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Pre-Operative Anxiety Related to Major Urogynecologic Surgery: Insights from Perioperative Survey Data in Maine

Nadi Nina Kaonga [1,2,*], Yanghee Courbron [3], Emmy Holmgren [3], Eliot Konzal [4], Whitney Williams [3], Mary Brandes [3] and Caroline Foust-Wright [2,3]

[1] Department of Gynecology and Obstetrics, Emory University School of Medicine, Atlanta, GA 30322, USA
[2] Department of Obstetrics and Gynecology, Maine Medical Center, Portland, ME 04102, USA
[3] Female Pelvic Medicine and Reconstructive Surgery, Maine Medical Partners, Portland, ME 04102, USA
[4] Maine Medical Partners, Portland, ME 04102, USA
* Correspondence: nkaonga@gmail.com

Abstract: Background: Higher levels of pre-operative anxiety are associated with adverse outcomes according to the cardiothoracic and orthopedic literature on emergent surgeries. There are limited data on pre-operative anxiety levels in the gynecologic setting. This study sought to identify predictive variables for high pre-operative anxiety levels in patients undergoing major urogynecologic surgery. Methods: Pre- and post-operative surveys that included demographic data, a modification of the Amsterdam Pre-Operative Anxiety and Information Scale, and open-ended questions regarding anxiety were administered. Descriptive, univariate and multivariate analyses were used to analyze the quantitative elements of the survey data. The qualitative components of the survey data were coded and analyzed using thematic analyses. Results: A total of 54 participants completed the pre-operative survey. The median age was 62 years old, and the majority were employed (n = 34, 60.7%). Roughly 1/3 had been diagnosed with a mental health condition (n = 19, 33.9%) and nearly all had other health conditions (n = 51, 91%). The baseline APAIS score ranged from 9 to 40, with higher scores reflecting higher levels of pre-operative anxiety. The median APAIS score was 24, with a score equal to or greater than 30 being in the highest tertile. Conclusion: No associations were made between the variables and pre-operative anxiety levels. However, useful insights into our patient population were made.

Keywords: anxiety; pre-operative anxiety; urogynecology; gynecology; surgery

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1. Introduction

An estimated 4.9 million obstetric and gynecologic procedures were conducted in 2006 in the United States [1]. Furthermore, over 25% of inpatient procedures performed from 1979 to 2006 in adult persons with female reproductive organs were obstetric and gynecologic procedures. Of those procedures, 29% were gynecologic surgeries. Despite a reported decrease in the number of procedures conducted over that nearly 30-year period, gynecologic surgery is quite common [1]. Pelvic organ prolapse surgery, in particular, accounts for roughly 300,000 gynecologic surgeries each year and has been increasing [1]. Regardless of the approach, pelvic organ prolapse surgery is major surgery and deals with patients' quality of life. Anywhere from 3 to 8% of female persons in the United States have pelvic organ prolapse. Among persons with pelvic organ prolapse, there is a 12.6% lifetime risk of undergoing pelvic organ prolapse surgery. It is therefore especially important to better understand what these individuals are experiencing emotionally leading up to surgery [2]. As we look to improve gynecologic surgical outcomes, addressing pre-operative anxiety presents an opportunity to optimize outcomes.

Anxiety is a normal physiologic response to surgery. However, higher levels of pre-operative anxiety can result in adverse outcomes before and after surgery [3–7]. While

there is literature on pre-operative anxiety, most studies have been descriptive. They also call for further research to identify strategies to reduce pre-operative anxiety.

A study within the Ear, Nose and Throat literature found that there was a significant association between pre-operative anxiety and post-operative pain [3]. Similarly, an orthopedic study identified that pre-operative anxiety was significantly associated with post-operative amputation phantom limb and residual limb pain [4]. In patients undergoing laparoscopic cholecystectomies, high levels of pre-operative anxiety had significantly negative effects on anesthesia recovery and post-operative pain control [5]. In the cardiac surgery literature, one study found that high levels of pre-operative anxiety were present in 7% of patients, and that high pre-operative anxiety was significantly predictive of post-operative morbidity and mortality [6]. The second study was a literature review and found that pre-operative education could potentially address high levels of pre-operative anxiety, but the data were conflicted on its true effectiveness. The author concluded that further research was needed [7].

