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Maternal postoperative complications after nonobstetric antenatal surgery

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Abstract

Objective—Our primary objective is to estimate the occurrence of major maternal 30 day postoperative complications after nonobstetric antenatal surgery.

Methods—We analyzed the 2005-2009 data files from the American College of Surgeons National Surgical Quality Improvement Program to assess outcomes for pregnant women undergoing nonobstetric antenatal surgery during any trimester of pregnancy as classified by CPT-4 codes. T-tests, χ^2 , logistic regression and other tests were used to calculate composite 30-day major postoperative complications and associations of preoperative predictors with 30 day postoperative morbidity.

Results—The most common non-obstetric antenatal surgical procedure among the 1,969 included women was appendectomy (44.0%). The prevalence of composite 30-day major postoperative complications was 5.8% (n=115). This included (not exclusive categories): return to the surgical operating room within 30 days of surgery 3.6%, infectious morbidity 2.0%, wound morbidity 1.4%, 30 day respiratory morbidity 2.0%, venous thromboembolic event morbidity 0.5%, postoperative blood transfusion 0.2%, and maternal mortality 0.25%.

Conclusion—Major maternal postoperative complications following nonobstetric antenatal surgery were low (5.8%). Maternal postoperative mortality was rare (0.25%).

Keywords

antenatal surgery; nonobstetric surgery; NSQIP; maternal morbidity; postoperative complications

Introduction

Nonobstetric surgery is performed on up to 2% of pregnant women in the United States.(1)
The two most common surgical procedures performed during pregnancy are appendectomy

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Disclosures of Interest Statement

The authors report no declarations of interest.

and cholecystectomy.(1) Other less common surgeries may include breast surgery, cardiac surgery, neurosurgery and surgery as a result of trauma.

Information is limited on the surgical outcomes in these pregnant women. The most updated publication by The American College of Obstetricians and Gynecologists' Committee on Obstetric Practice opined "that the issue of nonobstetric surgery and anesthesia in pregnancy is an important concern for physicians who care for women; though there is no data to allow specific recommendations."(2) Extant literature has evaluated outcomes specific to pregnancy complications and fetal outcomes.(3-8) However, these reports are case series limited by small sample size and postoperative *maternal* complications have not been the focus of these studies.

While much of the concern regarding surgery in pregnant women relates to fetal risks, physiologic changes of pregnancy pose added surgical and anesthetic challenges with respect to maternal safety.(9) Increases in maternal oxygen consumption, decreases in pulmonary functional residual capacity, and physiological edema of oropharyngeal tissues result in increased difficulty in ventilation and airway management of the gravid surgical patient.⁹ Changes in lower esophageal sphincter tone and delayed gastric emptying augment the risk of aspiration. The cardiovascular system is also altered in pregnancy as plasma volume, cardiac output, and heart rate increase while colloid oncotic pressure and systemic vascular resistance decrease, potentially increasing the risk of pulmonary edema.

Improved understanding of surgical outcomes for pregnant women undergoing nonobstetric surgery would improve preoperative counseling and postoperative management of pregnant women. With this in mind, we aimed in this descriptive study to estimate the prevalence of major maternal 30-day postoperative complications after nonobstetric antenatal surgery.

Methods

We obtained data from the 2005 to 2009 American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP), a national validated program for surgical quality assessment and improvement. Hospital participation is currently voluntary and confidential. The ACS NSQIP collects extensive information by a manual chart review process sampling patients undergoing surgical procedures. Over 100 variables are collected on each patient, including: demographic and preoperative characteristics, surgical information, and 30 day postoperative complications. Trained nurse abstractors collect data on the first 40 cases performed within consecutive 8-day cycles from general surgery and vascular surgery or a multi-specialty model. This dataset has been validated by previous studies.(10, 11) The ACS NSQIP participant use datasets are de-identified for patient, surgeon, and hospital. Further information on the ACS NSQIP program and database is available at: <http://www.acsnsqip.org>. This study was exempt from review by the Institutional Review Board as it involves research of an existing dataset from a public source.

