

Panniculectomy Performed in Conjunction With Gynecologic Surgery in Obese and Morbidly Obese Patients

A National Surgical Quality Improvement Program Analysis and Systematic Review of the Literature

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Introduction: Panniculectomy is a common procedure in plastic surgery, often performed after massive weight loss and in morbidly obese patients. It is also performed in combination with various gynecologic procedures based on the rationale that it will reduce complication rates and benefit the patient (Am J Obstet Gynecol, 2000; 182, 1502–1505; J Gynecol Technol, 1997;3:9–16; J Am Coll Surg, 1995). These and other studies fail to provide proof of these claims for a number of reasons, including study design, lack of a control group and the inclusion of nonmorbidly obese patients (J Am Coll Surg, 1995; Gynecol Oncol, 1998, 70, 80–86; Int J Gynecol Cancer, 2015;25(8):1503–1512). Recent medical practice has focused increasingly on minimizing patient morbidity and trends in reimbursement are moving toward penalizing practices, which increase complications. The aim of this study was to evaluate the premise that the addition of panniculectomy to gynecologic surgery in the obese and morbidly obese patient population results in a statistically significant improvement in measureable outcomes.

Methods/Results: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was reviewed to assess the association of complications with panniculectomy combined with gynecologic surgery in the morbidly obese patient population. The query identified 296 patients with a body mass index greater than 30 who had panniculectomy concomitant with gynecologic surgery. The results demonstrated a statistically significant relationship ($P < 0.05$) of these concomitant procedures with superficial infection, wound infection, pulmonary embolism, systemic sepsis, return to operating room, length of operation and length of stay. A systematic review of the literature was then performed which identified only 5 studies that included comparative cohorts of those with gynecologic surgery, with and without panniculectomy. There was no significant benefit across the studies in measured parameters.

Conclusions: This NSQIP study and systematic review of the existing literature does not support the premise that there is a statistically significant benefit associated with performing panniculectomy in conjunction with gynecologic surgery in the morbidly obese patient population. The NSQIP data demonstrate significant

elevation of negative outcomes in morbidly obese patients undergoing combined procedures. In the light of the risks to patients and current direction of medical practice the addition of elective panniculectomy to gynecologic surgery should be reevaluated in the a patient population with a body mass index greater than 30.

Key Words: reconstructive surgery, panniculectomy, morbid obesity, obese patient, gynecologic surgery, abdominoplasty

(Ann Plast Surg 2021;87: 600–605)

The panniculectomy is a common procedure performed in patients who have undergone weight loss as well as in patients who are morbidly obese. In addition, panniculectomy is frequently employed in conjunction with other surgical procedures. In particular, the literature contains many reports promoting the combination of panniculectomy with gynecologic surgery.^{1–5} Proponents of panniculectomy with various gynecologic surgeries argue that it improves the safety of these operations by decreasing complications and improving outcomes in this patient population.^{1,6,7} However, most of these studies lack comparative cohorts of patients operated on by the same surgeons with sample size sufficient for proper statistical comparison. One patient variable in the literature, which has been demonstrated to be consistently associated with increased intraoperative and postoperative morbidities, is morbid obesity.^{8,9} For obese patients, the presence of a large panniculus can not only be debilitating both physically and psychosocially, but also confers a significant wound complication risk.¹⁰ Our study aims to evaluate the outcomes of panniculectomy with gynecological surgery on a national scale in the obese and morbidly obese patient population.

PATIENTS AND METHODS

Database and Analytic Cohort

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) is a multicenter, retrospective, clinical data registry created for hospital quality comparisons and clinical research. We used this database to run a query on patients who had panniculectomy concomitant with gynecologic surgery and who were obese (body mass index [BMI] > 30). Gynecologic procedures (CPT 38770, 38780, 56630–56634, 56637, 56640, 58140, 58145, 58146, 58150, 58152, 58180, 58200, 58210, 58240, 58950–58954, 58956–58958, 58960), and panniculectomy (CPT 15830) were searched.