There have increasingly been studies on perioperative anxiety in the gynecologic literature [8–10]. One study surveyed the patterns and frequency of anxiety both pre- and post-operatively. The authors found that high levels of anxiety were associated with increased levels of postoperative pain [8]. Furthermore, the authors determined that high levels of anxiety could be identified early enough for an intervention to occur. Another study assessed the impact of pre-operative instruction on anxiety before gynecological surgery and found that it reduced pre-operative anxiety levels [9]. The final study implemented a self-catheterization instructional video to see what effect it had on pre-operative anxiety levels. However, the effect was not sustained [10]. More recently, a study identified that immediate pre-operative anxiety levels were correlated with the experience of higher post-operative pain levels [11]. Another study investigated perioperative depression and anxiety symptoms in relation to post-operative pain but found no correlation with baseline mood symptoms [12].

No study has yet identified the factors that are predictive of higher levels of perioperative anxiety. Therefore, this study was conducted to risk stratify persons undergoing major urogynecologic surgery according to their pre-operative anxiety levels in an effort to identify opportunities for targeted intervention.

2. Materials and Methods

This study used a combination of survey data and abstracted data from electronic health records. The surveys included closed and open-ended questions and leveraged a validated peri-operative anxiety survey scale. The protocol was approved by the Maine Health Institutional Review Board.

2.1. Eligibility

Adult persons (at or over 18 years old) who were literate in English and presenting for surgical consultation at a single outpatient site were eligible for enrollment. The site was a sub-specialty clinic that focuses on urogynecology. People undergoing the following surgeries were eligible for enrollment: sacrocolpopexy, sacrospinous ligament fixation, and uterosacral suspension. Individuals undergoing combined procedures that included at least one of the aforementioned surgeries were still eligible. If an individual was undergoing minor procedures or major surgery for conditions other than pelvic organ prolapse or did not have pelvic organ prolapse, they were not eligible. Individuals with cognitive deficits were also not eligible for enrollment.

2.2. Enrollment

At our site, consecutive eligible patients were approached at the 2-week pre-operative visit. They were screened for eligibility and offered participation in the study. Informed written consent was obtained. Before the pandemic, surveys were administered in person at routine pre- and post-operative visits. During the pandemic, the IRB protocol was

modified to allow subjects to mail in completed surveys after enrollment. For the 6-week post-operative visit, participants were intentionally sampled based on convenience.

2.3. Sample Size Estimates

We anticipated that our model would contain 3 variables. Based on the accepted conservative 'rule of thumb' of one variable per 10 events for regression analyses, it was estimated that a minimum of 30 participants would be needed for the study [13–15]. However, to account for attrition and conduct regression analyses to identify potentially protective and predictive variables, we sought to enroll 50 participants. For the 6-week post-op surveys, it was anticipated that a saturation point would be reached within 10 completed surveys.

2.4. Data Collection

Data were collected from surveys administered at fixed time points before and after surgery. The timepoints were 2 weeks before surgery, 2 weeks after surgery and, for a subset of participants, 6 weeks after surgery. The surveys were integrated into pre-existing workflows at the enrollment site.

The surveys were developed to assess anxiety levels prior to surgery, the day of surgery and after surgery using the original and then modified versions of the Amsterdam Pre-operative Anxiety Scale (APAIS), in addition to structured response questions and short free text questions. The original APAIS was used in the 2-week pre-operative survey. Then, the APAIS was modified in the 2-week post-operative survey for participants to reflect on and report their anxiety during the time leading up to surgery and the day of surgery. The score range for the baseline APAIS was from 9 to 45; this was the same score range for the modified versions. The 2-week pre-operative surveys also included structured questions to obtain sociodemographic information from each of the participants.

Data were also abstracted from the chart, in part to triangulate and verify data on the survey responses. These included the following: age, height, weight, body mass index, co-morbidities (if any), type of surgery, additional procedures (if any), time of surgery, post-operative catheter use (if needed), complications (if any) and whether or not the participant attended their 2-week and 6-week post-operative visits.

