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Abstracts from the International Pelvic Pain Society (IPPS) Annual Scientific Meeting on Pelvic Pain 2019

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It is my pleasure to inform you that the 22nd International Pelvic Pain Society (IPPS) Annual Scientific Meeting on Pelvic Pain was a success. The 2019 program provided participants with an expanded understanding of chronic pelvic pain evaluation, management, research and innovative therapies. I am thrilled to announce that this year the meeting was attended by a record number of clinicians, researchers and other members of the pain community. The meeting featured a variety of multidisciplinary abstracts, and for the first time, abstract proceedings are being published in *PAIN Reports*.

The abstracts presented here have undergone a rigorous peer review process whereby each abstract was evaluated by at least 2 members of the Scientific Program Committee. Abstracts were excluded if they were incomplete, if they had inadequate statistical analysis, if the data reported was a case report or series, if the data was incomplete or if the topic was not relevant to pain. In all 60 abstracts were submitted for presentation at the Annual Meeting, 55 were accepted for poster or oral presentation, and 50 were deemed suitable for publication in these proceedings.

Despite being a prevalent health problem that has been shown to have significant negative consequences on patients, providers and the healthcare system, chronic pelvic and abdominal pain is often ignored, underdiagnosed, and undertreated. The primary mission of the IPPS is to serve as an educational resource for healthcare providers and persons who suffer with chronic pain. The society promotes multi-disciplinary and biopsychosocial approaches to the diagnosis and treatment of CPP as well as education, research and dissemination of research results. The challenge of improving care for persons suffering with chronic pelvic pain can only be overcome through collaboration between patients and teams of multidisciplinary providers. This collaboration is exemplified in the variety of the abstracts presented here.

The IPPS thanks all providers and researchers who dedicate their lives and careers to the mission of improving the lives of people living with chronic pain. We thank the people who live with the experience of pain and yet participate in research and contribute to our improved understanding of chronic pain. This relentless effort and collaboration will continue throughout the year and we hope to come together again in 2020 at the 23rd Annual Scientific meeting in Denver, Colorado.

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Adolescents and young adults attitudes toward coping strategies for menstrual pain

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Introduction: Painful menstruation without an identified cause, known as primary dysmenorrhea (PD), is the leading cause of school and work absences in reproductive age girls and women, with 20% to 25% of young women reporting significantly impaired functioning because of their symptoms. The aim of this study was to explore coping strategies used by adolescents and young adults (AYA) with PD who were not taking exogenous hormones in the hopes of informing the direction of future treatment approaches.

Methods: Participants included 39 female AYA ages 16 to 24 with self-reported menstrual pain 4/10 on a 0 to 10 (0 = none, 10 = worst pain possible) numeric rating scale (M = 7.1, SD = 1.7). Participants were interviewed using a semi-structured interview guide; interviews were audio recorded, transcribed verbatim, and transcripts were checked for accuracy by the research team. Deductive, iterative thematic analysis was then conducted. Codes and themes were reviewed, and discrepancies were resolved with group consensus discussion.

Results: Participants endorsed using coping strategies across the biopsychosocial spectrum, which aligned into 4 themes: (1) medication use; (2) physical strategies, including rest, sleep, change in body position, heating pad, food and drinks, etc.; (3) psychological strategies, including distraction, positive self-statements, and

cognitive restructuring; and (4) social strategies, such as engaging a friend or family member. In addition, a number of sub-themes emerged related to effectiveness of coping mechanisms. While participants frequently reported that their coping strategies worked, they simultaneously reported having no control over the pain. Others reported that the only control they had was by using medication. Many also expressed an attitude of reluctance toward using medication.

Conclusions: This study contributes to our understanding of attitudes toward coping strategies used by AYA for menstrual pain, which may help identify targets for future interventions aimed at decreasing pain and improving functioning for this recurring and disabling condition.

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Disclosures/Conflicts of Interest: None.

Central Sensitization Inventory in endometriosis-associated pain

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Introduction: Endometriosis-associated pain may be due to disease-specific factors (ie, invasiveness of disease) and/or other factors, such as central sensitization. The aim of this study was to analyze the association between the Central Sensitization Inventory (CSI) and pelvic pain measures.

Methods: Included were women aged 18 to 50 years with endometriosis (current nodule on palpation or ultrasound; or visualized endometrioma on ultrasound; or previous surgical diagnosis), who were new or re-referred to the center between January 1, 2018 and December 31, 2018. Bivariate associations were tested between the CSI and the pain measures.

Results: We analyzed data from 335 women with endometriosis. The mean age of this cohort was 36.0 ± 7.0 years. Forty-five percent (151/335) had a no/low CSI score and 55% (184/335) had a high CSI score, respectively. A high CSI was associated with more severe dysmenorrhea, dyschezia, deep dyspareunia, superficial dyspareunia, and chronic pelvic pain on a 11-point NRS ($P = 0.002$, $P < 0.001$, $P < 0.001$, $P < 0.001$, $P < 0.001$, respectively). For the EPHect questions regarding dysmenorrhea, high CSI was significantly associated with pelvic pain at its worst during last period, in the last 12 months, and throughout life ($P < 0.001$; $P < 0.001$; $P = 0.004$; respectively). High CSI was also associated with general pelvic/lower abdominal pain at its worst in the last 3 months and at its worst ever ($P < 0.001$ and $P = 0.003$). For sexual pain, high CSI was associated with a history of ever having pelvic pain during or in the 24 hours following vaginal sexual intercourse/penetration ($P < 0.001$).

Conclusions: The Central Sensitization Inventory (CSI) was associated with more severe dysmenorrhea, dyschezia, dyspareunia, and chronic pelvic pain, as well as specific features of these types of pelvic pain as characterized by the EPHect data standards. Further analysis is needed to characterize the potential role of the CSI in phenotyping endometriosis-associated pain.

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Disclosures/Conflicts of Interest: Drs Allaire and Bedaiwy are consultants for Abbvie and Allergan.