The target population for this study included all pregnant women who underwent nonobstetric surgery during any trimester of pregnancy. Women were excluded from analysis if the surgical procedure was obstetric in nature. Therefore, surgical management of ectopic pregnancy and pregnancy ending procedures including dilation and curettage, hysterectomy, and cesarean section were excluded from the analysis. Women were also excluded from this analysis for age greater than 51 years old.

Nonobstetric antenatal procedures were divided into the following categories based on Physicians' Current Procedural Terminology Coding System, 4th edition (CPT-4) coding of the primary procedure: appendectomy, cholecystectomy, other intraperitoneal procedures,

skin, musculoskeletal, breast, and “other.” For further information on procedure categorization based on CPT-4 codes please refer to Table I.

Preoperative risk factors were explored including age, medical comorbidities, and functional status. Age was analyzed as a continuous variable. Preoperative medical conditions were also explored and analyzed as dichotomous variables (Yes/No). Preoperative functional status was defined in the ACS NSQIP dataset as a woman’s ability to perform activities of daily living in the 30 days prior to surgery. Activities of daily living include “bathing, feeding, dressing, toileting, and mobility.” Functional status was categorized as either “independent” or “dependent” and analyzed as a dichotomous variable (Yes/No). Other preoperative variables included in the dataset were explored as predictors of 30-day postoperative morbidity. These variables included: race, ethnicity, emergency surgery, smoking status, body mass index (kg/m^2), work relative value units, operative time, and type of anesthesia. Unfortunately, information on gestational age and pregnancy trimester were not available.

The primary outcome was composite 30-day major postoperative complications. Components included the following 30-day outcome measures: 1) mortality, 2) cardiac morbidity, 3) neurologic morbidity, 4) wound morbidity, 5) venous thromboembolic event (VTE) morbidity, 6) respiratory morbidity, and 7) infectious morbidity. Two additional process measures were included in the composite outcome: return to the operating room within 30 days after surgery and postoperative blood transfusion within the first 72 hours after surgery. Mortality was defined as mortality within 30 days of the index surgical procedure from any cause. Thirty-day cardiac morbidity was defined as cardiac arrest requiring cardiopulmonary resuscitation or myocardial infarction defined as an acute transmural myocardial infarction diagnosed with new-Q waves on electrocardiogram. Thirty-day neurologic morbidity measure was defined as a stroke or cerebral vascular accident or a postoperative non-medication related coma for greater than 24 hours after surgery. Thirty-day wound morbidity was defined as a deep wound surgical site infection, organ space surgical site infection, or wound dehiscence. Thirty-day VTE morbidity was defined as pulmonary embolism or deep vein thrombosis. Thirty-day respiratory morbidity was defined as prolonged mechanical ventilation >48 hours after surgery or unplanned re-intubation. Thirty-day infectious morbidity was defined as pneumonia, sepsis, or septic shock. Return to the operating room was defined as a women returning to a surgical operating room for a surgical intervention of any kind within 30 days of surgery. Postoperative blood transfusion required any transfusion of packed red blood cells or whole blood given within the first 72 hours after the women left the operating room. Composite 30-day major postoperative complications were analyzed as a dichotomous variable (Yes/No). Urinary tract infections and superficial surgical site infections were not considered major postoperative complications.

Descriptive statistics, Student’s *t* test, χ^2 , Wilcoxon rank sum test, and Fisher’s exact test were performed as appropriate. Logistic regression models were conducted to further explore the associations of preoperative predictors with 30 day postoperative morbidity. Preoperative variables were identified for inclusion in the final model based on univariate analysis ($p < .10$). These potential confounders were then added to each model in a stepwise fashion using likelihood ratio testing. The likelihood ratio test statistic was compared to the chi-squared distribution and a p-value calculated. Confounders with a p-value of $< .05$ were included in the final model. Statistical analysis was performed using STATA 11.0 (StataCorp, College Station, TX) and SAS 9.2 (SAS Institute, Inc, Cary, NC).