Outcomes

Predefined outcomes of interest included incidence of wound infection, wound disruption, superficial and deep surgical site infections, occurrences of pneumonia, pulmonary embolism, cerebral vascular accident/stroke with neurological deficit, myocardial infarction, occurrences of sepsis, septic shock, operative time, length of stay, disposition on discharge, return to operating room (OR), and death. Wound infection was defined as the development of at least one superficial or deep surgical site infection, or wound dehiscence. Our study aimed to compare these parameters in obese and morbidly obese patients who received

Received October 14, 2020, and accepted for publication, after revision December 8, 2020. From the ^aDepartment of Plastic and Reconstructive Surgery, Cooper University Healthcare; and ^bCooper Medical School of Rowan University, Camden, NJ. This study was approved by the Cooper University Healthcare Institutional Review Board. Conflicts of interest and sources of funding: none declared.

Presented at: Plastic Surgery the Meeting (ASPS) 2019 in San Diego, California
 Authorship Role and Participation: S.N.: (1) substantial contribution to conception and design, acquisition of data, analysis, and interpretation of the data; (2) drafting the article and revising the article critically for important intellectual content; and (3) final approval of the version to be published. T.P.: (1) substantial contribution to acquisition of data; (2) revising the article critically for important intellectual content; and (3) final approval of the version to be published.

J.G.: (1) substantial contribution to conception and design, analysis and interpretation of the data; (2) drafting the article and revising the article critically for important intellectual content; and (3) final approval of the version to be published.

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ISSN: 0148-7043/21/8705-0600

DOI: 10.1097/SAP.0000000000002735

panniculectomy with gynecological surgery to those patients who received gynecological surgery alone.

A systematic review of the existing literature was then performed. We assessed the literature for prior studies on panniculectomy performed with gynecologic surgery. Articles were included in this review if they met all of the following criteria: (1) Studies involved an patient population with a BMI >30; (2) Studies were comparative with both a study group and a control group; (3) patients were separated into groups based on performance of abdominal surgery in conjunction with simultaneous panniculectomy versus performance of abdominal surgery without simultaneous panniculectomy. Exclusion criteria were as follows: (1) studies without control groups; (2) studies reporting abdominoplasty rather than panniculectomy; (3) studies on non-obese patients; (4) studies without statistical comparison. The review identified 45 candidate articles. Of these 45 studies, 5 studies included comparative cohorts of morbidly obese patients who received gynecologic surgery with and without panniculectomy.^{11–15} A meta-analysis of the combined results was conducted.

Statistical Analysis/Meta-analysis

NSQIP groups with and without panniculectomy and BMI subgroups were compared using Fisher's exact test for categorical frequencies. Meta-analysis of the results from published studies was carried out using a random effects model. Comparisons between panniculectomy and control groups were expressed as point estimates, differences in means or rate differences with 95% confidence intervals for each study

as well as for the combined effect. Statistical analyses were carried out using SAS v9.4 (SAS Institute, Cary, NC).

RESULTS

NSQIP

The NSQIP query identified 296 patients who underwent panniculectomy concomitant with gynecologic surgery with a BMI greater than 30, out of almost 47,000 who received gynecology surgery (0.63% of patients undergoing both procedures) (Fig. 1). Unadjusted outcome analysis showed that obese patients (BMI > 30) who underwent combined procedures, compared to gynecologic surgery alone, experienced significantly higher incidence of superficial infection (10.5% vs 4.5%; $P=0.001$), wound infection (2.4% vs .54%; $P=0.0014$), pulmonary embolism (2.4% vs .85%; $P=0.0147$), and systemic sepsis (4.7% vs 1.6% $P=0.0004$). Other complications, such as occurrences of pneumonia, occurrences of cardiac arrest, and death, were also observed to be more frequent in patients undergoing both procedures compared with gynecologic procedures alone—although these were not found to be statistically significant (Table 1).