2.5. Data Analysis

Quantitative survey data elements were analyzed using rStudio [16]. Descriptive analyses were conducted. Correlations between the variables and pre-operative anxiety were run; chi-square and Fisher's analyses were conducted to assess the strengths of association between the variables and pre-operative anxiety. For parametric data, *t*-tests were conducted. Non-parametric tests were used when indicated. For the comparison of paired categorical data, McNemar's test was conducted. Simple and multiple regression were run. After reviewing the data, the APAIS scores were divided into tertiles, with the highest tertile representing the most anxiety and the lowest tertile reflecting the lowest anxiety.

Qualitative survey data elements (from the free text questions) were analyzed by hand using the grounded theory. Specifically, open coding techniques were used to develop themes, and as the data continued to be systematically reviewed, axial coding techniques were then applied to generate and refine the categories of the qualitative data.

3. Results

From February 2019 to August 2021, there were 534 eligible individuals. The total number of individuals approached for this study is not known as these data were not captured. There were 59 participants enrolled in the study; of those, 54 completed the 2-week pre-operative survey and half also completed the 2-week post-operative survey. Eight individuals were approached to then also complete the 6-week post-operative survey. See Figure 1.

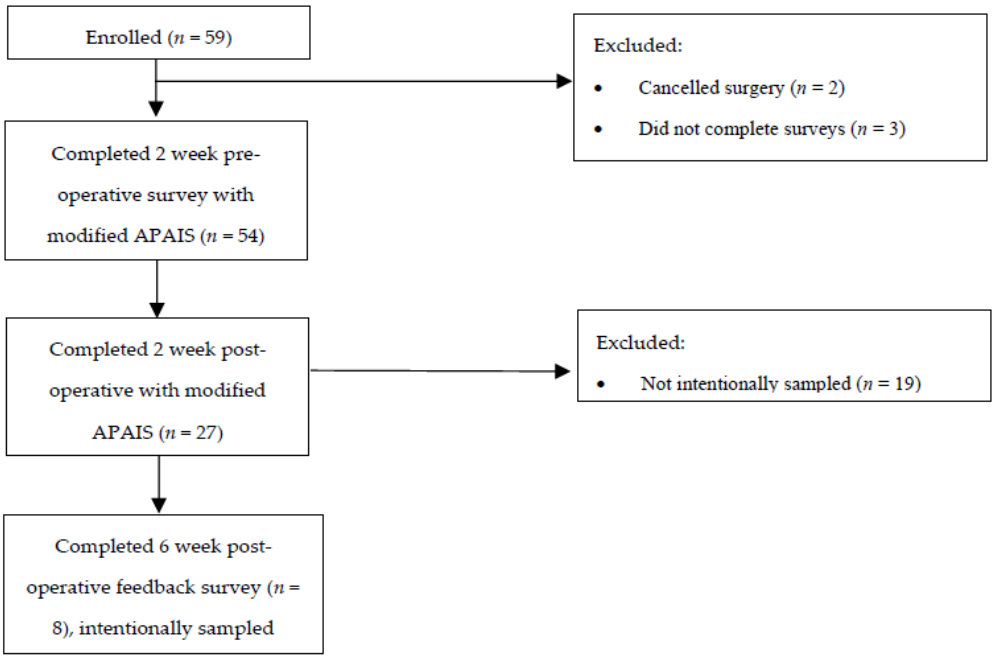

Figure 1. Participant enrollment by survey type. Total approached is unknown, number eligible: 534.

All participants (n = 54) identified as White but two participants also identified as Native American or Alaskan Native. The median age was 62 years old [IQR 53.8, 69.3] and most had undergone menopause (n = 42, 75%). Most (n = 34, 60.7%) were employed. Nearly all participants had undergone non-prolapse surgery in the past (n = 47, 94%). One-third reported that they had a prior mental health condition (n = 19, 33.9%), with anxiety being the most common. There was no difference between those who completed the pre-operative survey only and those who completed both the pre- and the post-operative survey. See Table 1. There were also no differences in the baseline characteristics of the participants enrolled prior to versus after the start of the COVID-19 pandemic.