Results

Our study population included 1,969 pregnant women. Women were excluded for the following reasons: 1) age greater than 51 years old ($n = 94$), 2) surgery for treatment of ectopic pregnancy ($n=307$), or 3) undergoing pregnancy ending procedures ($n = 84$). No procedures for cervical cerclage (CPT-4 59320 or 59325) in pregnant women were listed in the 2005 to 2009 datasets.

The most common nonobstetric antenatal surgical procedure was appendectomy ($n/N = 868/1,969$, 44.0%) followed by cholecystectomy ($n = 439/1,969$, 22.3%). Seventy-seven percent ($n/N = 1,521/1,969$) of nonobstetric antenatal procedures were intraperitoneal procedures, including appendectomy, cholecystectomy, and other intraperitoneal procedures. Of these 1,521 intraperitoneal procedures, 64.8% ($n/N = 986/1,521$) were laparoscopic. The CPT-4 codes for all nonobstetric antenatal procedures are listed in Table I. Some of the studied procedures only required monitored-anesthetic care or local anesthesia, however gastrointestinal diagnostic procedures such as colonoscopy were not included in the ACS NSQIP dataset.

The prevalence of composite 30-day major postoperative complications was 5.8 % ($n=115$). This included (not exclusive categories): return to the operating room within 30 days of surgery 3.6% ($n=70$), infectious morbidity 2.0% ($n=39$), wound morbidity 1.4% ($n=28$), 30 day respiratory morbidity 2.0% ($n=22$), VTE morbidity 0.5% ($n=9$), postoperative blood transfusion 0.2% ($n= 5$), mortality 0.25% ($n=5$), and cardiac morbidity 0.05% ($n =1$). No women experienced neurologic morbidity. Table II lists the prevalence of 30-day major postoperative complications by procedure category.

Minor complications including superficial surgical site infections and urinary tract infection were present in 1.9% ($n/N = 37/1,969$) and 0.71% ($n/N = 14/1,969$) of women, respectively. As noted in the methods, these two morbidities were not considered major postoperative complications.

Univariate analysis was conducted to identify preoperative variables associated with 30 day major postoperative complications.(Table III) After adjusting for confounding, age per 5-year interval increase (adjusted odds ratio (AOR) = 1.32 (95% confidence interval (CI) 1.13, 1.53)), preoperative systemic infection (AOR = 2.30 (95% CI 1.48, 3.58)) and New York Heart Class III or IV (AOR = (95% CI 1.62, 8.81)) were associated with increased odds of postoperative complications. The full logistic regression model is listed in Table IV.

Five pregnant women died within 30 days of surgery (0.25%, $n = 5/1969$). One women was underwent craniotomy for intracranial hemorrhage. The remaining four women underwent intraperitoneal procedures for liver hematoma, intraperitoneal abscess, small bowel infarction, and unspecified hematoma. Four of five women (80%) experiencing postoperative mortality were American Society of Anesthesiologist classification 4 or 5 undergoing emergency procedures. Four of five women (80%) experiencing postoperative mortality had preoperative systemic infection, including systemic inflammatory response syndrome (40%, $n = 2/5$), sepsis (20%, $n = 1/5$), and septic shock (20%).

We conducted a subgroup analysis of all antenatal appendectomies, the most common procedure reported. Eight hundred sixty-eight appendectomies were performed. 36.6% (318/868) were open and 63.4% (550/868) were laparoscopic. The prevalence of composite 30 day major postoperative complications was 3.9% ($n = 34/868$). No women undergoing appendectomy experienced mortality, cardiac morbidity, or neurologic morbidity. Open appendectomies were significantly more likely to experience wound morbidity compared to laparoscopic procedures (2.2% ($n/N = 7/318$) vs. 0.6% ($n/N = 3/550$), $p=.04$). Composite 30-

day morbidity was higher in the open appendectomies 5.7% (n = 18/318) compared to the laparoscopic appendectomies 2.9% (n= 16/550) p = .048); however women undergoing open appendectomy were more likely to have preoperative systemic infection than women undergoing laparoscopic appendectomy (47.8% vs. 35.3%, p<0.001).

