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Pelvic Pain and Apical Prolapse Surgery: A Population-Based Retrospective Cohort Study

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Abstract

Objectives: To evaluate the association of pre-operative pelvic pain with operative characteristics; and the association of patient and operative characteristics with postoperative pain.

Methods: This is a retrospective cohort study utilizing Clinformatics™ DataMart, a large national commercial insurance database. We collected data for patients more than 18 years old who underwent apical prolapse surgery between January 2005 and December 2014. We stratified data by pre-operative (prior) pain and analyzed for associations of prior and postoperative pain. Logistic regression analysis was performed using SAS software.

Results: A total of 14,440 patients met inclusion criteria and were analyzed. Patients with prior pain were more likely to have an abdominal (open or laparoscopic) approach, a concomitant hysterectomy, but less likely to have additional repairs or a mesh insertion ($P < .001$). Postoperative pain was less with a concomitant hysterectomy, whether they had prior pain (OR 0.56, 95% CI 0.41–0.77) or not (OR 0.68, 95% CI 0.56–0.82). Additional vaginal repairs were associated with more postoperative pain for those without prior pain (OR 1.63, 95% CI 1.3–2.04). Age more than 45 years was associated with less pain. Length of hospital stay > 2 days was associated with more pain.

Conclusions: Patients with prior pain were more likely to undergo an abdominal approach and have a concomitant hysterectomy. Postoperative pain was less with a concomitant hysterectomy, but more with additional vaginal repairs. There is a need to include pain as an outcome in future studies, particularly clinical trials.

Keywords

apical prolapse; vaginal prolapse; colpopexy; laparoscopy; pelvic pain

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INTRODUCTION

Apical prolapse is defined as descent of cervix or vaginal vault below their normal position. Surgeries for apical prolapse can be abdominal (open or laparoscopic/robotic sacrocolpopexy) or vaginal (extraperitoneal/sacrospinous ligament fixation or intraperitoneal/uterosacral colposuspension). Although anterior vaginal prolapse is the more common pelvic organ prolapse variant, some degree of apical defect is usually present, especially in advanced cases.¹ Procedures for vaginal prolapse have higher recurrence rates in absence of a satisfactory apical support.²

There is increasing attention to pain as an important clinical outcome. In addition to the suffering and distress, pain is associated with major problems such as depression, anxiety, insomnia, fatigue, opioid use and potential abuse, healthcare costs, lost work days.³

Although several studies have evaluated the outcomes of different apical prolapse procedures^{4–6}, they have focused on prolapse recurrence and sexual dysfunction while pelvic pain was generally missed. As substantial percentage of patients with pelvic organ prolapse, suffer from pelvic pain, it is imperative to fill the knowledge gap regarding the association of apical prolapse surgeries on pre-existing and new onset postoperative pain. This will provide valuable information to optimize potentially modifiable operative variables and properly counsel patients.

In this population-based study, we adopted a retrospective cohort design to examine the effect of apical prolapse procedures on pelvic pain in patients with and without pre-operative pelvic (prior) pain. We also examined the association of prior pain with operative characteristics. Finally, we analyzed the association of postoperative pain with patient and operative characteristics.

MATERIALS AND METHODS

Data Source

This is a population-based retrospective cohort study. We used health insurance claims data from Clinformatics™ DataMart (CDM), a product of Optum, Inc. (Eden Prairie, MN). This is a database consisting of insurance claims from one of the largest national commercial health insurers and has been previously used and validated in numerous studies.^{7–9} This database included more than 56 million patients enrolled in managed care plans including preferred provider organizations, health maintenance organizations, exclusive provider organizations and a fee-for-service plan. In all these situations, a complete claim had to be submitted for providers to receive reimbursement. Overall, between 2000 and 2015, about 7% of insured patients in this database were enrolled in Medicare Part C plans. The population in this database is approximately representative of the geographic distribution of US population with a slightly higher representation of the South. Compared to the US population, the proportion of people in the age group between 21 and 64 is higher because this is a database from a commercial insurance company and most enrollees join the program through their employers. We interrogated member eligibility data file, medical services claims data, and inpatient confinement data. Both outpatient and inpatient surgeries

were included in this study. This study was exempt from institutional review board approval and we adhered to guidelines for cohort studies as outlined in the STROBE statement.¹⁰