Altered pelvic floor muscle function in gynecological cancer survivors suffering from dyspareunia: a case-control study

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Introduction: Gynecological cancer is one of the most prevalent cancers affecting women. Oncological treatments including surgery, radiation therapy and chemotherapy are suggested to yield alterations of the PFMs and vaginal tissues. These changes may contribute to the development of debilitating conditions such as dyspareunia, which affects more than half of gynecological cancer survivors. In women with no history of cancer, such as women with vestibulodynia, alterations in PFM function have been identified as playing a key role in the etiology of pain during sexual intercourse. Furthermore, previous studies in this younger population demonstrated the efficacy of physiotherapy treatment to reduce dyspareunia by improving PFM function. However, to date, no study has investigated PFM function in relation to dyspareunia in gynecological cancer survivors. A comprehensive and objective assessment of the alterations in PFM function will enable a better understanding of dyspareunia in this understudied population, which in turn, will help guide the development of adapted and effective physiotherapy treatment.

Methods: Gynecological cancer survivors were included in the study if they reported vulvovaginal pain at an intensity of 5/10 on a numerical rating scale, for at least 80% of sexual intercourse attempts, for more than 3 months. They also had to have completed all scheduled oncological treatments at least 3 months before participating in the study. A standardized gynecological examination was performed by a gynecological oncologist to confirm each participants eligibility. Asymptomatic women were included if they had undergone a total hysterectomy for benign conditions more than 3 months prior and reported no pain during sexual intercourse. All women attended one evaluation session conducted by an experienced physiotherapist to assess PFM function. After verifying data normality using Shapiro-Wilk test and visual inspection of distribution, Student's t tests were used to compare the 2 groups (0.05).

Results: Twenty-two gynecological cancer survivors with dyspareunia (endometrial cancer = 17, cervical cancer = 5) participated in this study. All of them (100%) had surgery (total hysterectomy and bilateral salpingo-oophorectomy = 21, total hysterectomy = 1), 11 (50%) had brachytherapy, 7 (31.8%) had external beam radiation therapy, and 7 (31.8%) had chemotherapy. They were compared to 33 asymptomatic women (total hysterectomy and bilateral salpingo-oophorectomy = 15, total hysterectomy and unilateral salpingo-oophorectomy = 2, total hysterectomy = 16). Baseline characteristics were similar between both groups in terms of age, body mass index and number of vaginal childbirths (P 0.261). Gynecological cancer

survivors with dyspareunia demonstrated significantly higher PFM tone (1.46 ± 0.69 vs 1.02 ± 0.43 N, $P = 0.012$), lower flexibility (23.25 ± 8.94 vs 35.36 ± 5.49 mm, P 0.001), lower number of rapid contractions performed (6.0 ± 1.7 vs 7.4 ± 2.1, $P = 0.010$), which is suggestive of an altered coordination, and lower endurance (1711.50 ± 902.50 vs 2155.55 ± 671.50%*s, $P = 0.009$) compared to asymptomatic women. However, no significant difference was found between the 2 groups for PFM maximal strength ($P = 0.292$).

Conclusions: Our findings showed that gynecological cancer survivors suffering from dyspareunia had altered PFM function, notably higher PFM tone and lower flexibility, coordination and endurance, compared to asymptomatic women who underwent a total hysterectomy for benign conditions. These results provide strong basis to guide the development of treatment protocols focusing on these alterations involved in dyspareunia in cancer survivors.

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Widespread pain is associated with poorer psychological health in women with chronic pelvic pain presumed secondary to endometriosis

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Introduction: Endometriosis is a chronic inflammatory disease that affects about 10% of women of reproductive age. Of those that are symptomatic, many present with pain in the pelvic region; dysmenorrhea (painful periods), dyspareunia (pain during sexual intercourse), and non-cyclical pain. In addition to pelvic pain, many women experience complex pain profiles that extend into other regions of the body. Previous research has demonstrated that women with interstitial cystitis/bladder pain syndrome who also experience pain in multiple other body sites have poorer psychological health compared to those women whose pain is localized to their pelvis.[1] We aimed to determine if the same relationship exists for women with pelvic pain symptoms consistent with endometriosis rather than those focused on the bladder. Additionally, we aimed to determine if more widespread pain was related to self-reported comorbidities and poorer reproductive outcomes. Widespread pain is associated with systemic inflammation, which has been shown to play a role in the pathogenesis of conditions comorbid to endometriosis, in addition to adverse reproductive outcomes.[2] Our hypothesis was that in women with chronic pelvic pain (CPP) and confirmed or suspected endometriosis, the presence of widespread pain would be associated with poorer psychological health, comorbid conditions and adverse reproductive outcomes compared to those with more localized pain.

Methods: Local ethical approval was obtained prior to recruitment. Women with CPP were enrolled into one of 2 cohorts: EndoPain1: strong suspicion of endometriosis; EndoPain2: previous surgical diagnosis of endometriosis. Baseline questionnaires were completed prior to surgery and included Beck Depression Inventory (BDI), State-Trait Anxiety Inventory (STAI) and Pain Catastrophizing Scale (PCS) and a body map that described the location of their pain. Participants were categorized into groups according to how many body regions were affected by pain. Two different categorizations were performed: (1) as in the previous study the cohort was divided into 3 groups: pelvic pain only, intermediate (1–2 additional regions affected), or widespread (3–7 regions affected); (2) the cohort was divided into 4 groups: pelvic pain only, isolated (1 additional region affected), intermediate (2 additional regions affected), or widespread (3–7 additional regions affected). Data were computed using SPSS. The KolmogorovSmirnov test was used to test normality and as all variables were non-normally distributed in at least one group, the Kruskal-Wallis test was used to identify differences between the subgroups.

