases of small bowel resections and 48089 (84.6%) cases of colorectal resections. The principal diagnosis by age group and the complication rates by principal diagnosis in each age group were listed in Table 1 and Table 2 respectively. The HCUP NIS databases do not contain indications for surgery. As such, the diagnoses listed may not represent the exact surgical pathologies that were required for the operations.

Mechanical wound complications

In the personal domain profile, there were no statistically significant predictors in the ethnicity and the socioeconomic status categories. The odds for patients in the 18-39 age group to suffer mechanical wound complications were 1.9 times that of patients in the 65-79 age group (OR = 1/.52=1.9, 95% CI [1.5, 2.4], $p < .01$) and 2.9 times that of patients in the 80 and over age group (OR = 1/.35 = 2.9, 95% CI [2.2, 3.8], $p < .01$). The 40-64 age group was not a significant predictor of mechanical wound complications. The odds of male patients having mechanical wound complications were 1.6 times that of female patients (OR = 1.6, 95% CI [1.4, 1.8], $p < .01$). Patients with private insurance (OR = .70 (95% CI [.60, .81], $p < .01$) were less likely to suffer mechanical wound complications compared to patients with Medicare.

In the social history domain profile, smoking status, alcohol abuse, and illicit drug abuse were not significant predictors of mechanical wound complications. In the comorbidity domain profile, congestive heart failure, chronic pulmonary disease, coagulopathy, fluid and electrolyte disorders, obesity, psychoses, pulmonary circulation disorders, and weight loss were identified as independent risk factors for mechanical wound complications. Patients with 1-2 comorbidities and 3 or more comorbidities were more likely to have mechanical wound complications (OR = 1.7, 95% CI [1.4, 2.1], $p < .01$, and OR = 2.0, 95% CI [1.5, 2.6], $p < .01$, respectively). The strongest predictors in the comorbidity domain profile were weight loss (OR = 2.7) and 3 or more comorbidities (OR = 2.0) (Table 3). Although smoking status and hypertension were both statistically significant, they were not clinically significant predictors of mechanical complications because they both had an odds

ratio less than 1 (OR = 0.79, 95% CI [0.70, 0.90], $p < .01$ and OR = 0.77, 95% CI [0.68, 0.86], $p < .01$, respectively).

Postoperative infections

In the personal domain profile, there were no statistically significant predictors in the ethnicity, the primary insurance status, and the socioeconomic status categories. The odds for patients in the 18-39 age group to suffer postoperative infections were 1.4 times that of patients in the 65-79 age group (OR = 1/.73 = 1.4, 95% CI [1.1, 1.6], $p < .01$) and 2 times that of patients in the 80 and over age group (OR = 1/.49 = 2.0, 95% CI [1.6, 2.6], $p < .01$). The 40-64 age group was not a significant predictor of postoperative infection. The odds of male patients to suffer postoperative infections were 1.4 times that of female patients (OR = 1.4, 95% CI [1.3, 1.5], $p < .01$).

There were no clinically significant predictors of postoperative infections in the social domain profile. In the comorbidity domain profile, congestive heart failure, fluid and electrolyte disorders, obesity, pulmonary circulation disorders, and weight loss were identified as independent risk factors for postoperative infections. The patients with comorbidities were also more likely to have postoperative infections. The strongest predictors of postoperative infections were electrolyte disorders and weight loss (OR = 2.0, 95% CI [1.8, 2.2], $p < .01$ and OR = 2.4, 95% CI [2.2, 2.7], $p < .01$) (Table 4). Although smoking status (OR = 0.82, 95% CI [0.74, 0.91], $p < .01$), uncomplicated diabetes mellitus (OR = 0.84, 95% CI [0.74, 0.94], $p < .01$), and hypertension (OR = 0.76, 95% CI [0.69, 0.83], $p < .01$) as well as valvular disease (OR = 0.73, 95% CI [0.57, 0.92], $p < .01$) were statistically significant, they were not clinically significant predictors of postoperative infections because they all had an odds ratio less than 1.