Study Cohort

The selection of study cohort is graphically summarized in Figure 1. We identified 24,465 women who had an apical prolapse procedure between January 2005 and December 2014 identified by Current Procedural Terminology (CPT) codes 57280 (abdominal, open approach), 57425 (laparoscopic approach, including robotic assisted), 57282 (vaginal, extra-peritoneal approach), and 57283 (vaginal, intra-peritoneal approach). If a woman had more than 1 apical prolapse procedure during this period, the first one was selected. We removed those who had more than 1 apical prolapse procedure on the same date (N=802) and restricted the cohort to those aged ≥18 at the time of surgery (N=23,656). We then selected those who had continuous enrollment for at least 12 months before and 7 months after surgery (N=14,603). The enrollment before and after surgery was included so we can check for pelvic pain diagnosis before and after surgery. We further excluded patients from Puerto Rico (N=2) as region is one of the variables of the regression model. Puerto Rico is not in any of the 4 geographic census regions and will be a group by itself and a group this small will very likely cause numerical problems in modeling. Finally, we removed those who had any claim with a diagnosis of cervical or uterine cancer at any time during the 19 months of study period, leaving 14,440 women in the cohort. The cervical cancer diagnosis was identified by International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) code 180.x and the ICD-9-CM code for uterine cancer was 182.x.

Study Variables

We categorized patients by type of surgery, age, region (Midwest, Northeast, South, and West), length of hospital stay for surgery, the specialty of surgeon who performed the surgery, and whether or not the patient had a concomitant hysterectomy, additional vaginal repairs, or mesh insertion during the surgery. Patients were also stratified by presence of pre-operative pelvic (prior) pain. A patient was considered to have prior pain if she had pelvic pain diagnosis in the 12 months prior to surgery during any outpatient office visit, emergency department visit, or hospitalization. Outpatient office visits were identified by CPT codes 99201–99205 and 99211–99215. Emergency department visits were identified by CPT codes 99281–99288. Hospitalizations were identified using inpatient confinement data. Pelvic pain was identified by ICD-9-CM codes 625.0, 625.3, and 625.9. The ICD-9-CM and CPT codes for mesh insertion, hysterectomy and other repair procedures can be found in the appendix.

Outcome

First, we examined the association of prior pain with operative characteristics. We then examined the association of patient and operative characteristics with postoperative pain. All these analyses were performed in patients with and without prior pain. A patient was considered to have postoperative pelvic pain if a diagnosis of pelvic pain was made on a claim between 1 and 7 months after surgery during any outpatient office visit, emergency department visit, or hospitalization. We excluded pelvic pain diagnoses in claims within 30 days of the surgery to exclude the expected postoperative pain.

Statistical Analysis

The proportion of patients with pelvic pain before and after surgery was calculated and categorized by the type of apical prolapse surgery, concomitant hysterectomy, additional vaginal repairs, and mesh insertion. We then performed bivariate analysis to examine the association between postoperative pelvic pain and aforementioned factors by Chi-square tests, stratified by prior pelvic pain. The association of surgery type, concomitant hysterectomy, additional repairs, and other characteristics with the likelihood of having pelvic pain after surgery was examined by logistic regression. All statistical analyses were performed using SAS version 9.4 (SAS Inc., Cary, NC).

RESULTS

Patient Characteristics

We identified 24,465 patients, of them 10,025 were excluded, and the remaining 14,440 analyzed (Fig. 1). Table 1 categorizes patients according to the approach and type of procedure performed and other characteristics, stratified by the presence or absence of pelvic pain prior to surgery. While women under the age of 45 represented only 21% of cases, they represented more than 44% of cases with prior pelvic pain. In contrast, women 55–64 years old represented 34.5% of the cases, yet this age group only takes up 16.7% of the group with prior pelvic pain. Over a half of the overall cohort underwent a concomitant hysterectomy and about two thirds underwent additional vaginal repairs. Among patients with prior pelvic pain, over 74% underwent a concomitant hysterectomy while about 50% had additional vaginal repairs. The table also summarizes data on geographic region, length of stay, and surgeon specialty. Next, we sought to examine the proportions of patients with pelvic pain before and after surgery in the study cohort and stratify them according to approach and other clinical variables (table 2). Finally, the distribution of the overall study population according to presence of prior pain and operative approach is graphically presented in Figure 2.

Associations of prior pain

Next, we sought to examine the association of prior pain with operative characteristics (table 3). Patients with prior pain were more likely to have an abdominal approach, undergo a concomitant hysterectomy, but less likely to have additional vaginal repairs or a mesh insertion compared to those without prior pain ($P < 0.001$ for all). All these findings are graphically presented in Figure 3.