Table 1. Sociodemographic characteristics of all participants with all participants and sub-set of participants who completed the post-operative survey.

Variables	Completed Pre-Op Survey	Completed Post-Op Survey
Sample size	54	27
Age (years)	62.0 (median, IQR: 53.8, 69.3)	62 yo (median, IQR 50.5, 69)
Race *	• White: 56 (100%) • Native American or Alaskan Native: 2 (3.6%)	• White: 27 (100%) • Native American or Alaskan Native: 2 (7.4%)
Education highest level completed	• None: 1 (1.8%) • Some HS: 2 (3.6%) • HS or GED: 9 (16.1%) • Trade or craft certificate: 7 (12.5%) • Some college: 11 (19.6%) • College: 15 (26.8%) • Post-graduate or professional degree: 11 (19.6%)	• None: 1 (3.7%) • Some HS: 1 (3.7%) • HS or GED: 4 (14.8%) • Trade or craft certificate: 6 (22.2%) • Some college: 4 (14.8%) • College: 3 (11.1%) • Post-graduate or professional degree: 8 (29.6%)

Table 1. *Cont.*

Variables	Completed Pre-Op Survey	Completed Post-Op Survey
Employment *	• Employed for wages: 29 (51.8%) • Self-employed: 5 (8.9%) • Out of work and looking for work: 0 (0%) • Out of work and not looking for work: 1 (1.8%) • Homemaker: 3 (5.4%) • Student: 0 (0%) • Military: 0 (0%) • Retired: 18 (32.1%) • Unable to work: 1 (1.8%)	• Employed for wages: 15 (55.6%) • Self-employed: 2 (7.4%) • Out of work and looking for work: 0 (0%) • Out of work and not looking for work: 1 (3.7%) • Homemaker: 1 (3.7%) • Student: 0 (0%) • Military: 0 (0%) • Retired: 9 (33.3%) • Unable to work: 0 (0%)
Income **	• 0–49,999: 22 (42.3%) • 50–99,999: 18 (34.6%) • ≥100,000: 12 (23.1%)	• 0–49,999: 11 (42.3%) • 50–99,999: 9 (34.6%) • ≥100,000: 6 (23.1%)
Marital status	• Single, never married: 2 (3.6%) • Married/domestic partnership: 42 (75%) • Widowed: 5 (8.9%) • Divorced: 7 (12.5%)	• Single, never married: 1 (3.7%) • Married/domestic partnership: 17 (63%) • Widowed: 3 (11.1%) • Divorced: 6 (22.2%)
Ever diagnosed with mental health condition *	• Yes: 19 (33.9%) ○ 16 (anxiety) ○ 8 (depression) ○ 3 (ADHD, PTSD) ○ 1 (personality disorder, other) • No: 37 (66.1%)	• Yes: 10 ○ 9 (anxiety) ○ 2 (depression) ○ 1 (PTSD, ADHD, other) • No: 17
Other health conditions	51 (91%)	23 (85.5%)
Any prior surgery ***	Yes: 47 (94%) None: 3 (6%)	Yes: 21 (91.3%) None: 2 (8.7%)

Sources: 2-week pre-operative survey and 2-week post-operative survey. * Participants could select more than one option; ** 4 of 54 participants did not answer, 1 of 27 who completed post-op survey did not answer; *** 6 of 54 participants did not answer, 4 of 27 who completed post-op survey did not answer.

The highest values within the APAIS scale dealt with the post-operative period (median sub-score 4 [IQR 3,5]): "wanting to know more about recovery" and "worry about recovery." Illustrating this point further, one respondent in the 2-week post-operative survey wrote, "When will I feel normal?" In addition, there were high values for "wanting to know more about the procedure." The lowest values within the scale dealt with anesthesia.