When the data were further subdivided into groups of patients with a BMI greater than 35 and BMI greater than 40 (morbidly obese patient population), the results demonstrated an increased number of complications associated with panniculectomy with gynecological surgery compared with patients with gynecologic surgery alone in all BMI categories. In BMI greater than 35, occurrence of systemic sepsis in

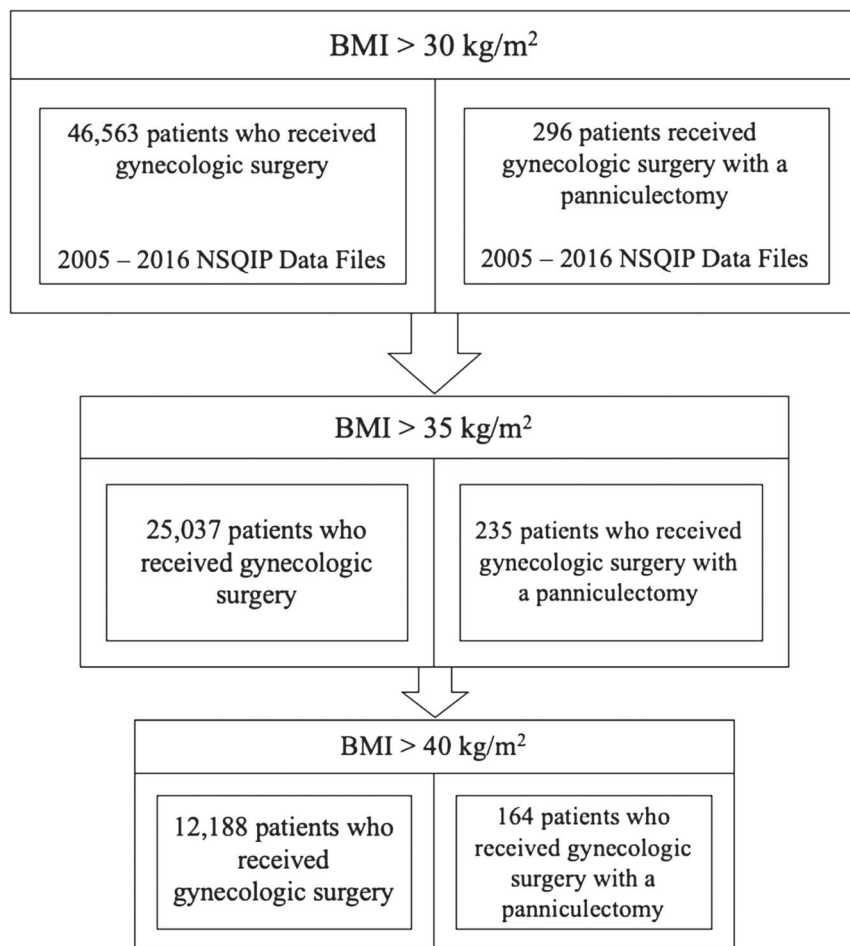


FIGURE 1. Study flow diagram for patient study.