Table 1. Principal diagnosis by age group

Principal diagnosis/Complication	Age groups			
	18 - 39	40 - 64	65 - 79	80 and over
Malignant/Carcinoid tumor	654 (2.6%)	9891 (38.7%)	10217 (40.0%)	4798 (18.8%)
Benign tumor	186 (3.4%)	2165 (39.6%)	2494 (45.7%)	616 (11.3%)
Ulcerative colitis	393 (36.9%)	477 (44.8%)	180 (16.9%)	14 (1.3%)
Crohn's disease	732 (41.5%)	852 (48.3%)	160 (9.1%)	20 (1.1%)
Diverticulosis/Diverticulitis	565 (6.8%)	4793 (58.0%)	2433 (29.4%)	477 (5.8%)
Digestive-genital track fistula	8 (2.2%)	182 (48.9%)	143 (38.4%)	39 (10.5%)
Other	1486 (10.3%)	6805 (47.4%)	4541 (31.6%)	1532 (10.7%)

Table 2. Complication rates by principal diagnosis in each age group

Principal diagnosis		Age groups			
		18 - 39	40 - 64	65 - 79	80 and over
Malignant or Carcinoid tumor	Mechanical wound complications	27 (17.3%)	286 (34.5%)	217 (37.0%)	94 (58.0%)
	Infection	24 (11.1%)	478 (35.8%)	435 (46.7%)	152(58.5%)
Benign tumor	Mechanical wound complications	4 (2.6%)	43 (5.2%)	53 (9.0%)	9 (5.6%)
	Infection	9 (4.2%)	75 (5.6%)	71 (7.6%)	12 (4.6%)
Ulcerative colitis	Mechanical wound complications	11 (7.1%)	10 (1.2%)	7 (1.2%)	1 (0.6%)
	Infection	24 (11.1%)	34 (2.5%)	10 (1.1%)	0 (0.0%)
Crohn's disease	Mechanical wound complications	19 (12.2%)	27 (3.3%)	4 (0.7%)	1 (0.6%)
	Infection	35 (16.2%)	51 (3.8%)	9 (1.0%)	0 (0.0%)
Diverticulosis or Diverticulitis	Mechanical wound complications	10 (6.4%)	91 (11.0%)	62 (10.6%)	10 (6.2%)
	Infection	30 (13.9%)	206 (15.4%)	98 (10.5%)	23 (8.8%)
Digestive-genital track fistula	Mechanical wound complications	1 (0.6%)	7 (0.8%)	2 (0.3%)	0 (0.0%)
	Infection	2 (0.9%)	8(0.6%)	7(0.8%)	1 (0.4%)
Other	Mechanical wound complications	84 (53.8%)	365 (44.0%)	241 (41.1%)	47 (29.0%)
	Infection	92 (42.6%)	485 (36.3%)	302 (32.4%)	72 (27.7%)
Total		4024 (7.1%)	25165 (44.3%)	20168 (35.5%)	7496 (13.2%)
	Mechanical wound complications	156 (3.9%)	829 (3.3%)	586 (2.9%)	162 (2.2%)
	Infection	216 (5.4%)	1337 (5.3%)	932 (4.6%)	260 (3.5%)

Table 3. Adjusted statistically significant predictors of mechanical wound complications with forest plot

	OR*	95% CI for OR	
		Lower	Upper
Age 65–79 (18–39)	0.52	0.41	0.65
Age 80 and over	0.35	0.26	0.46
Gender (Female)	1.6	1.4	1.8
Private insurance (Medicare)	0.70	0.60	0.81
Smoking status (Non-smoker)	0.79	0.70	0.90
Congestive heart failure	1.3	1.1	1.6
Chronic pulmonary disease	1.3	1.1	1.4
Coagulopathy	1.4	1.1	1.8
Hypertension	0.77	0.68	0.86
Fluid and electrolyte disorders	1.9	1.7	2.1
Obesity	1.2	1.1	1.4
Psychoses	1.4	1.1	1.8
Pulmonary circulation disorders	1.5	1.2	2.0
Weight loss	2.7	2.4	3.1
1–2 comorbidities (No comorbidity)	1.7	1.4	2.1
3 or more comorbidities	2.0	1.5	2.6

* $p < .01$ (Reference group in parentheses)