We also conducted a subgroup analysis of all antenatal cholecystectomies, the second most common procedure reported. Four hundred thirty nine cholecystectomies were performed. 10.0% (44/ 439) were open and 90.0% (395/440) were laparoscopic. The prevalence of composite 30 day major postoperative complications was 1.8% (n = 8/439). Complications from antenatal cholecystectomy included: VTE morbidity (0.2%), infectious morbidity (0.5%), and return to the operating room (1.4%). No women undergoing cholecystectomy experienced mortality, morbidity, neurologic morbidity, wound morbidity, or pulmonary morbidity. No significant differences were found in any postoperative complications between the open and the laparoscopic procedures.

Discussion

We found the prevalence of major postoperative complications following nonobstetric antenatal surgery to be low (5.8%). Age, medical comorbidities, preoperative functional status, preoperative systemic infection, and operative time were associated with increased major maternal postoperative comorbidities in nonobstetric antenatal surgery. 30 day postoperative maternal mortality was rare (0.25%) and occurred most commonly in women with preoperative systemic infection undergoing emergency procedures.

Recently, two separate papers have addressed postoperative outcomes of select nonobstetric surgical procedures in pregnant versus non-pregnant women.(12, 13) These papers were population-based analyses of clinical maternal outcomes utilizing the Health Care Utilization Project Nationwide Inpatient Sample (HCUP-NIS) database. This database is a stratified sample of all inpatient admissions to nonfederal, acute-care hospitals and is maintained by the Agency for Healthcare Research and Quality and using coding data from medical billing. These papers specifically investigated outcomes after cholecystectomy, thyroid and parathyroid surgery comparing outcomes of antenatal procedures to age-matched non-pregnant women. Both studies demonstrated that pregnant women had higher rates of unadjusted surgical complications, longer length of stay, and higher costs of admission.(12, 13) A major limitation of these studies was the reliance on coding data from medical billing that was limited to the hospital admission associated with the inpatient surgical procedure.

We found a modestly higher prevalence of maternal postoperative complications following antenatal cholecystectomy than Kuy et al. (5.6% vs. 4.3%, respectively).(12) This is consistent with a higher prevalence of complications found by formal chart review (like that of the ACS NSQIP) as opposed to medical billing data (as used in HCUP-NIS). Heisler et al. demonstrated that postoperative complications were much more likely to be found through a formal chart review process and that coding data from medical billing significantly underestimated postoperative morbidity.(14) We believe this allows us to report more specifically and accurately on the prevalence of maternal postoperative complications. Moreover, our analyses included complication rates of additional surgical procedures - not previously published – which expands further on the results of previous studies.

Delay in surgical treatment of the pregnant women has been shown to increase complications in biliary tract disease.(12, 15) Muench et al. documented increased repeat inpatient admissions and emergency room visits in pregnant women with biliary symptoms (biliary colic, gallstone pancreatitis, and acute cholecystitis) who cholecystectomy greater

than 5 weeks after diagnosis (10/11, 90.9%) compared with women who underwent surgery within 2 weeks of diagnosis (1/5, 20%) ($p < .001$).⁽¹⁵⁾ Kuy et al. also found favorable results of operative management of biliary disease in pregnancy, including lower maternal complications (4.3% vs. 16.5%) and fetal complications (5.8% vs. 16.5%; all $p < .001$) than non-operative management of biliary disease in pregnancy.⁽¹²⁾ Our data adds to these findings that operative management of biliary disease during pregnancy is safe.