Results: Fifty-seven participants were recruited and of these 56 met criteria to be included in study analyses. Eighty-two percent of women (n = 46) reported pain in at least one region outside the pelvis and 52% (n = 29) in 2 or more regions. The cohort was best divided into 4 groups (pelvic pain only n = 10; isolated n = 17; intermediate n = 11; widespread n = 18). As predicted, those with more widespread pain had significantly higher PCS ($2(3) = 10.130$, $P = 0.017$) and BDI scores ($2(3) = 9.465$, $P = 0.024$). However, there was no difference in state or trait anxiety scores between the groups ($2(3) = 5.731$, $P = 0.125$; $2(3) = 5.305$, $P = 0.151$ respectively). Although not formally tested, these data suggested that the presence of widespread pain is associated with; increasing incidence of comorbidities, additional pain conditions as well as psychological and systemic disorders, reduced incidence of live births and increased prevalence of negative reproductive outcomes.

Conclusions: Our data suggests that a majority of women experiencing CPP consistent with a diagnosis of endometriosis also have pain outside the pelvis. In line with previous work in bladder pain syndrome, we observed a significant relationship between widespread pain and poorer psychological health. Interestingly, poorer reproductive outcomes and increasing reports of comorbid conditions were reported in women with more widespread pain profiles. In order to optimize clinical outcomes, it is important that psychological wellbeing is addressed. Use of the body map to determine the widespreadness of women's pain may be a valuable tool for clinicians to identify patients with widespread pain who may require a multimodal approach to pain management rather than focusing solely on their pelvis.

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Disclosures/Conflicts of Interest: None.

Differing urologic parameters in chronic pelvic pain populations

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Introduction: The Uroflow is a reliable test that is conducted to measure the amount of urine voided and the speed and pattern of urination.

Methods: Subjects return for on-site visits 5 times in 24 weeks, when a Uroflow reading is captured. Variables include maximum flow rate, average flow rate, voided volume, flow time, time to peak flow, voiding time and voiding pattern. We looked at the first 4 weeks of data (visits 1 and 2), both baseline on-site visits prior to

the administration of placebo or metoprolol. Subjects also completed an at-home 24-hour voiding diary providing bladder pain ratings during each void via a preprogrammed smartphone as well as completing the GUPI. Analysis was performed using Kruskal-Wallis and Mann-Whitney-Wilcoxon tests on continuous variables. Continuous data are presented as median (interquartile range). Unadjusted P-values < 0.05 were considered statistically significant.

Results: Of 46 female participants, 20 are HC, 14 are BPS, and 12 are MPP. Age did not differ among the 3 groups (HC = 27 years [22–40.5], BPS = 35 [27–48], MPP = 38.5 [31–58.5], $P = 0.067$). At baseline (visit 1, week 0) uroflow parameters differed between BPS and the other populations: voided volume (HC = 335.5 mL [207–450.5], BPS = 115 [91.5–174.5], MPP = 328 [132–479]), mean flow rate (HC = 16 mL/s [11.4–23.7], BPS = 9.2 [3.9–13.1], MPP = 12.7 [8–21.5]), and max flow rate (HC = 26 mL/s [20–43.3], BPS = 16.1 [3–19], MPP = 21.9 [11–42.3]). HC had higher voided volume ($P = 0.0029$), mean flow ($P = 0.0030$), and max flow ($P = 0.0030$) than BPS, but the 3 parameters did not differ between HC and MPP and between BPS and MPP. Interestingly these differences did not appear at visit 2, week 4. Voiding time, flow time, and time to max flow did not differ in both visits 1 and 2. The data from the 24-hour voiding diary show a non-significant trend in the total number of voids becoming more abundant in BPS than the MPP and HC groups in weeks 1, 2 and 3. For example in week 1, void counts did not differ (HC = 6 voids/24 hours [4–9], BPS = 9 [5–14], MPP = 8 [4–9], $P = 0.39$). Median pelvic pain scores prior to and after void were higher in BPS than HC, higher in MPP than HC, and not different between BPS and MPP in weeks 1, 2 and 3. At baseline (visit 1, week 0), significant difference were seen in pain subscale scores ranged 0 to 23 (HC = 0 [0–0], BPS = 13 [10.5–15.5], MPP = 10 [7.7–15]), urinary subscale scores ranged 0 to 10 (HC = 1 [0–2], 5.5 [2.5–7.5], 3 [2–7]), quality of life (QOL) impact subscale scores ranged 0 to 12 (HC = 0 [0–2], BPS = 7 [6.5–9], MPP = 7 [5–8]), and GUPI total scores ranged 0 to 45 (HC = 2 [1–3], BPS = 26 [21–31], MPP = 19 [15–28]). Compared to HC, the other 2 groups had higher pain (BPS $P < 0.0001$, MPP $P < 0.0001$), urinary (BPS $P = 0.0002$, MPP $P = 0.0004$), QOL (BPS $P < 0.0001$, MPP $P < 0.0001$), and total scores (BPS $P < 0.0001$, MPP $P < 0.0001$). At weeks 1, 2, and 3, HC did not report scores, and there were no significant differences between BPS and MPP. However, at week 4, BPS and MPP again had higher pain, QOL and total scores compared to HC. However, urinary score was higher in BPS than HC, not different between HC and MPP, and higher in BPS than MPP.

Conclusions: As expected, BPS subjects are voiding smaller amounts and have a lower mean and max flow rate during the Uroflow collection compared to HC but not MPP as seen at their baseline visit. This finding is confirmed in the GUPI urinary subscale score reflecting urinary frequency, as BPS tend to void more frequently and have more pain. However, it is unclear why both the GUPI and uroflow findings tended to fade in subsequent visits. Perhaps MPP and BPS overlap in time, such that on some occasions differences between the 2 diagnoses are more apparent, whereas at other times, the pelvic floor musculature tenses in patients with BPS. ICECAN does not perform a pelvic examination at visit 2 to determine if this might be true, but additional data from visits 3 and 5 may help us answer this question, as would trend analysis of results compared to the HC group. It was also interesting that BPS and MPP appear to affect pelvic floor related QOL equally supporting the comparability of these disorders.