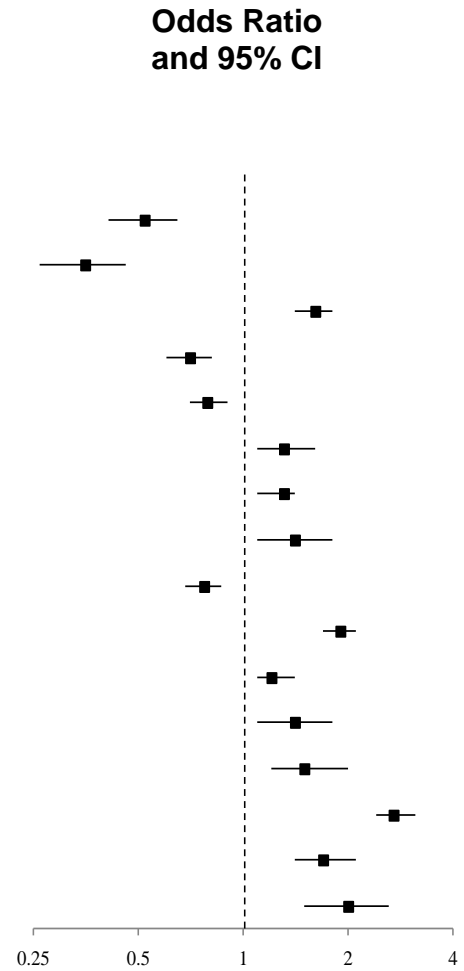
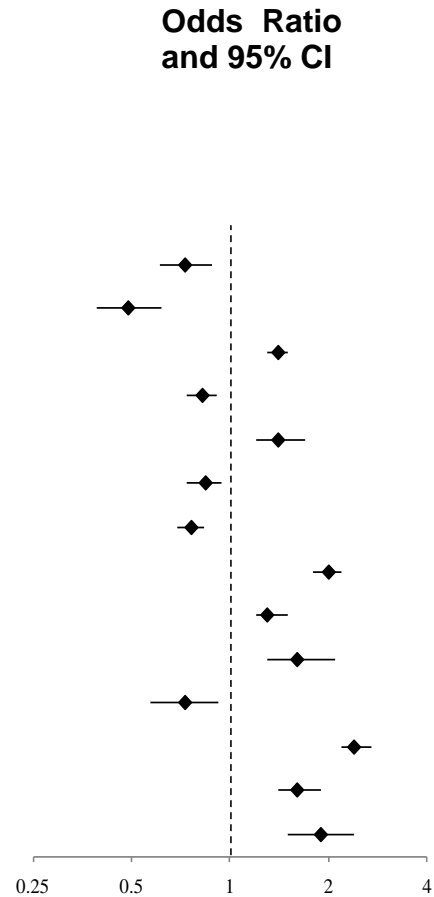


Table 4. Adjusted statistically significant predictors of infection complications with forest plot

	OR*	95% CI for OR	
		Lower	Upper
Age 65–79 (18–39)	0.73	0.61	0.88
Age 80 and over	0.49	0.39	0.62
Gender (Female)	1.4	1.3	1.5
Smoking Status (Non-smoker)	0.82	0.74	0.91
Congestive heart failure	1.4	1.2	1.7
Diabetes, uncomplicated	0.84	0.74	0.94
Hypertension	0.76	0.69	0.83
Fluid and electrolyte disorders	2.0	1.8	2.2
Obesity	1.3	1.2	1.5
Pulmonary circulation disorders	1.6	1.3	2.1
Valvular disease	0.73	0.57	0.92
Weight loss	2.4	2.2	2.7
1–2 comorbidities (No comorbidity)	1.6	1.4	1.9
3 or more comorbidities	1.9	1.5	2.4

* $p < .01$ (Reference group in parentheses)



Discussion

Abdominal wound dehiscence is one of the most serious complications in gastrointestinal surgery with high morbidity and mortality. (25) Wound dehiscence includes external wound disruption (ICD-9-CM code 998.32) and internal wound disruption (ICD-9-CM code 998.31). Advanced age has been implicated in the literature for increasing surgical mortality, complications, and prolonged length of stay. However, most studies on intestinal resection in the literature focused on patients in the advanced age groups. The impacts of younger ages on the mechanical wound complications and postoperative infections after elective open intestinal resection remain unexplored.