Associations of post-operative pain

After observing the association of prior pain with operative characteristics, we examined how surgical approach was associated with post-operative pain. We started by examining the association of postoperative pain with the approach, procedure, concomitant hysterectomy, additional repairs, and mesh insertion in the two groups based on the presence or absence of prior pain. As presented in table 4, there were no significant differences in the distribution of patient with postoperative pain among different surgical approaches, whether patients had pre-operative pelvic pain or not. In contrast, patients who underwent hysterectomy had

significantly less postoperative pain, regardless of prior pain. On contrast, patients who underwent additional repairs had significantly more postoperative pain, regardless of prior pain. Finally, patients who underwent concomitant mesh insertion had significantly more postoperative pain, but only in patients without pre-operative pain.

Next, we sought to analyze association of postoperative pain with patient and operative characteristics using logistic regression analysis *while adjusting for other covariates*. As presented in table 5, postoperative pain was significantly less in patients who underwent open abdominal (OR 0.72, 95% CI 0.53–0.99) and extraperitoneal vaginal approaches (OR 0.73, 95% CI 0.57–0.95) compared to laparoscopic procedures, only in patients without prior pain.

Furthermore, postoperative pain was significantly less in patients older than 45 years old, regardless of prior pain, while it was more in patients with longer length of hospital stay (>2 days). Interestingly, postoperative pain was less cases performed by urologists (regardless of prior pain). There were no significant association of postoperative pelvic pain to geographic region.

Concomitant hysterectomy was associated with less postoperative pain, whether patients had prior pain (OR 0.56, 95% CI 0.41–0.77) or not (OR 0.68, 95% CI 0.56–0.82). Additional vaginal repairs were associated with more postoperative pain for those without prior pain (OR 1.63, 95% CI 1.3–2.04), but not those with prior pain (OR 1.33, 95% CI 0.98, 1.80). Also, after adjusting for other covariates, mesh insertion was not associated with significant change in postoperative pain, regardless of prior pain.

Finally, to identify which additional repairs were associated with more postoperative pain, we further analyzed according to the individual additional repair performed. As shown in table 6, higher postoperative pain was significantly associated with anterior repair (in patients with prior pain); posterior repair (patients without prior pain); combined anterior and posterior repairs (regardless of prior pain); and combined anterior, posterior, and enterocele repair (in patients without prior pain).

DISCUSSION

Postsurgical pain is a clinical problem with significant medical, psychological, social and economic consequences.¹¹ It is estimated that surgery contributes to pain in 22.5% of patients seen at pain clinics.¹² Decreasing postsurgical pain appears to be an inviting goal with multifold benefits. In addition to decreasing suffering by patients, it also decreases clinic visits, unnecessary imaging and other procedures, opioid use and potential abuse, healthcare costs, lost work days, and potential for associated psychologic problems as anxiety, depression, and insomnia. Therefore, it appears logic to identify and possibly modify the determinants of postsurgical pain.

Published studies of apical prolapse surgery have primarily focused on patient satisfaction and prolapse recurrence with few examining pain after apical prolapse surgeries.^{4,5,13–15} A randomized study comparing abdominal sacral colpopexy to vaginal sacrospinous colpopexy showed similar subjective and objective prolapse correction success rates.⁴ Two Cochrane

reviews focused on prolapse awareness and recurrence found that both are more in vaginal compared to abdominal approaches. As a secondary outcome, dyspareunia was more common in vaginal compared to abdominal approaches.⁶ Other studies evaluated pain medication requirements following sacropepy and POP surgeries involving transvaginal mesh.^{16–18} In a systematic review of complications and reoperation rates after apical prolapse procedures, pain-related complications were higher in vaginal mesh (2.5%), followed by sacral colpopexy (2.3%) and traditional vaginal repair (1.6%) groups. In a database study, complications and failure rates for apical repair via different routes were investigated. Pelvic pain was found to be higher in sacrocolpopexies (22%) and native tissue repairs (22.7%), while transvaginal mesh repair was surprisingly associated with lowest (16.4%).¹⁹ The rate of pre-operative pelvic pain was significantly lower in the transvaginal mesh repair group, suggesting that surgeons may have avoided using mesh in these individuals.