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Sphingolipid-ceramide pathway metabolite concentrations are altered in provoked vestibulodynia and are associated with the functional connectivity of sensorimotor brain regions

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Introduction: Metabolomics, which measures the biochemical products of cell processes downstream of genomic, transcriptomic, and proteomic systems, may be particularly helpful for identifying biochemical pathways that may be altered in PVD. Sphingolipids including ceramides have been associated with mood disorders and neuropathic pain and are known to regulate inflammation. The overall aim of this research is to identify novel pathophysiological mechanisms underlying symptoms in PVD.

Methods: Samples of plasma and vaginal fluid, obtained using vaginal swabs during the follicular phase, 5 to 7 days post menstrually, were collected in 109 HC and premenopausal women with PVD. The diagnosis of PVD was identified during a clinical examination. Inclusion criteria for patients with PVD included least 6 months of vulvar vestibular pain at least 4 out of 10 in severity during intercourse and other activities involving vestibular pressure (eg, tampon use) and findings on exam consistent with vestibulodynia. Pain was assessed via cotton swab test, vulvar algesiometer while internal muscle tenderness was tested with 2 kg of finger pressure calibrated by algometer prior to examination. Metabolomic profiling was performed using Metabolons global metabolomics platform. Here we report analysis results from 54 vaginal (HC = 29, PVD = 25) and 58 plasma (HC = 29, PVD = 29) samples from women who were not taking local or systemic hormones. The dataset comprised a total of 824 compounds of known identity (named biochemicals) in plasma, and 952 named biochemicals in vaginal swabs. Welchs two-sample t test was used to identify metabolites associated with sphingolipid-ceramide pathway that differed significantly ($q < 0.10$, correcting for all measured biochemicals) between PVD and HC. Resting state fMRI was obtained on a 3T Siemens scanner in women with PVD. After preprocessing in SPM8, CONN-fMRI functional connectivity toolbox v17a was used to compute region-to-region connectivity matrices, obtained by correlating the fMRI time-series and corrected for physiological noise and motion. Global functional connectivity was then computed using in-house workflow scripts using Matlab and the Graph Theoretic GLM toolbox. Spearmans correlation was used to correlates symptom measures and global functional connectivity of regions comprising an extended sensorimotor network (ie, somatomotor cortices, posterior insula, basal ganglia and thalamus) with metabolites demonstrating group differences in concentrations.

Results: In the vaginal samples of PVD compared to HC, we observed significantly higher levels of vaginal metabolites involved in sphingolipid synthesis (eg, sphinganine, sphingadienine) and sphingosines (eg, sphingosine). Decreased vaginal levels of hexosylceramides (HCER) (glycosyl ceramide (d18:1/20:0, d16:1/22:0)*) and several sphingomyelins (eg, sphingomyelin (d18:2/24:1, d18:1/24:2)*). In plasma samples, PVD showed higher levels of sphingomyelins and ceramides than HCs. Levels of several of these altered sphingolipid-ceramide pathway metabolites were associated with increased total vulvar pain and total muscle tenderness as well as the global connectivity of sensorimotor network regions, $|r| = 0.30$ to 0.60, $P < 0.04$ to 0.006.

Conclusions: In the current study we observed altered vaginal and plasma levels of metabolites in the sphingolipid-ceramide pathway that correlated with increased pain and muscle tenderness and the global connectivity of regions involved in pain processing and sensorimotor integration. Animal studies have demonstrated an association between sphingolipid-ceramide pathway metabolites, changes in the dorsal root ganglion and inflammatory cytokines with central sensitization. Taken together, alterations in sphingolipid-ceramide pathway metabolites observed in samples collected from PVD group could directly or indirectly affect vaginal mucosa and brain activity and modulate nociception.

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Investigation of pelvic floor symptoms after endometriosis surgery

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Introduction: Endometriosis is an inflammatory disease, affecting many women and causing pain in the pelvic region. Pain complaints are manifested as pelvic floor dysfunction, deep dyspareunia, and also dysmenorrhea, dyschezia and dysuria. Treatments for endometriosis have focused on hormonal therapies and surgery but pain and dysfunction in the pelvis may persist postoperatively. There is a scarce literature on the assessment of pelvic pain and pelvic floor dysfunctions after endometriosis surgery. The aim of the study was to investigate the pelvic floor symptoms in women after endometriosis surgery.

Methods: The Pelvic Floor Distress Inventory (PFDI-20) has shown to be psychometrically valid and reliable instrument for measuring the extent to which pelvic floor disorders affect quality of life. PFDI-20 consists of 3 separate scales: Pelvic Organ Prolapse Distress Inventory (POPDI) of 6 questions about the inconvenience of the prolapse, Colorectal-Anal Distress Inventory (CRADI) with 8 questions concerning difficulties of defecation, and the Urinary Distress Inventory (UDI) with 6 questions about difficulties in urination. Each scale is scored from 0 to 100, with higher scores indicating greater symptom burden. The Pelvic Pain and Urgency/Frequency (PUF [bother, symptom, and total]) questionnaire was developed and validated by Parsons et al. as a simple method to identify women with interstitial cystitis (IC) or painful bladder syndrome (PBS). This questionnaire is widely used by clinicians and has been used in several current studies because it provides balanced attention to urinary urgency/frequency and symptoms associated with pelvic pain. This questionnaire consists of 12 items that are divided into 2 domains: the symptom and bother scores. Increasing severity or magnitude of each item is assessed with an increasing score. The data were analyzed by using the SPSS 22.0 statistical analysis software.

Results: The 43 enrolled participants were age 1749 years, 67.06 kg ± 10.0 weight and 161.69 cm ± 6.10 height, more than half were married and more than half had completed high school or higher education. Mean gravidity and parity was 1.34 ± 0.78 and 0.95 ± 0.60. In 13 (30.2%) patients bilateral endometrioma was found. They reported that endometriosis had been diagnosed previously. All had undergone at least one laparoscopy or laparotomy by MS. After surgery all had suppressive treatment in the form of COC or progestins. The median PUF total score after surgery for the 43 patients was 14.00 (range 5–28), PUF symptom score was 10.00 (range 3–18), PUF bother score was 4 (range 2–14) respectively. All women with endometriosis had a PUF score of less than 20. The median PFDI-20 score for the 43 patients after surgery was 44.83 (range 8.33–125.20), POPDI-6 score was 12.50 (range 0–41.66), CRADI-8 was 11.5 (range 0–34.37), UDI-6 score was 20.83 (range 8.33–42.66) respectively.