Compared to other reviews of coding data from medical billing datasets, systematic chart review adds more information on postoperative complications.⁽¹⁴⁾ The ACS NSQIP dataset provides more accurate information on the prevalence of maternal postoperative complications due to its comprehensive data collection process. Potential limitations of this study and secondary datasets in general include sampling bias and errors in data entry. Specifically, the ACS NSQIP dataset does not collect information on gestational age at the time of surgery, pregnancy trimester, fetal complications, and pregnancy outcomes. Hopefully, future datasets will collect this information so further data on outcomes of non-obstetrics antenatal surgery will be available to clinicians in the future. Other potential limitations of a secondary dataset include sampling bias and errors in data entry. The ACS NSQIP participant use data files do not allow for identification of participating hospital within the dataset and therefore we were not able to account for the effect of clustering of observations within centers. However, previous investigators have demonstrated that the clustering effect from the ACS NSQIP for other end points is minimal and did not change the overall adjusted outcomes.^(10, 16) Participation in the ACS NSQIP is voluntary. This may create a sampling bias excluding those hospitals that have worse outcomes due to lack of resources or who decline to participate because of reservations with reporting perceived higher rates of adverse outcomes. However, current NSQIP participation includes over 320 hospitals including a wide range of both community based care facilities and tertiary care centers.

In short, our data provides some needed information on maternal outcomes of nonobstetric antenatal surgery by surgical procedures. We found the overall prevalence of major maternal postoperative complications to be low. Major maternal postoperative complications were associated with increasing maternal age, medical comorbidities, preoperative functional status, preoperative systemic infection, and operative time.

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Table I**CPT codes of nonobstetric antenatal surgery**

Category	CPT codes
Appendectomy	44900, 44950, 44955, 44960, 44970, 44979
Cholecystectomy	47480, 47562, 47563, 47564, 47570, 47600, 47605, 47610
Other intraperitoneal procedures	37617, 38100, 38120, 38129, 39502, 43633, 43644, 43659, 43770, 43771, 43772, 43773, 43774, 43848, 43860, 43999, 44005, 44050, 44120, 44140, 44143, 44144, 44150, 44155, 44160, 44180, 44202, 44204, 44205, 44207, 44238, 44310, 44314, 45113, 45130, 45170, 45397, 47130, 47350, 47780, 48120, 48140, 48150, 49000, 49002, 49010, 49020, 49040, 49081, 49205, 49255, 49570, 49572, 49585, 49590, 49650, 49659, 49999, 50546, 58740, 58920, 58925, 58940, 60540, 60650
Skin, Incision and Drainage	10140, 10180, 11005, 14300, 20005, 21501, 23030, 26990, 27301, 40800, 45005, 46020, 46030, 46040, 46060, 46924, 49550, 49568, 49580, 56405, 56420, 56440, 56515, 56620, 56740, 57000, 57010, 57065, 57130
Musculoskeletal procedures	19370, 20900, 21462, 21935, 23146, 24077, 24130, 24400, 24515, 24586, 25111, 25400, 26358, 26615, 27049, 27329, 27365, 27536, 27590, 27619, 27759, 27814, 27822, 27880, 28805, 29881, 38724, 49321, 49322, 49329, 49505, 49507, 49553, 49560, 49561, 49587
Breast procedures	19020, 19110, 19120, 19125, 19160, 19180, 19220, 19260, 19301, 19302, 19303, 19304, 19305, 19307
Other (vascular, cardiac, neck)	21555, 21556, 21600, 21705, 22554, 33025, 33875, 33880, 34203, 35226, 35236, 35665, 36475, 36478, 36819, 37722, 37799, 38745, 38760, 39220, 39530, 42440, 42815, 42826, 43289, 43330, 52320, 60220, 60225, 60240, 60252, 60271, 60500, 61322, 61510, 64712

CPT = Current Procedural Terminology

Table II

30 day major postoperative complications by procedure type [N = 1,969]