TABLE 1. Perioperative and Postoperative Outcomes*

Outcomes	>30 kg/m ²			>35 kg/m ²			>40 kg/m ²		
	Gynecologic Surgery (%)	Gynecologic Surgery and Panniculectomy (%)	P†	Gynecologic Surgery (%)	Gynecologic Surgery and Panniculectomy (%)	P†	Gynecologic Surgery (%)	Gynecologic Surgery and Panniculectomy (%)	P†
No.	46,563 (99.37)	296 (0.63)		25,037 (99.07)	235 (0.93)		12,188 (98.67)	164 (1.33)	
Superficial infection	2104 (4.52)	31 (10.47)	<0.0001	1486 (5.94)	30 (12.77)	<0.0001	899 (7.38)	26 (15.85)	0.0002
Wound infection	252 (0.54)	7 (2.36)	0.0014	181 (0.72)	7 (2.98)	0.002	113 (0.93)	6 (3.66)	0.0051
Postoperative infection	750 (1.61)	8 (2.70)	0.1563	406 (1.62)	8 (3.40)	0.0608	207 (1.70)	5 (3.05)	0.2091
Dehiscence	589 (1.26)	5 (1.69)	0.4316	441 (1.76)	5 (2.13)	0.6136	274 (2.25)	4 (2.44)	0.7883
Pneumonia occurrence	420 (0.90)	2 (0.68)	1	211 (0.84)	2 (0.85)	0.7267	110 (0.90)	2 (1.22)	0.6619
Pulmonary embolism	396 (0.85)	7 (2.36)	0.0147	241 (0.96)	6 (2.55)	0.0284	107 (0.88)	5 (3.05)	0.0167
CVA	58 (0.12)	0	1	28 (0.11)	0	1	13 (0.11)	0	1
Cardiac arrest	66 (0.14)	0	1	40 (0.16)	0	1	27 (0.22)	0	1
MI	82 (0.18)	1 (0.34)	0.4093	40 (0.16)	1 (0.43)	0.3184	23 (0.19)	1 (0.61)	0.2746
Transfusions	5534 (11.88)	43 (14.53)	0.357	3039 (12.14)	39 (16.60)	0.1378	1548 (12.70)	32 (19.51)	0.0332
Sepsis	741 (1.59)	14 (4.73)	0.0004	441 (1.76)	12 (5.11)	0.0012	260 (2.13)	12 (7.32)	0.0003
Septic shock	236 (0.51)	2 (0.68)	0.6647	134 (0.54)	2 (0.85)	0.3613	75 (0.62)	2 (1.22)	0.2725
Return to OR	1129 (2.42)	19 (6.42)	0.0002	677 (2.70)	19 (8.09)	<0.0001	406 (3.33)	16 (9.76)	0.0002
Mean OR time, min	158.32 ± 94.58	259.86 ± 110.95	<0.0001	161.73 ± 93.12	261.39 ± 110.98	<0.0001	165.43 ± 92.52	261.29 ± 107.45	<0.0001
Mean LOS, d	3.92 ± 5.32	5.1 ± 4.16	<0.0001	3.97 ± 5.16	5.56 ± 4.38	<0.0001	4.11 ± 5.62	6.36 ± 4.87	<0.0001
Death	92 (0.20)	0	1	53 (0.21)	0	1	30 (0.25)	0	1

Perioperative and postoperative outcomes of morbidly obese patients undergoing gynecologic surgery with and without panniculectomy.

CVA, cerebral vascular accident; MI, myocardial infarction; OR, operating room; LOS, length of stay.

*American College of Surgeons National Surgical Quality Improvement Program, 2005–2016.

†Fisher exact test for categorical variables, and Satterthwaite for continuous variables.

patients with gynecologic procedures was 5.1% with panniculectomy versus 1.8% without panniculectomy ($P = 0.0012$). In patients who were morbidly obese with a BMI greater than 40, occurrence of sepsis in patients receiving both procedures was 7.3% versus 1.8% without panniculectomy ($P = 0.0003$), and occurrence of blood transfusion was 19.5% with panniculectomy versus 12.7% without panniculectomy ($P = 0.0332$). In patients with BMI greater than 30, those who received gynecologic surgery with panniculectomy had a mean length of stay of 5.1 days versus 3.92 days in patients without panniculectomy ($P < 0.0001$). Patients with a BMI greater than 30 who received panniculectomy with gynecological surgery also had an increased operative time of 259.96 minutes, compared with those with gynecologic surgery alone who had a mean operative time of 158.32 minutes ($P < 0.0001$). Length of stay and mean operative time were even larger in the subgroup of patients who had a BMI greater than 40. The mean LOS was 6.35 days for those who had gynecological surgery with panniculectomy versus 4.11 days for those who had gynecological surgery alone ($P < 0.0001$) and the mean operative time was 261.21 versus 165.43 minutes ($P < 0.0001$) (Table 1).

Systematic Review

A systematic review of the literature was conducted to identify studies, which were either retrospective or prospective that included comparative cohorts of patients receiving gynecologic surgery with panniculectomy compared with those receiving gynecologic surgery

alone. The parameters assessed in the meta-analysis review included operative time, length of stay, risk of infection, and aortic lymph node yield and the results from each study were consolidated by outcome variable. Composite results of the analysis demonstrated that performing gynecologic surgery with panniculectomy significantly increased operating time by 52.30 minutes (95% confidence interval [CI], 19.55–85.05) (Fig. 2A). Performing the 2 surgeries concomitantly also increased aortic lymph node yield by 1.68 (95% CI, 0.556–2.800), but showed no significant difference in pelvic lymph node yield (Figs. 2G and H). This difference in aortic lymph node yield, reported in 2 of the 5 studies, was the only benefit demonstrated with the addition of panniculectomy in this analysis. Differences in infection rate, length of stay, estimate blood loss, cellulitis, and between gynecologic surgery with and without panniculectomy were not statistically significant (Fig. 2). It is also important to note that only 3 of the 5 total studies provided data for length of stay, cellulitis occurrence, and aortic and pelvic lymph nodes yield (Fig. 2).