Conclusions: The scores of pelvic pain urgency frequency symptom and pelvic floor dysfunction are close to scores of normal population after surgical excision of endometriosis in long term. The study suggests that endometriosis surgery may help reducing pain and pelvic floor dysfunctions. The long term follow-up of endometriosis patients should include not only the assessments of pelvic pain but the also the pelvic floor functions.

Source of Financial Support: None.

Disclosures/Conflicts of Interest: None.

The effect of Kegel and pelvic floor muscle relaxation exercises on primary dysmenorrhea and premenstrual syndrome in women between 18 and 45 years: a preliminary study

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Introduction: In this preliminary study, we aimed to investigate the effect of Kegel and pelvic floor muscle relaxation (PFM) exercises at the level of primary dysmenorrhea and premenstrual syndrome scale (PMSS) score among female university students in Istanbul, Turkey.

Methods: Each student was asked to fill out a structured questionnaire including socio-demographic information, general health condition, and premenstrual syndrome scale (PMSS). The perceived pain level was evaluated by using the Visual Analogue Scale (VAS), which is a 10-point Likert type scale. The Turkish version of PMSS was used to rate premenstrual pain. Volunteers were divided into 2 groups (Study Group had Kegel and PFM relaxation exercises and Control Group had only PFM relaxation exercises). The data was analyzed by using the SPSS 22.0 computer program. Paired *t* test was used to compare the rate of dysmenorrhea level and PMSS score within the groups.

Results: Seventeen individuals with a mean age of 22.58 ± 1.00 years participated in the research. In the study group, mean dysmenorrhea VAS scores were 5.81 and 5.00; and PMSS scores were 132.09 and 110.36, on the first and second menstrual cycles, respectively. In the control group, mean dysmenorrhea VAS scores were 5.66 and 4.33; and PMSS scores were 148.50 and 126.66, on the first and second menstrual cycles, respectively. Parameters of both dysmenorrhea and PMSS total scores improved in both the study and the control groups. Comparison of the first and second menstrual cycle pain parameters between the 2 groups did not reveal a statistically significant difference in the parameters of dysmenorrhea and PMSS total score ($P > 0.05$).

Conclusions: Our results indicate that the severity of dysmenorrhea decreases with both Kegel and PFM relaxation exercise in university students in Turkey. Combination of Kegel and PFM relaxation exercises do not appear to be superior than the relaxation exercises alone. Both Kegel and relaxation exercises seems to be helpful in the management of dysmenorrhea.

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The association between core strength, posture, physical activity level and dysmenorrhea

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Introduction: In this study, we aimed to investigate the relation between physical activity, core strength, posture and primary dysmenorrhea level among female university students in Istanbul, Turkey.

Methods: International Physical Activity Questionnaire (UFAA) was used to calculate physical activity level, the Turkish version of PMSS was used to rate premenstrual syndrome, New York Posture Rating Test was used to evaluate posture and Sahrmann Core Stability tests were used to measure core activity level. Students were also asked to fill McGill Pain Questionnaire (MPQ) to address their general pain levels. Spearman's correlation test was used to analyze the relationship between the dysmenorrhea level, core muscle strength, posture, physical activity and PMSS level by using SPSS 22 software. A correlation level of 0.05 was considered to be significant.

Results: 98.1% of 52 students reported to have pain during menstruation. 17.3% of them had mild pain while 63.5% had moderate and 17.3% had severe pain. Statistical analysis revealed a positive, moderately strong significant correlation between PMSS and MPQ scores ($r = 0.435$; $P = 0.001$), positive weak significant correlation between PMSS and VAS scores ($r = 0.399$; $P = 0.003$), positive strong significant correlation between VAS and MPQ scores ($r = 0.600$; $P < 0.001$), and a negative weak significant correlation between posture and MPQ scores ($r = -0.281$; $P = 0.044$). Other variables did not reveal any significant correlation with each other.

Conclusions: Our results suggest that premenstrual pain scores are positively correlated with general pain levels and dysmenorrhea severity. General pain levels are also positively correlated with dysmenorrhea severity. On the other hand, posture is negatively correlated with the general pain levels.

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Markers of oxidative stress and sympathetic function in bladder pain syndrome

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Introduction: Recent work has demonstrated that increased oxidative stress in a rat model of BPS is modulated by sympathetic nervous system function. We tested the hypothesis that findings would support similar pathophysiology in a small sample of patients with BPS compared to patients with another pelvic pain disorder, myofascial pelvic pain (MPP) and healthy control subjects (HC). Isoprostanes (8-iso-PGF2), a well-documented measurement of oxidative stress produced by the free radical oxidation of arachidonic acid, were measured in urine samples. Norepinephrine, mainly produced by sympathetic nerve terminals and increased in chronic stress or pain, was likewise measured in both urine and serum samples. Using samples collected from the baseline visit, we measured isoprostane in urine in 4 subjects each in the BPS, MPP and HC groups, and norepinephrine in urine and blood in 2 subjects in each group using an ELISA assay. Isoprostane and norepinephrine for each patient were measured in duplicate following manufacturer instructions (Enzo Life Sciences, Farmingdale, NY and Rocky Mountain Diagnostics, Colorado Springs, CO) and normalized to urine creatinine levels (Enzo). Urine measurements are expressed as pg Isoprostane per mg creatinine. We also reviewed the study binder for any medications that might alter norepinephrine levels.

Methods: Using samples collected from the baseline visit, we measured isoprostane in urine in 4 subjects each in the BPS, MPP and HC groups, and norepinephrine in urine and blood in 2 subjects in each group using an ELISA assay. Isoprostane and norepinephrine for each patient were measured in duplicate following manufacturer instructions (Enzo Life Sciences, Farmingdale, NY and Rocky Mountain Diagnostics, Colorado Springs, CO) and normalized to urine creatinine levels (Enzo). Urine measurements are expressed as pg Isoprostane per mg creatinine. We also reviewed the study binder for any medications that might alter norepinephrine levels.