Type of procedure	N	Composite 30 day major morbidity							Return to the OR [n = 70]	Composite 30 day morbidity [n = 115]
		30 day mortality [n = 5]	30 day cardiac morbidity [n = 1]	30 day wound morbidity [n = 28]	30 day VTE morbidity [n = 9]	30 day respiratory morbidity [n = 22]	30 day infectious morbidity [n = 39]	Blood transfusion [n = 5]		
Appendectomy	865	0	0	10(1.2)	3(0.4)	3(0.4)	13(1.5)	0	15(1.7)	34(3.9)
Open	318	0	0	7(2.2)	0	1(0.3)	8(2.5)	0	8(2.5)	18(5.7)
Laparoscopic	550	0	0	3(0.6)	3(0.6)	2(0.4)	5(0.9)	0	7(1.3)	16(2.9)
Cholecystectomy	439	0	0	0	1(0.2)	0	2(0.5)	0	6(1.4)	8(1.8)
Open	44	0	0	0	1(2.3)	0	0	0	1(2.3)	2(4.6)
Laparoscopic	395	0	0	0	0	0	2(0.5)	0	5(1.3)	6(1.5)
Intraperitoneal procedures	214	3(1.4)	0	13(6.1)	4(1.9)	13(6.1)	16(7.5)	3(1.4)	30(14.0)	41(19.2)
Open	173	3(1.7)	0	12(6.9)	4(2.3)	13(7.5)	15(8.7)	2(1.2)	26(15.0)	36(20.8)
Laparoscopic	41	0	0	1(2.4)	0	0	1(2.4)	1(2.4)	4(9.8)	5(12.2)
Skin, Incision and Drainage	66	1(1.52)	1(1.52)	0	0	0	2(3.03)	0	1(1.52)	3(4.55)
Musculoskeletal procedures	112	0	0	1(0.89)	1(0.89)	1(0.89)	2(1.79)	0	5(4.46)	8(7.14)
Breast procedures	149	0	0	4(2.68)	0	0	1(0.67)	0	8(5.37)	11(7.38)
Other (vascular, cardiac, neck)	121	1(0.83)	0	0	0	5(4.13)	3(2.48)	2(1.65)	5(4.13)	10(8.26)

All values listed as n(row %) unless otherwise specified

VTE = Venous Thrombotic Event

OR = Operating Room

30 day cardiac morbidity includes: cardiac arrest or acute transmural myocardial infarction,

30 day wound morbidity includes: deep wound surgical site infection (SSI) of fascial or muscle layers, organ space SSI, or wound dehiscence.

30 day VTE morbidity includes: pulmonary embolism or deep vein thrombosis.

30 day respiratory morbidity includes: prolonged mechanical ventilation >48 hours after surgery or unplanned re-intubation

30 day infectious morbidity includes: pneumonia, sepsis, or septic shock.

Blood transfusion includes the transfusion of packed red blood cells or whole blood cells within 72 hours of completion of surgery.

Return to the OR includes the return to the surgical operating room for any reasons within 30 days of surgery.

Table III

Bivariate analysis of 30 day major postoperative complications after non-obstetric antenatal surgery by preoperative risk factor.

	30 day major complication (n=115)	No major complication (n=1,854)	p-value
Age (years, mean $\pm$ SD)	31.87 $\pm$ 7.67	28.46 $\pm$ 6.42	<.001
Race			
White	70(60.87)	1,231(66.40)	0.22
Ethnicity			
Hispanic	13(11.30)	331(17.85)	0.073
Current smoker	23(20.00)	387(20.87)	0.823
Body mass index (kg/m ² , mean, $\pm$ SD)	29.90 $\pm$ 7.00	29.33 $\pm$ 7.53	0.439
Previous procedure within 30 days	12 (10.4)	34 (1.8)	<.001
Hypertension	9(7.83)	59(3.18)	0.008
Diabetes mellitus	7(6.09)	44(2.37)	0.015
History of CVA with neurologic deficit	2(1.74)	5(0.27)	0.059
Steroid use for chronic condition	3(2.61)	20(1.08)	0.147
Preoperative systemic infection	51 (44.4)	439 (23.7)	<.001
SIRS	33 (28.7)	384 (20.7)	
Sepsis	13 (11.3)	52 (2.8)	
Septic Shock	5 (4.4)	3 (0.2)	
Known bleeding disorder	7(6.09)	30(1.62)	0.001
Current pneumonia	3(2.61)	6(0.32)	0.013
Preoperative blood transfusion > 4 units	3(2.61)	4(0.22)	0.006
Prior myocardial infarction within 6 months	3(2.61)	6 (0.32)	0.013
New or exacerbated congestive heart failure	2(1.74)	5(0.27)	0.059
Prior percutaneous coronary intervention	3(2.61)	4(0.22)	0.006
Prior cardiac surgery	4(3.48)	8(0.43)	0.004
Angina within 30 days of surgery	3(2.61)	4(0.22)	0.006
New York Heart Class III or IV	13(11.30)	33(1.78)	<.001
Chronic obstructive pulmonary disease	1(0.87)	4(0.22)	0.26
Ventilator dependency	12(10.43)	6(0.32)	<.001