DISCUSSION

Gynecologic surgery procedures remain very common. In obese patients, concurrent panniculectomy is often performed under the premise that it offers a benefit to the patient, however, the evidence-basis for this is lacking. Current studies in the literature claim that the addition of panniculectomy to gynecologic procedures reduces the depth of the field, facilitates exposure, and provides greater control of abdominal

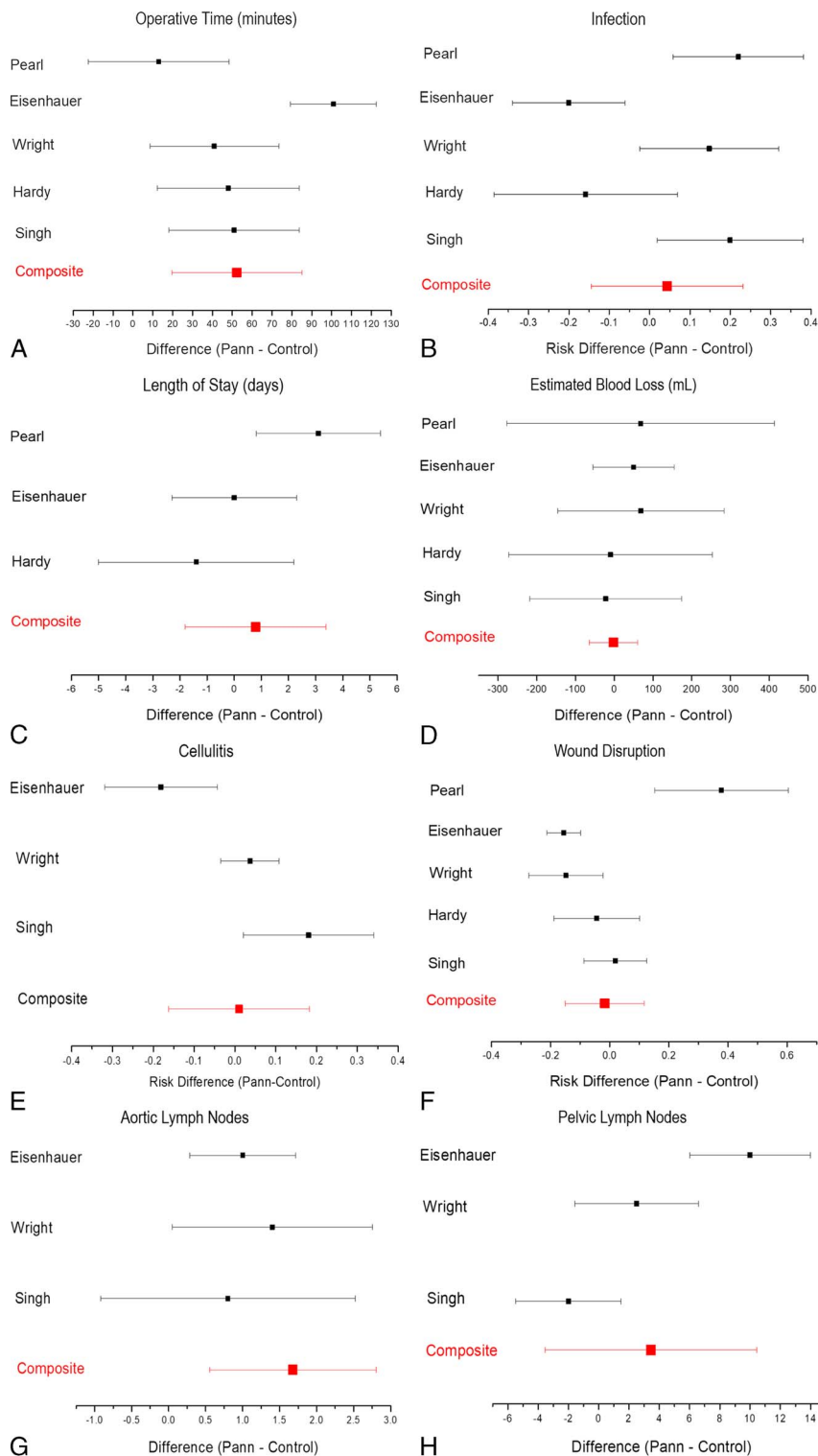


FIGURE 2. A–H, Forest plots of the meta-analysis data demonstrating differences in operative outcomes between gynecologic surgery with panniculectomy (Pann) versus gynecologic surgery alone (control) with 95% CI. [full color online](#)

viscera.^{1–5} These claims represent opinion, and we find no comparative analysis to justify them.

Other studies include claims that the addition of panniculectomy will reduce complication rates, infections, operative time, blood loss,

wound necrosis, and generally make these procedures safer.^{1,7,16} Some studies conclude that despite a significantly higher complication rate, the patients nevertheless recovered, and they felt the combination was feasible.¹⁷ Existing studies fail to provide proof of these claims for

several reasons, the main reason being study design. Many studies report on abdominoplasty and not panniculectomy specifically, or report mixed patient populations combining both obese and nonobese patients.^{3,4,17–24} Many studies are simply case series without comparative cohorts nor do they use historical data.^{1,2,16,18,25–27} Most importantly, lacking in these studies are designs that directly compare groups of patients operated on by the same surgeons with the same criteria in significant number.