Results: Urine Isoprostane was highest in the BPS group (16,660 pg/mg creatinine $\pm$ 4400), followed by MPP (9578 pg/mg $\pm$ 1675; not significantly different from each other), and significantly lower in HC (1720 pg/mg $\pm$ 461). Urine norepinephrine was lower in HC compared to both BPS and MPP which did not differ from each other. Serum values did not differ across groups. However, isoprostane and norepinephrine also correlated with age, which differed significantly across groups (HC 26.8 $\pm$ 2.4; BPS: 45.2 $\pm$ 14 and MPP: 47.2 $\pm$ 16.6 years, Brown-Forsythe ANOVA. $P = 0.04$). In addition, 3 of the MPP patients were on amitriptyline or nortriptyline and one was on Adderall, which can raise norepinephrine levels through uptake inhibition. However, the individual values of these subjects did not stand out particularly compared to the rest of the group.

Conclusions: These preliminary data demonstrate that both isoprostane and norepinephrine can be accurately measured in subjects with BPS and MPP. Some interesting trends are emerging, though numbers in each group are too small to provide any meaningful conclusions, and the confounds of age and medications may account for some of these observations. A larger sample is needed.

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Association between dysmenorrhea and chronic pain: a systematic review and meta-analysis of population-based studies

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Introduction: Dysmenorrhea has been increasingly associated with pain chronicity, with relevant mechanisms including central sensitization and abnormal stress responses. However, no systematic review has been conducted on the association between dysmenorrhea and chronic pain based on population studies. It is also unknown whether the strength of the association would be similar for CPP and CNPP. Therefore, the first aim of the study was to systematically summarize the population-based studies for the associations between dysmenorrhea and CPP, and between dysmenorrhea and CNPP. The second aim was to quantify the magnitude of the associations between dysmenorrhea and the presence of CPP and CNPP, using a meta-analytic approach.

Methods: We searched PubMed, Embase, and PsychInfo from inception to January 2019, and included 16 studies meeting the criteria of observational population-based studies that examined the relationship between dysmenorrhea and chronic pain or chronic pain-related outcomes in the review. Nine studies reported findings on the association between dysmenorrhea and CPP, with 5 for CPP presence and 4 for CPP severity. Eight studies reported findings on the association between dysmenorrhea and CNPP (most musculoskeletal pain), with 5 for CNPP presence and 3 for CNPP severity. Each study was evaluated for bias based on the modified Newcastle and Ottawa Scale (NOS). We summarized the results by CPP and CNPP, as well as by primary dysmenorrhea, endometriosis-associated dysmenorrhea, and undifferentiated dysmenorrhea. We further did random-effect meta-analyses for the associations between dysmenorrhea and the presence of CPP and CNPP.

Results: Of the 16 studies, the dysmenorrheachronic pain association was a pre-specified research question in 9 studies (3 for CPP, 6 for CNPP). Dysmenorrhea was defined in 3, and well-classified in 2 studies. Primary dysmenorrhea was measured in 2 studies, and endometriosis-associated dysmenorrhea was examined in 1 study. The NOS score ranged from 1 to 8, with 25% of the studied categorized as poor quality, 50% as moderate quality, and 25% as high quality. Dysmenorrhea was positively associated with CPP presence, but the results for CPP severity were mixed. Dysmenorrhea was positively associated with the presence and severity of CNPP conditions except arthritis. Primary dysmenorrhea was positively associated with CPP intensity in 1 study and with the presence of primary fibromyalgia but not rheumatoid arthritis in the other. In 1 study, the intensity of endometriosis-associated dysmenorrhea was positively associated with CPP intensity. Five studies including 5342 women, of overall moderate quality, were suitable for meta-analysis for the association between dysmenorrhea and CPP presence. Overall, women with CPP had 2.59 (95% CI = 2.03–3.30) times the odds of having dysmenorrhea compared to women without CPP (I2 = 54%). Four studies including 757 women, of overall moderate quality, were suitable for meta-analysis for the association between dysmenorrhea and CNPP presence. Overall, women with CNPP had 2.43 (95% CI = 1.33–4.44) times the odds of having dysmenorrhea compared to women without CNPP (I2 = 65%).

Conclusions: Our study is the first to systematically quantify the magnitude of the association between the 2, providing empirical evidence beyond an anecdotal relationship between dysmenorrhea and CPP. The dysmenorrhea CNPP association in our study, with a slightly smaller magnitude, adds to the literature of dysmenorrhea-associated pain chronicity. Our findings suggest that dysmenorrhea might be a general risk factor for chronic pain. However, better-designed studies are needed to address the methodological issues including inconsistent measures for dysmenorrhea and inadequate control of confounding. Since most studies did not isolate primary dysmenorrhea, whether it is an etiologically relevant risk factor for chronic pain is unclear. Given that adolescence is a sensitive period for neurodevelopment, elucidating the role of primary dysmenorrhea in pain chronicity in future longitudinal studies is important for preventing both CPP and CNPP.

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Ojeok-sans anti-inflammatory properties on cancer-induced visceral nociception

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Introduction: Background and Aims: Visceral pain is frequent in advanced cancer patients, largely due to elevated levels of inflammation. It is believed that reductions in inflammatory cytokines may lead to lower visceral hypersensitivity. Ojeok-san is an herbal formula consisting of 17 herbs. This herbal formula has been shown to possess anti-inflammatory, immunoregulatory, and analgesic properties. The aim of the study was to examine whether the analgesic effects of Ojeok-san in cancer induced visceral pain are mediated through the cytokine TNF alpha.

Methods: Referred somatic hyperalgesia was assessed using von Frey filaments (0.008, 0.02, 0.04, 0.07, 0.16, 0.4, 0.6). Colorectal visceromotor response to distension was calculated using intra-balloon pressure changes. An ascending phasic distension protocol (10, 25, 40, 65, 80 mm Hg) was used to assess visceral pain related to colon cancer. ELISA and RT-qPCR were used to assess inflammation.