	30 day major complication (n=115)	No major complication (n=1,854)	p-value
Acute or chronic dialysis	5(4.35)	11(0.59)	0.002
Acute or chronic renal failure	3(2.61)	6(0.32)	0.013
Ascites	7(6.09)	16(0.86)	<.001
Esophageal varices	1(0.87)	4(0.22)	0.26
Unintentional weight loss of > 10% in last 6 months	2(1.74)	15(0.81)	0.261
Functional status(dependent/partially dependent for ADLs)	20(17.39)	29(1.56)	<.001
Current Cancer	2(1.74)	11(0.59)	0.174
Current radiation therapy within 30 days	1(0.87)	4(0.22)	
Current chemotherapy within 30 days	1(0.87)	8(0.43)	
Known CNS tumor	1(0.87)	5(0.27)	
Disseminated cancer	2(1.74)	7(0.38)	
ASA			<.001
Class 1 or 2	73(63.48)	1,631(87.97)	
Class 3	25(21.74)	219(11.81)	
Class 4	13(11.30)	4(0.22)	
Class 5	4(3.48)	0	
Emergency surgery	65(56.52)	915(49.35)	0.136
Work relative value unit (mean, $\pm$ SD)	14.40 $\pm$ 7.77	10.97 $\pm$ 4.53	<.001
Type of anesthesia (general)	109(94.78)	1,648(88.89)	0.048
Operative time			<.001
< 1 hour	32(27.83)	1,136(61.27)	
1-2 hours	54(46.96)	546(29.45)	
2-3 hours	17(14.78)	113(6.09)	113(6.09)
3-4 hours	7(6.09)	44(2.37)	
>4 hours	5(4.35)	15(0.81)	
Wound class			<.001
1-Clean	35(30.43)	388(20.93)	
2-Clean/contaminated	35(30.43)	781(42.13)	
3-contaminated	14(12.17)	428(23.09)	
4-dirty	31(26.96)	257(13.86)	

All values listed as n(%) unless otherwise specified

SD = standard deviation

ADLs = activities of daily living

ASA = American Society of Anesthesiologist

CVA = cerebrovascular accident

SIRS = systemic inflammatory response syndrome

Table IV

30 day major postoperative complications after non-obstetric antenatal surgery

Predictor	AOR (95% CI)	p-value
Age (per 5 year increase)	1.32 (1.13, 1.53)	<.001
Preoperative systemic infection *	2.30 (1.48, 3.58)	<.001
New York Heart Class III or IV	3.77 (1.62, 8.81)	0.002
Ventilator dependency	6.72 (1.84, 24.5)	0.004
Functional status(dependent/partially dependent for ADLs)	3.34 (1.48, 7.52)	0.004
Operative time		
< 1 hour	1 (reference)	
1-2 hours	3.33 (2.05, 5.39)	<.001
2-3 hours	2.66 (1.25, 5.66)	0.011
3-4 hours	3.95 (1.44, 10.8)	0.008
>4 hours	5.80 (1.53, 22.0)	0.010
Work RVU	2.48 (.65, 9.48)	0.18
Previous procedure within 30 days	2.01 (.84, 4.81)	0.12

AOR= adjusted odds ratio

CI= confidence interval

RVU = relative value unit

* Preoperative systemic infection includes SIRS (systemic inflammatory response syndrome), sepsis, and septic shock