Does pelvic organ prolapse cause pelvic pain? A question that remains without a clear answer. Some patients ascribe back and pelvic pain to their pelvic organ prolapse. However, very little evidence confirm that prolapse causes pelvic pain.²⁰ In a study involving 152 patients with prolapse, the authors concluded that pelvic organ prolapse doesn't cause pelvic or low back pain.²¹ Our data suggests that treating apical prolapse seem to improve pain as most patients with pre-operative pain didn't report pain after surgery. However, we have to be careful in making this conclusion as presence of pain was reported through ICD-9 codes and not direct patient survey.

In our study, it seems that the presence of pre-operative pain was associated with the operative characteristics. For example, presence of prior pain was associated with more hysterectomies. Per our results, this appeared helpful as concomitant hysterectomy was associated with lower postoperative pain. Similarly, it seems surgeons tried to avoid mesh insertion in patients with prior pain which is in accordance with other studies.¹⁹

Our finding that a concomitant hysterectomy is associated with less postoperative pain is conceivable as undiagnosed pathologies such as endometriosis, fibroids, and adenomyosis can cause pelvic pain. Current evidence suggests that uterine preservation during apical prolapse surgery may be associated with higher re-operation rates for recurrent prolapse.²² In a randomized trial including 66 women with stage 2–4 uterine prolapse, sacrospinous hysteropexy was associated with significantly higher stage 2 or more prolapse recurrence compared to vaginal hysterectomy with uterosacral suspension.²³ Therefore, it appears that the trade-off of avoiding hysterectomy (such as shorter operative time and rapid recovery) can be higher risk of postoperative pelvic pain and prolapse recurrence.

In our study, additional vaginal repairs were associated with more postoperative pain in those without prior pain (de novo pain). However, insertion of mesh was not associated with more postoperative pain. This comes in line with other studies where some patients developed de novo dyspareunia after anterior repair.^{24,25} These studies also showed that although mesh erosion occurred in some patients, mesh insertion was not associated with a significant increase in postoperative dyspareunia. In a clinical point, gynecologists used to

place meshes in older, less sexually active women. Many of them would have had dyspareunia if they were sexually active.

Our results also showed that postoperative pain was less in patients older than 45 years. This finding is in agreement with studies showing age-related changes in pain perception and tolerance thresholds.²⁶ This has significant clinical implications in managing postoperative pain as there is evidence that postoperative pain and narcotic consumption are associated with patient age with more pain and analgesic requirements in younger patients.²⁷

What is the appropriate time frame to follow postoperative pain? There are advantages and disadvantages for different time frames. For example, further extending the follow-up period may allow us to identify more cases with persistent pain, albeit risking inclusion of surgery-unrelated cases. In addition, for research using insurance claims data, only those who had continuous enrollment in the study period were eligible for the study. This means the longer the follow-up, the smaller the sample size would be. For example, in our study, extending the follow-up period to 1 year will decrease cohort subjects by 13%. While some patients may still be recovering surgery at 1 month after the operation, initiating the follow-up at a later time point may lead to an underestimation of patients with post-operative pain. Given all these considerations, we believe that follow-up from 1 to 7 months after surgery should be a clinically meaningful time frame. There is a clear need for further studies to examine postoperative pain after gynecologic surgeries over a long period (e.g. from 1 month to 3 years) and evaluate correlation between close and remote postoperative pain.

The results of this study may have been impacted by some limitations. First, it relied on ICD-9-CM and CPT codes, which sometimes can be inaccurate or incomplete.²⁸ In particular, some of the diagnostic codes for pelvic pain are not very specific. To address this, we selected the codes most frequently used by physicians for pelvic pain and have been used in previous studies.²⁹ These imitations of ICD-9-CM codes can affect the classification of patients according to presence of pelvic pain, whether pre- or postoperatively. Second, ICD-9-CM data do not provide information on the severity or duration of pain or how the diagnosis was made or the staging of prolapse. For example, Pelvic Organ Prolapse Quantification (POP-Q) values were not available. Similarly, other potentially relevant pre-operative data as pelvic imaging were not available. Also, CPT data do not provide operative details e.g. estimated blood loss (EBL), operating room (OR) time, intra-operative findings/ complications or results of pathological examination. However, we included the data on length of hospital stay, which may reflect the complexity of the case and might explain the association between extended hospital stay and increased postoperative pain. One potential addition is using narcotic dispensing from pharmacy records as a surrogate for pain severity. However, it has limitations as it is not possible to examine if or how patients took these medications after they filled the prescription. Also, some patients may get medicine from out-of-network resources which will not be captured by the insurance database. Third, information about race/ethnicity are not included in the Clinformatics DataMart database. Therefore, we couldn't analyze our data according to these two variables. Fourth, the group of patients who underwent surgery for apical prolapse without a concomitant hysterectomy includes those who previously had a hysterectomy and currently underwent colpopexy for vault prolapse and those who underwent uterine-preserving surgery and currently underwent