Results: We found that exposure to AOM/DSS promoted referred somatic hyperalgesia and visceromotor responses in mice. Meanwhile, 2000 mg/kg of Ojeok-san was able to mitigate mechanical hyperalgesia and visceral nociception. Ojeok-san-treated mice exhibited an increase in plasma IL-4. Our in vitro experiments showed that Ojeok-san has the capacity to reduce TNF alpha and increase prodynorphin gene expression in M1-stimulated macrophages. Meanwhile, M2-stimulated macrophages increased proenkephalin gene expression.

Conclusions: Taken together, these data suggest that the herbal formula, Ojeok-san, may provide analgesia in the AOM/DSS model of colon cancer by decreasing inflammation and increasing expression of opioid receptors.

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Dyspareunia uncovered: a qualitative description of endometriosis-associated sexual pain

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Introduction: Dyspareunia affects more than half of the endometriosis population and has a marked impact on physical and emotional well-being. Despite its prevalence and sequelae, dyspareunia has not been measured rigorously in intervention studies, is often avoided by clinicians and patients, and is considered the neglected symptom of endometriosis. The aim of this study was therefore to inform a deeper understanding of endometriosis-associated dyspareunia.

Methods: Potential participants were enrolled in an endometriosis and pelvic pain data registry hosted at a tertiary center. Inclusion criteria were age 18 years or older, clinically suspected or surgically diagnosed endometriosis, and history of dyspareunia alone or with a partner. Exclusion criteria were no previous sexual activity, no history of dyspareunia alone or with a partner, and inability to understand or speak English. Each participant completed a semi-structured interview about their experience of dyspareunia. Interviews were transcribed verbatim and coded for meaningful themes related to the study aim. Recruitment continued until no new themes were identified.

Results: Seventeen participants completed interviews. The average interview was 28 minutes (SD = 13) and the average participant age was 33.3 (SD = 7.2). Fourteen (82%) participants identified as white, 12 (71%) had at least a college degree, 10 (59%) were partnered, and 11 (65%) self-identified as heterosexual. On an 11-point numeric rating scale (0 = no pain, 10 = worst pain imaginable), average deep dyspareunia and superficial dyspareunia scores were 6.6 (SD = 2.8) and 3.3 (SD = 3.4), respectively. The main finding was that participants primarily experienced 2 types of dyspareunia: pain at the vaginal opening (n = 7) and pain in the abdomen/pelvis (n = 13). The character of the pain depended on pain location: superficial dyspareunia was experienced as pulling, burning and/or stinging, whereas deep dyspareunia was frequently reported to be sharp, stabbing and/or cramping. For most participants, onset of the pain also depended on pain location: superficial dyspareunia always began with initial penetration whereas deep dyspareunia was often triggered by sexual position. A minority of participants experienced additional pain with arousal, orgasm, or post-coitally. The impact of dyspareunia emerged as another important finding. Fifteen and participants reported interrupting intercourse because of pain, 10 avoided sexual encounters, and 11 reported that sexual pain negatively affected their self-esteem, partner well-being and/or relationships.

Conclusions: This study provides a fundamental description of endometriosis-associated dyspareunia and confirms previous findings about the physical and emotional impact of this symptom. Superficial dyspareunia was common among participants and might be caused by co-morbid conditions like vulvodynia. The results suggest that superficial dyspareunia and deep dyspareunia should be disaggregated for unbiased outcome measurement in research and effective management in clinical practice. Future work could investigate the etiology of pain that occurs with arousal and orgasm or otherwise does not fall within the current typography of dyspareunia.

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Assessment of the endometriosis burden in Canada: II-evaluating fatigue and its correlation with endometriosis-related pain symptoms

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Introduction: Endometriosis is a chronic gynecologic disorder impacting women in their prime reproductive years. Pain symptoms associated with endometriosis include dysmenorrhea, non-menstrual pelvic pain and pain during sex. Understanding the fatigue burden among endometriosis patients is needed to provide more patient-centric treatment modalities. Thus, this study aims to quantify fatigue and its correlation with the endometriosis-related pain symptoms among endometriosis patients. This dataset was used previously to evaluate prevalence, diagnostic delay and treatment patterns among endometriosis patients in Canada.

Methods: An online cross-sectional survey was administered to Canadian women aged 18 to 49 in the period between December 2018 and January 2019. The survey was composed of 2 main sections: a prevalence screener that was administered to all participants and an endometriosis-specific section that was administered to women who self-reported an endometriosis diagnosis. The prevalence screeners asked participants about their demographic information, past and present symptomatic experience, health-related quality of life and fatigue. To produce Canadian nationally representative estimates, all the survey data was weighted by age, geographical region, education and household income levels. Fatigue T-scores were compared between symptomatic women with a self-reported diagnosis of endometriosis (reporting an experience of at least one of the endometriosis-related pain symptoms) and women without endometriosis using T-tests. This analysis was then repeated across each of the age bands that were defined in the study (18–29, 30–34, 35–39, 40–44 and 45–49). In addition, the impact of experiencing moderate to severe levels of each of the endometriosis-related pain symptoms on fatigue levels was examined by testing the difference between respondents with a self-reported diagnosis of endometriosis who were experiencing that level of severity of the symptom at the time of survey completion and those who were not using T-tests as well.

Results: The survey was completed by 30,000 women. Among them, 2,004 women reported receiving a diagnosis of endometriosis. Respondents with endometriosis diagnosis had a significantly higher age at time of survey administration (35.5 vs 33.6; $P < 0.01$). A total of 71.4% of respondents with endometriosis reported that they were experiencing at least one of the endometriosis-related pain symptoms at the time of survey completion. Those women had a significantly higher T-score compared to women without diagnosis (59.2 vs 55.2; $P < 0.001$). These results were consistent across each of the age bands examined (18–29 years: 57.3 vs 56.6, 30–34 years: 60.7 vs 55.4, 35–39 years: 61.4 vs 55.0, 40–44 years: 59.1 vs 54.0 and 45–49 years: 58.1 vs 53.0; $P < 0.05$ for all comparisons except for the 18–29 years group). Among women with a self-reported diagnosis of endometriosis, experiencing moderate to severe level of each of the endometriosis-related pain symptoms compared to mild/none was associated with a significant increase in the level of fatigue (dysmenorrhea: 60.0 vs 57.5, non-menstrual pelvic pain: 62.8 vs 57.0 and pain during sex: 59.6 vs 58.2; $P < 0.05$ for all comparisons).