In this study, we use the ACS-NSQIP datasets and concurrently analyze the literature to assess outcomes in obese and morbidly obese patients who undergo inpatient, elective gynecologic surgery with panniculectomy to understand the surgical and medical morbidity of performing these 2 procedures together. If these concurrent surgeries are to be justified in the high-risk obese (BMI > 30) and morbidly obese (BMI > 40) population, it is vital to demonstrate that the combination of panniculectomy with gynecologic surgery not only does not harm patients but also demonstrates some measurable benefit in outcomes. Additionally, many current studies represent single center or single provider experiences, which can be prone to bias. With over 85% of Americans projected to be overweight or obese by 2030 and with the increasing focus on reduction of medical morbidity, it is important to elucidate generalizable outcomes data in this patient population to inform surgeons in shared decision making and optimal patient selection for risk reduction.²⁸

One of the key voids of the literature is that most studies do not have a control or comparative cohort against gynecologic surgery with panniculectomy. Hopkins et al¹ reported a series of 78 patients that underwent panniculectomy with gynecologic surgery, with only 2 patients experiencing wound infection, and thus concluded that massively obese patients can safely undergo panniculectomy simultaneously with a gynecologic procedure. However since this was a retrospective survey at a single institution, there was no cohort to compare these outcomes to a sample that had gynecologic surgery alone. Powell et al⁶ also reported a series of 20 morbidly obese patients that underwent panniculectomy with gynecologic surgery, with only 3 patients experiencing partial wound dehiscence, and thus concluded that abdominal panniculectomy is safe and useful in morbidly obese women. Yet, this study demonstrated the outcomes of a single institution outcome with a small sample size of 20 women, lacking any comparative cohort. In our study, we directly compare outcomes for several key metrics and outcomes (wound infections, reoperation, and medical morbidity) in patients undergoing panniculectomy with gynecologic surgery and gynecologic surgery alone.