hysteropexy for uterine prolapse. Due to the limitation of the past surgical history in the administrative database, it is not possible to differentiate these 2 groups. However, this shouldn't make a difference in the conclusion from a clinical standpoint. Fifth, as previously discussed, because we followed the patients for 7 months, cases that presented with pain after 7 months were not captured.

Despite the previously mentioned limitations, this study has strengths points. First, it provides a large, geographically diverse patient population across different healthcare settings. The large size of the cohort significantly increases the power of the study. Second, claims database analysis allows capturing real-world insurance clinical data. Third, it allows longitudinal tracking at the patient level. Fourth, we adhered to the STROBE statement for strengthening the reporting of observational studies in epidemiology.¹⁰ Fifth, we systematically sought to minimize bias. For example, we adjusted for concomitant hysterectomy and additional repairs when analyzing clinical variables such as age and surgical approach.

Based on the findings of this study, further research is warranted. First, pain should be included in outcome research studies of gynecologic surgery including those for pelvic organ prolapse. This is particularly important in randomized controlled trials where validated pain assessment questionnaires can be used. Second, there is a clear need for translational research to investigate the mechanisms of gynecologic pain including postoperative pain. This can increase our understanding of the complex pathways involved in pelvic pain control, including molecular, cellular and animal model-based studies. This need has been recently stressed by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) of the National Institutes of Health (NIH) declaring mechanisms of gynecologic pain syndromes as one of its high program priorities.³⁰ Finally, interdisciplinary collaborative research including gynecologists, psychologists, pain scientists, cell biologists, and cognitive scientists is highly encouraged to improve our understanding of pelvic pain and develop successful management approaches.

In conclusion, our results show that in patients who undergo apical prolapse surgeries, those with prior pain were more likely to undergo an abdominal approach, have a concomitant hysterectomy, and have postoperative pain. Concomitant hysterectomy was associated with less pain, while additional vaginal repairs were associated with more postoperative pain. There is a need to include pain as an outcome in future studies, particularly randomized controlled trials.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

The study cohort selection flow diagram.

*Identified by any claim with ICD-9 code 180.x (cervical cancer) or 182.x (uterine cancer) during the 19 months of study period.

Figure 2. Overall study cohort. Percentages of patients stratified by presence of pre-operative (prior) pain (A), and procedure performed (B).

Figure 3.

Association of prior pain and operative variables: approach (A), concomitant hysterectomy (B), additional repairs (C), and mesh insertion (D)

Table 1.

Characteristics of study population

Patient and Operative Characteristic	Total N=14440	Without Prior Pain N=12027 (83.3%)	With Prior Pain N=2413 (16.7%)
N (column %)			
Approach			
Abdominal	5681 (39.3)	4605 (38.3)	1076 (44.6)
Vaginal	8759 (60.7)	7422 (61.7)	1337 (55.4)
Procedure			
Abdominal, open	2126 (14.7)	1788 (14.9)	338 (14.0)
Abdominal, laparoscopic	3555 (24.6)	2817 (23.4)	738 (30.6)
Vaginal, extra-peritoneal approach	5430 (37.6)	4844 (40.3)	586 (24.3)
Vaginal, intra-peritoneal approach	3329 (23.1)	2578 (21.4)	751 (31.1)
Age at surgery			
< 45	3030 (21.0)	1948 (16.2)	1082 (44.8)
45-54	4424 (30.6)	3580 (29.8)	844 (35.0)
55-64	4983 (34.5)	4580 (38.1)	403 (16.7)
65+	2003 (13.9)	1919 (16.0)	84 (3.5)
Region			
Midwest	3552 (24.6)	3067 (25.5)	485 (20.1)
Northeast	829 (5.7)	750 (6.2)	79 (3.3)
South	7322 (50.7)	6055 (50.3)	1267 (52.5)
West	2737 (19.0)	2155 (17.9)	582 (24.1)
Length of stay			
Outpatient	7072 (49.0)	5760 (47.9)	1312 (54.4)
1	2678 (18.5)	2289 (19.0)	389 (16.1)
2	3005 (20.8)	2551 (21.2)	454 (18.8)
3	1160 (8.0)	987 (8.2)	173 (7.2)
4+	525 (3.6)	440 (3.7)	85 (3.5)
Surgeon specialty			
OB/Gyn	11121 (77.0)	9121 (75.8)	2000 (82.9)
Urology	1363 (9.4)	1241 (10.3)	122 (5.1)
Both	194 (1.3)	176 (1.5)	18 (0.7)
Other	1762 (12.2)	1489 (12.4)	273 (11.3)
Concomitant hysterectomy			
No	6274 (43.4)	5658 (47.0)	616 (25.5)
Yes	8166 (56.6)	6369 (53.0)	1797 (74.5)
Additional repairs			
None	4928 (34.1)	3652 (30.4)	1276 (52.9)
Anterior	1596 (11.1)	1404 (11.7)	192 (8.0)
Posterior	1762 (12.2)	1565 (13.0)	197 (8.2)
Anterior and posterior	3102 (21.5)	2799 (23.3)	303 (12.6)