Advanced age has been identified as a risk factor for abdominal wound dehiscence in the literature. (25-27) However, the current study showed that patients in the 18 to 39 age group were more likely to suffer mechanical wound complications than patients in the 65 to 79 and 80 and over age groups. The differences in findings may be attributed to the combination of pathologic conditions associated with this age group, the severity of the pathology, and overall nutritional status and health status of the patient, as well as possible patient non-compliance. Younger patients may be less likely to comply with postoperative instructions in terms of physical activity and wound hygiene. The younger patients required intestinal resection

may represent a group of patients with poor physical conditions and poor nutritional status compared to patients in the older age groups in this cohort study. However, we were not able to confirm this hypothesis due to the lack of detailed clinical information in the HCUP NIS databases. The 40-64 age group was not a statistically significant predictor for both mechanical wound complications and postoperative infections. Further studies on the associated mechanisms are warranted. In a recent study using a California patient discharge database, Meehan and colleagues reported that patients under the age of 50 had a much higher risk of aseptic mechanical failure after total knee arthroplasty compared to those age 65 and older.⁽²⁸⁾ However, the mechanism that led to the mechanical failure remain unknown. This study included both wound dehiscence and other mechanical wound complications, such as non-healing surgical wound (989.83), hematoma (998.12) seroma (998.13), and persistent postoperative fistula (998.6). Wound hematoma and seroma are associated with poor wound healing and wound infections.⁽²⁹⁾

Gender may play an important role in wound healing. van Ramshort et al. identified male gender as one of the independent risk factors for abdominal wound dehiscence.⁽²⁵⁾ We also found that male patients were more likely to developed mechanical wound complications compared to female patients. Tissue plasmin plays an important role in wound healing because of its fibrinolytic property.⁽³⁰⁾ In a recent laboratory study, Rono, and colleagues found that gender-dependent plasminogen deficiency led to poor skin wound healing in male mice.⁽³¹⁾ This may account for one of the mechanisms that lead to the gender differences in wound healing.

We found that patients with private health insurance were less likely to suffer mechanical wound complications compared to patients with Medicare. However, LaPar et al. found that both Medicare and Medicaid patients were more likely to suffer mechanical wound complications compared to patients with private insurance.⁽³²⁾ It is unclear if the Medicaid expansion since 2010 contributed to the differences in the findings.

There was no clinically significant predictor for mechanical wound complications in the social domain profile. In the comorbidity domain

profile, congestive heart failure, chronic pulmonary disease, and pulmonary circulation disorders were identified as significant predictors of mechanical wound complications, all of which can lead to tissue hypoxia. Adequate tissue oxygenation is essential for proper wound healing.⁽³³⁾ Two previous studies have shown that patients with obesity have a higher incident rate of wound dehiscence after abdominal surgery.^(26, 27) The current study found obesity to be a significant independent predictor of mechanical wound complications. The relative avascular nature of adipose tissue in obese patients and the oxidative stress in abdominal obesity may impair wound healing process in obese patients.⁽³⁴⁾

Copeland et al. found that patients with serious mental illness had higher pain threshold and higher rates of postoperative delirium and/or confusion.⁽³⁵⁾ We found that patients with psychoses were more likely to suffer mechanical wound complications. Patients with psychoses may be less compliant with medical advice about postoperative activity level due to higher level of pain threshold and postoperative delirium. A history of psychoses in patients' profile should prompt a timely arrangement of care coordination for this special patient population during perioperative period.

Nutrition is an essential element in wound healing. Malnutrition may lead to the development of wound complications after surgery.^(36, 37) Weight loss, as an indicator of malnutrition, has been implicated as a significant predictor of postoperative wound complications.⁽³⁸⁾ Weight loss is defined as involuntary weight loss of more than 10 lbs. (4.5 kilograms) or more than 5 % of the body weight over 6 – 12 months.⁽³⁹⁾ The current study has identified weight loss as the strongest predictor of mechanical wound complications. We also identified fluid and electrolyte disorders as a significant independent risk factor for mechanical wound complications. Fluid and electrolyte disorders affect the equilibrium of extracellular fluid,⁽⁴⁰⁾ which in turn affect tissue oxygenation either due to dehydration or tissue edema.

Peripheral vascular disease (PVD) has long been implicated as a significant risk factor in delayed wound healing, especially in the lower extremities. However, PVD has not been implicated as a risk factor for mechanical wound complications after abdominal surgery.

Kennedy et al. reported that PVD was not a statistically significant predictor of postoperative complications, including wound dehiscence after colon cancer surgery. ⁽⁴¹⁾ We also did not find PVD as an independent risk factor for mechanical wound complications. Smoking, hypertension, and diabetes mellitus are considered significant risk factors for PVD. ⁽⁴²⁾ However, these three conditions were not identified as clinically significant predictors of mechanical wound complications in our study.