The 2-week pre-operative baseline APAIS score ranged from 9 to 40 (See Figure 2). The median 2-week pre-operative APAIS baseline score was 24 [IQR 19, 29.75] (See Table 2). When the APAIS score was divided into tertiles, one quarter of participants had a score in the highest tertile (≥30); only one participant had a score less than 10 (9). Higher scores are reflective of more anxiety. No single or combination of variables was found to be statistically associated with a higher APAIS score, including factors that were clinically suspicious for a high association a priori (i.e., mental health, comorbidity, prior surgery). Additionally, analyses did not identify any single or combination of variables statistically associated with a lower APAIS score, including factors that were clinically anticipated to be protective a priori (i.e., education, marital status, no prior mental health diagnosis).

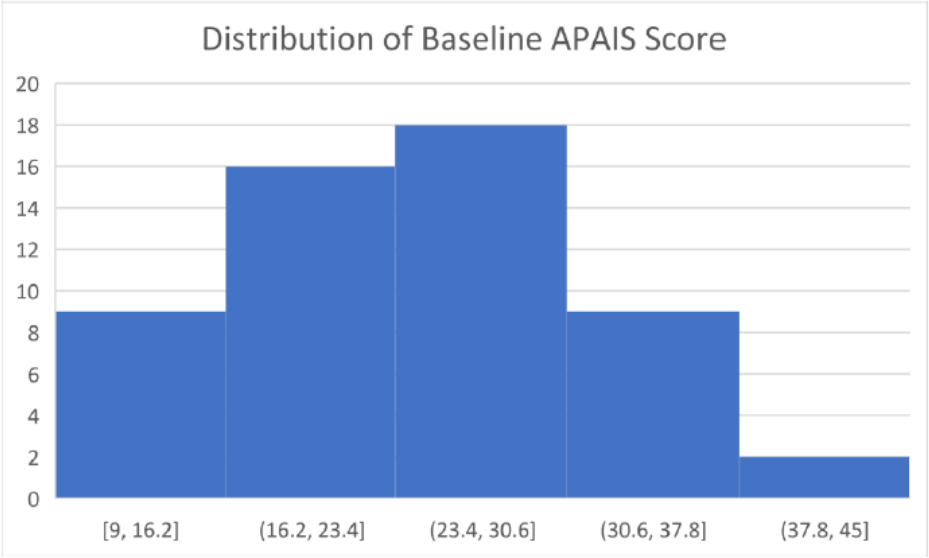

Figure 2. Histogram of baseline APAIS score. X axis: Ranges of APAIS scores, y axis: number of participants.

Table 2. Baseline APAIS score with all participants and sub-set of participants who completed the post-operative survey.

	Completed Pre-Op Survey Score [IQR]	Completed Post-Op Survey Score [IQR]
Baseline APAIS Score	24 [19.25, 29.75]	24 [21.5, 29]

Pain immediately after surgery and at follow-up did not correlate with the baseline APAIS score. When the APAIS scores were calculated using the 2-week post-operative surveys (that used modified APAIS questions) and compared to the baseline scores, the anxiety scores did not change, reflecting no changes in score over time. See Table 2.

Post-operative complications were uncommon and there was no correlation between having a complication and the APAIS scores. See Table 3. For the individuals with urinary incontinence, it was transient.

Table 3. Post-operative complications *.

Complication	Frequency, *n* (%)
Urinary incontinence	8 (14.8%)
Urinary retention	3 (5.6%)
Urinary tract infection	4 (7.4%)
Deep vein thrombosis/Pulmonary Embolism	1 (1.8%)
Vaginal bleeding	2 (3.7%)
Wound-related issue	2 (3.7%)
Recurrent prolapse	4 (7.4%)

* Abstracted from the charts of all 54 participants; six participants had two concurrent complications, and the remainder had one each.

Post-operatively, the majority of participants reported that their anxiety levels were better than the day of surgery (n = 17), and one participant felt worse than the day of surgery. Only one of those participants with less anxiety after surgery had a baseline APAIS score of above 30.

During the 2-week post-operative period, participants felt that the most helpful strategies used to reduce their pre-operative anxiety were the pre-op discussion/teaching with the staff (n = 10). Confidence in the surgeon and care team also mattered (n = 5). Only two participants mentioned that premedication was helpful. It is of note that premedication is not part of our standard practice. For those who responded to the 6-week survey, the three methods that participants thought would be the most helpful were a booklet, online portal/network and meditation.