Patient and Operative Characteristic	Total N=14440	Without Prior Pain N=12027 (83.3%)	With Prior Pain N=2413 (16.7%)
	N (column %)		
Enterocoele	590 (4.1)	433 (3.6)	157 (6.5)
Anterior and enterocoele	179 (1.2)	154 (1.3)	25 (1.0)
Posterior and enterocoele	348 (2.4)	298 (2.5)	50 (2.1)
Anterior, posterior and enterocoele	1935 (13.4)	1722 (14.3)	213 (8.8)
Mesh insertion during surgery			
No	10526 (72.9)	8514 (70.8)	2012 (83.4)
Yes	3914 (27.1)	3513 (29.2)	401 (16.6)

Table 2.

Proportions of patients with pelvic pain before and after surgery, by type of surgery, concomitant hysterectomy, additional repairs, and mesh insertion

	Total N=14440	% with Prior Pain N=2413 (16.7%)	% with Post Pain N=911 (6.3%)
Approach			
Abdominal	5681	1076 (18.9)	358 (6.3)
Vaginal	8759	1337 (15.3)	553 (6.3)
Procedure			
Abdominal, open	2126	338 (15.9)	132 (6.2)
Laparoscopic	3555	738 (20.8)	226 (6.4)
Vaginal, extra-peritoneal	5430	586 (10.8)	329 (6.1)
Vaginal, intra-peritoneal	3329	751 (22.6)	224 (6.7)
Concomitant hysterectomy			
No	6274	616 (9.8)	425 (6.8)
Yes	8166	1797 (22.0)	486 (6.0)
Additional repairs			
No	4928	1276 (25.9)	269 (5.5)
Yes	9512	1137 (12.0)	642 (6.7)
Mesh insertion			
No	10526	2012 (19.1)	649 (6.2)
Yes	3914	401 (10.2)	262 (6.7)

Table 3.

Association of prior pain with operative characteristics: approach (A), concomitant hysterectomy (B), additional repairs (C), and mesh insertion (D)

A			
	Approach		P value [#]
	Abdominal	Vaginal	
	N (row %)		
Without prior pain	4605 (38.3)	7422 (61.7)	< 0.001
With prior pain	1076 (44.6)	1337 (55.4)	
B			
	Concomitant hysterectomy		P value [#]
	No	Yes	
	N (row %)		
Without prior pain	5658 (47)	6369 (53)	< 0.001
With prior pain	616 (25.5)	1797 (74.5)	
C			
	Additional repairs		P value [#]
	No	Yes	
	N (row %)		
Without prior pain	3652 (30.4)	8375 (69.6)	< 0.001
With prior pain	1276 (52.9)	1137 (47.1)	
D			
	Mesh insertion		P value [#]
	No	Yes	
	N (row %)		
Without prior pain	8514 (70.8)	3513 (29.2)	< 0.001
With prior pain	2012 (83.4)	401 (16.6)	

[#] Chi-square test.

Table 4.