SSI is not only costly, but also adversely associated with morbidity and mortality. ^(43, 44) Identifying risk factors for SSI is one of the most important initial steps in preventing SSI. The overall infection rate in our study was 4.8%. Rates for infection in small intestinal resection and colorectal resection were 6.2% and 4.6%, respectively. Data from National Healthcare Safety Network 2006-2008 report showed that the mean procedure associated infection rates for colectomy were 3.99% for cases with 0 risk factor to 9.47% for cases with three risk factors, and the mean rates for small bowel surgery were 3.44% for cases with 0 risk factor and 6.75% for cases with one to three risk factors. ⁽⁴⁵⁾

Patients in the 18-39 age group had a higher than overall infection rate (5.4% vs. 4.8%). Patients in the age groups of 64-79 and 80 and over had a lower than overall infection rate (4.6% and 3.5%, Table 2). The 40-64 age group had a similar but slightly lower infection rate as the 18-39 age group (5.3% vs. 5.4%). Korol et al. reported that increased age was one of the predictors of SSI in mixed types of surgeries. ⁽⁴⁶⁾ However, we found that younger patients were more prone to SSI after elective open intestinal resection. As in the case of mechanical wound complications, this finding may be attributed to the associated pathology and its severity as well as patients' overall health status and nutritional status in this patient population. In a SSI study after liver resection, advanced age did not increase SSI. ⁽⁴⁷⁾ In addition, two studies on wound infection after elective open colorectal resection also did not find advanced age to be a predictor of SSI. ^(5, 48) Meehan et al. reported that patients younger than age 50 had a higher risk of periprosthetic joint infection after total knee replacement. ⁽²⁹⁾ In another study involving 144,000 cases in mixed types of surgical

procedures, Kaye et al. reported that the risk of SSI increased with age only up to age 65 and that the risk of SSI decreased after age 65. ⁽⁴⁹⁾ However, the mechanism of these findings remains unknown.

We also identified obesity as one of the significant predictors of postoperative infections. This is consistent with the findings in other studies. ^(43, 46, 50) Wick et al. reported that obesity increased the risk of SSI by as much as 60% after colectomy with significant increased cost. ⁽⁵⁰⁾ Despite using preoperative antibiotic prophylaxis as a surgical standard of care measure, ⁽⁵¹⁾ the medical and economic burden of SSI in intestinal resection on obese patients remains significant.

The current study did not identify smoking and diabetes mellitus as significant predictors of postoperative infections. Moreno Elola-Olaso et al found that patients who smoked within 1 year prior to surgery were statistically significantly associated with SSI after liver resection. ⁽⁴⁷⁾ It is possible that the adverse effect of smoking on wound infection diminishes after patients stopped smoking for a period. However, the NIS data does not differentiate a current smoker from a past smoker. Contrary to the findings by Korol et al. in a systematic review of SSI in mixed types of surgeries, the current study and others did not find diabetes as a statistically significant predictor of SSI. ^(5, 46-48) Perhaps, glucose level or hemoglobin A_{1c} level at the time of surgery is more useful than the diagnosis of diabetes itself in terms of predicting postoperative infections.

We found that postoperative infections were associated with mechanical wound complications. All statistically significant predictors with positive estimates for postoperative infections were also statistically significant predictors of mechanical wound complications. It is likely that the breakdown of the wound healing process presented an opportunity for infection to occur. The breakdown of the tissues also provided the perfect medium for bacteria to grow.

Limitations

The current study had inherent limitations that exist in secondary population-based data studies. The researchers had no control over how the data were collected and assembled.

The HCUP NIS databases also do not contain detailed clinical information, such as specific surgical indications, preoperative mechanical bowel preparation, and patients' physical conditions and nutritional status, as well as laboratory data.

Conclusions

Individual patient surgical risk profile can be constructed using preoperative patient profiles for improving perioperative care coordination and patient care quality. Younger patients had overall higher rates of mechanical wound complications and infection after elective open intestinal resection. Future studies on the associated mechanisms are warranted. Weight loss, fluid and electrolyte disorders, and pulmonary circulation disorders, as well as male gender were also found to be major risk factors. Postoperative infections were associated with mechanical wound complications.

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