Our NSQIP query identified 296 with a BMI greater than 30 who underwent panniculectomy with gynecologic surgery, out of 46,563 who received gynecologic surgery alone. Important findings derived from this analysis, include concurrent panniculectomy with gynecologic surgery is associated with higher incidences of superficial infection, wound infection, pulmonary embolism, and sepsis. Additionally, when patients were further subdivided into patients with a BMI greater than 35 and BMI greater than 40 (morbid obesity), there was a significantly increased need for blood transfusions that correlated with increasing BMI compared with all patients with a BMI greater than 30. These findings, although intuitive, emphasize the importance of understanding the risks involved when performing an elective procedure such as panniculectomy with gynecologic surgery in the already high-risk obese patient population. Additionally, data from our meta-analysis demonstrated no significant improvements in infection rates when performing gynecologic surgery with panniculectomy compared with gynecologic surgery alone. This study provides the foundation for a more comprehensive evidence-based understanding of safety outcomes of the 2 combined procedures.

Our study also found increased length of stay as well as an increase in operative time in patients undergoing gynecologic surgery with panniculectomy compared with those receiving gynecologic surgery alone. Our ACS-NSQIP data results showed that in patients with

a BMI greater than 30, OR time was 1.7 hours longer. The data from our meta-analysis confirmed this finding, as the combined results from the 5 studies with comparative patient cohorts showed a composite increase of OR time by 50 minutes when performing panniculectomy with gynecological surgery compared with gynecologic surgery. The data from Hopkins et al¹ also reported an increase opening and closing times—leading to an increase in operative times in patients receiving gynecologic surgery with panniculectomy in morbidly obese patients, despite them overall deeming the combination of the 2 procedures as safe. Our study also compared length of stay for patients undergoing gynecologic surgery with panniculectomy compared with those undergoing gynecologic surgery alone. Although our meta-analysis showed no significant difference in length of stay when performing the 2 procedures together versus gynecologic surgery alone, our NSQIP data yielded an increase in length of stay by 1.18 days ($P < 0.0001$) for patients receiving both surgeries compared with those receiving gynecologic surgery alone. Another important finding from our analysis was when patients were further subdivided into BMI greater than 40, length of stay increased by 2.25 days for patients receiving both surgeries compared with those receiving gynecologic surgery alone.

Although we could not perform cost assessment in NSQIP, these findings suggest added cost to our health care system when performing gynecologic surgery with panniculectomy.^{9,29} If we are going to advocate for procedures that are associated with increased cost of care, the negative implications of increased costs should be balanced out by reduced complication rates and a measurable benefit to the patient. However, the data from our analysis demonstrate the contrary.

This study is not without limitations. The first limitation is that NSQIP only includes 30-day outcomes and thus does not account for long-term outcomes following gynecologic surgery with panniculectomy. Furthermore, data regarding the type of panniculectomy skin resection pattern and specific details regarding wound closure techniques are not available. In cases that required an unplanned return to the operating room, the indication for the return is not available. Lastly, the ACS-NSQIP does not provide any data on the cost of combined gynecologic surgery with panniculectomy nor do we have any quality of data or metrics to assess this, and we can only draw conclusions based on length of stay and operative time. Our study benefits from a large sample size and contains data collected by trained clinical data abstracters from numerous surgeons across various health care settings, which acts to increase the generalizability of the data. For each of the aforementioned strengths there are clear downsides, such as, limited data on technique and or even incision type. The possibility of uncontrolled confounders within the NSQIP data sets certainly introduces a degree of weakness to our study. However, the large cohort size strengthens the level of evidence. Thus, the findings may apply across diverse patient populations more so than studies with small patient numbers from a single clinical setting.

In summary, medical practice in recent years and in particular following the landmark Institute of Medicine report “To err is human” has focused increasingly on minimizing patient morbidity and trends in reimbursement. Specifically, those under recent Medicare Access and CHIP Reauthorization Act legislation are moving toward rewarding practice that decreases complications and thereby lowers cost of care and penalizing that which increases complications. One patient variable, which has demonstrated to be consistently associated with increased morbidity in surgery, is morbid obesity. We conclude that there is a lack of clear evidence that combination of panniculectomy, an elective procedure, with gynecologic surgery in the obese and morbidly obese patient population results in measureable improvements in outcomes. These findings may serve as guidelines regarding the indications for concurrent panniculectomy with gynecologic surgery in obese and morbidly obese patients and may assist physicians in optimal patient selection and informed consent process to improve patient outcomes and safety.

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