Association of operative characteristics with postoperative pelvic pain in patients with and without prior pain

Characteristics	<u>Patients without Prior Pain</u>			<u>Patients with Prior Pain</u>		
	Total	% with post pain	p value [#]	Total	% with post pain	p value [#]
Approach						
Abdominal	4605	5.0	0.463	1076	11.8	0.991
Vaginal	7422	5.3		1337	11.8	
Procedure						
Abdominal, open	1788	4.9	0.813	338	13.3	0.492
Laparoscopic	2817	5.1		738	11.1	
Vaginal, extra-peritoneal	4844	5.2		586	13.0	
Vaginal, intra-peritoneal	2578	5.5		751	10.9	
Concomitant hysterectomy						
No	5658	5.8	0.006	616	15.7	< 0.001
Yes	6369	4.7		1797	10.5	
Additional repairs						
No	3652	3.8	< 0.001	1276	10.3	0.018
Yes	8375	5.8		1137	13.5	
Mesh insertion						
No	8514	4.9	0.014	2012	11.6	0.432
Yes	3513	6.0		401	13.0	

[#]Chi-square test.

Table 5.

Association of postoperative pelvic pain with patient and operative characteristics in patients with and without prior pain

Patient and Operative Characteristic	Odds Ratio (95% CI)	
	Without Prior Pain	With Prior Pain
Procedure		
Abdominal, open	0.72 (0.53, 0.99)	0.95 (0.59, 1.53)
Laparoscopic	1.00	1.00
Vaginal, extra-peritoneal	0.73 (0.57, 0.95)	1.02 (0.68, 1.54)
Vaginal, intra-peritoneal	0.90 (0.70, 1.16)	0.93 (0.66, 1.31)
Age at surgery		
< 45	1.00	1.00
45-54	0.75 (0.60, 0.94)	0.75 (0.57, 1.00)
55-64	0.60 (0.48, 0.76)	0.60 (0.41, 0.88)
65+	0.33 (0.24, 0.46)	0.33 (0.14, 0.78)
Region		
Midwest	1.00	1.00
Northeast	1.21 (0.85, 1.71)	1.35 (0.65, 2.83)
South	0.96 (0.78, 1.18)	1.20 (0.85, 1.70)
West	1.34 (1.05, 1.71)	1.15 (0.77, 1.71)
Length of stay		
Outpatient	1.00	1.00
1	1.20 (0.96, 1.51)	0.93 (0.63, 1.36)
2	1.22 (0.96, 1.54)	1.03 (0.70, 1.50)
3	1.49 (1.07, 2.07)	1.72 (1.04, 2.84)
4+	1.82 (1.19, 2.78)	1.65 (0.87, 3.12)
Surgeon specialty		
OB/Gyn	1.00	1.00
Urology	0.70 (0.52, 0.96)	0.31 (0.13, 0.72)
Both	0.49 (0.20, 1.21)	0.44 (0.06, 3.38)
Other	1.08 (0.83, 1.41)	1.21 (0.82, 1.78)
Concomitant hysterectomy		
No	1.00	1.00
Yes	0.68 (0.56, 0.82)	0.56 (0.41, 0.77)
Additional vaginal repair		
No	1.00	1.00
Yes	1.63 (1.30, 2.04)	1.33 (0.98, 1.80)
Mesh insertion		
No	1.00	1.00
Yes	1.18 (0.95, 1.45)	0.90 (0.60, 1.35)

* Adjusted for type of surgery, age, region, year of the surgery, length of stay, surgeon specialty, concomitant hysterectomy, and mesh insertion during surgery.

Table 6.

The association of additional vaginal repairs on the risk of having postoperative pelvic pain, by prior pelvic pain

Additional repairs	Odds Ratio (95% CI)*	
	Without Prior Pain	With Prior Pain
No	1.00	1.00
Yes		
Anterior	1.09 (0.77, 1.55)	1.67 (1.01, 2.75)
Posterior	2.04 (1.56, 2.67)	1.39 (0.85, 2.26)
Anterior + posterior	1.55 (1.19, 2.03)	1.68 (1.10, 2.56)
Enterocoele	1.29 (0.80, 2.06)	0.81 (0.46, 1.45)
Anterior + enterocoele	1.40 (0.63, 3.09)	1.26 (0.36, 4.40)
Posterior + enterocoele	1.28 (0.73, 2.26)	0.98 (0.37, 2.58)
Anterior + posterior + enterocoele	1.95 (1.45, 2.62)	1.51 (0.92, 2.48)

* Adjusted for type of surgery, age, region, year of the surgery, length of stay, surgeon specialty, concomitant hysterectomy, and mesh insertion during surgery.