4. Discussion

Despite finding no statistical association between the variables and high pre-operative anxiety levels, this study provided an opportunity to better understand our patient population's perioperative anxiety, especially related to the procedure and recovery. Our findings are also consistent with more recent literature investigating anxiety and the perioperative period.

Interestingly, the literature for APAIS suggests that scores greater than 11 signal high pre-operative anxiety [17–20]. Given that our patient population had a baseline median score of 24 and only one participant had a score below 11 (score = 9), our population may be more anxious compared to other populations undergoing surgery. The fact that the scores did not change over time seems to further support this observation. We likely did not capture self-reported anxiety given how we asked about baseline mental health, but it is also possible that baseline anxiety in our population is underdiagnosed.

We were able to use the survey results as a diagnostic tool. We now provide more information regarding the recovery process in our standard pre-operative counseling. We also provide all surgical candidates with information about our free health-system-sponsored pre-operative meditation course.

This study had several limitations, including the following: delays leading to protracted timeline, enrollment bias, a homogenous population, and recall bias. Delays are inevitable in any study. Our study recruitment and attrition were impacted by the COVID-19 pandemic, but interestingly, the data were not. It is possible that given the protracted timeline, enrollment bias was introduced into the study as well. Unfortunately, we were not able to calculate retention data.

It is possible that by asking about pre-operative anxiety, we unintentionally elevated anxiety levels. Our consent process did alert patients to this possibility, and they were encouraged to get in touch with the study team if that occurred. Fortunately, there were no instances of this, but future studies could include a question in the survey to gauge any triggers caused by the study. The participants were asked to self-report, which increases the risk of recall bias. However, the proximity of the surveys to the surgery slightly mitigated this risk. Additionally, the study used a validated tool that has proven to be accurate in the assessment of pre-operative anxiety.

Our study participants did reflect the population of patients seen in the single site. However, our study may not be generalizable to other locations due to the homogeneous nature of the study population. Unfortunately, it is known that gynecologic sub-specialties are less frequently accessed by marginalized, under-served and/or understudied populations; this importantly warrants further investigation and change.

While our study had limitations, there were benefits and opportunities. We had a small but reasonable sample size estimate for what we sought to do. We gained insights into our patient population and can now design strategies to shift pre-operative care and optimize patient comfort and outcomes. It is also possible that by raising these issues, participants may better have their questions answered, process root causes and subsequently have their fears alleviated.

The current literature on pre-operative anxiety related to gynecologic surgery has not identified predictors. However, a recent study found data suggesting that elevated pre-operative anxiety levels are associated with higher post-operative pain [21]. This is particularly relevant to our population. There are interventions that may help alleviate

anxiety levels and warrant further exploration in our population. Two studies investigated the use of meditative-like techniques, namely guided imagery and video-based intervention [22,23]. The guided imagery study found that the intervention improved preparedness despite not having an impact on anxiety on the day of surgery [22]. The video intervention, which had focused on minor surgeries, did significantly decrease anxiety levels [23]. Another four studies explored the use of music and/or art therapy and found that the interventions significantly decreased pre-operative anxiety levels [24–27]. Two studies that explored the use of anxiolytics had mixed results, but they did find success with metoprolol for short-term perioperative anxiety [28,29]. Acupuncture may also reduce pre-operative anxiety [30]. Most recently, a study found that chewing gum reduced pre-operative anxiety levels [31].

These potential interventions are exciting. While we did not find the factors predictive of pre-operative anxiety, we did learn that our population is worried/anxious about the recovery period. As a next step, we intend to investigate the application of proven interventions from the literature and assess if these mitigates the anxiety and worry faced by our patients in the recovery period.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/reprodmed5010003/s1.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Maine Health for studies involving humans.

Informed Consent Statement: Written informed consent was obtained from all subjects involved in the study.

Data Availability Statement: De-identified data are available on a case-by-case basis. Data are contained within the article and Supplementary Materials.

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Conflicts of Interest: The authors declare that they have no competing interests.

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