Conclusions: Women with symptomatic endometriosis experience significant fatigue levels compared to women who do not have a diagnosis of the disease. Moderate to severe levels of endometriosis-related pain symptoms is associated with higher fatigue burden among respondents who report an endometriosis diagnosis.

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Ecological momentary assessment of menstrual and pelvic pain data via nightly text messages in adolescents and young adults

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Introduction: Ecological momentary assessment (EMA) is a procedure for the collection of data in real time during the course of participants regular lives. EMA has been used to assess pain levels in a variety of conditions, but no known studies have used EMA for collecting menstrual and pelvic pain-related data. The aims of the current study were: (1) to assess the feasibility and acceptability of using EMA via end of day text messages to collect menstrual and pelvic pain-related data in a sample of adolescents and young adults (AYA); and (2) to describe patterns of reported non-menstrual pelvic pain across study participants, including correlations with demographic and clinical variables.

Methods: Participants included 92 female AYA ages 16 to 24 years (M = 20.8, SD = 2.0) enrolled in a larger study examining experimental pain across the menstrual cycle. Participants were categorized as having dysmenorrhea (n = 39) if they reported an average menstrual pain rating of 4 or higher on a 0 (no pain) to 10 (worst pain possible) numeric rating scale (NRS). Control participants (n = 53) rated average menstrual pain as 3 or below on the same scale. Participants were sent an automatic nightly text message between 8 PM and midnight inquiring about whether or not they were menstruating and their level of pelvic pain that day, regardless of menstruation status, on the NRS. A study coordinator followed up the following day with any participant who had not yet responded. Feasibility was assessed by the average percentage response rate; acceptability was assessed via qualitative interviews conducted at study completion. Non-menstrual pelvic pain (NMPP) was calculated as the percentage of days during which the participant was not menstruating that she reported experiencing any level of pelvic pain (ie, >0 on the NRS). Groups were compared using independent samples *t*-tests; bivariate correlations were conducted using Pearson correlations.

Results: Ninety participants (97.8%) agreed to receive daily text messages. One participant did not have text messages included in her phone plan and the other was an international student for whom daily texts would have been too expensive. These participants were sent nightly emails. Average length of study participation was 78.3 days (SD = 35.5; min = 22; max = 171). Global response rate was very high (98.5%); individual response rates ranged from 72.6% to 100%. Of all the non-bleeding days that were rated as painful, the vast majority (92.4%) were rated between 1 and 3 on the NRS. NMPP ranged from 0 to 27.3 percent of days (M = 3.1, SD = 5.2) in the control group and from 0 to 40.7 percent of days (M = 8.7, SD = 10.7) in the dysmenorrhea group. Average NMPP in the dysmenorrhea group was significantly higher than in the control group (P = 0.004). Across the whole sample, NMPP was positively correlated with average menstrual pain rating (r = 0.38, P = 0.000) but was not correlated with age (r = 0.17, P = 0.11) or age at menarche (r = −0.06, P = 0.57). Qualitative analyses revealed that all participants who completed nightly text messages found the protocol acceptable.

Conclusions: EMA via nightly text message is a feasible and acceptable method of menstrual and pelvic pain data collection in female AYA. Future versions of this EMA protocol will include scaling the technology in order to decrease administrative burden (eg, automatic data entry). Further research is needed to elucidate the relationships among sub-clinical pelvic pain during non-menstrual cycle phases and potential subsequent clinical implications.

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Development and preliminary content validation of a patient-reported tool for assessing the burden of endometriosis

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Introduction: Endometriosis is often characterized by chronic pelvic pain that can impact quality of life, intimate relationships, education and work, as well as emotional wellbeing. Although there are existing patient-reported outcome tools that assess the multidimensional burden of endometriosis, they are neither quick to complete nor score and thus not suitable for use outside of a research setting. This tool is designed to provide an intuitive graphical real-time representation of this burden.

Methods: In an exploratory phase, a 6-member working group of experts in endometriosis and pelvic pain disorders identified 11 domains and 27 key concepts thought to reflect the burden of endometriosis and/or its treatment on patient's lives. The relevance and importance of these domains and key concepts were then assessed by 4 US patient focus groups totaling 25 women with self-reported surgically confirmed endometriosis. Patient and expert perspectives were collated to construct draft statements intended to assess each of the identified domains. This was followed by a consensus phase where the domains and draft statements were refined and voted upon by 16 endometriosis specialists including the 6-member working group and an

additional 10 experts and stakeholders (eg, physicians, patient advocates, and patients) using an iterative Delphi consensus process. Th process was used with voting on a 9-point scale. For each statement, consensus was defined as both 80% of respondents indicating high agreement scores in the range of 79% and 20% indicating low agreement scores in the range of 13. Following the consensus phase, individual interviews were conducted with 13 women with endometriosis to evaluate content, patient understanding, time needed to answer all questions, use, and interpretation of the tool. The expert consensus panel finalized the tool instructions, domains, and statements using patient recommendations to enhance comprehension and valid completion of the tool.

Results: After 3 rounds of voting by the working group, there was consensus for the visual disk-shaped tool to include 10 symptom domains: pelvic pain (period pain, non-menstrual pelvic pain, and sexual pain); vaginal bleeding; bowel and bladder symptoms; energy and fatigue; sexual wellbeing; fertility; social activities and relationships; work, school, and other daily tasks; self-image and perception; and emotional wellbeing. These 10 domains are represented by 12 statements. Using a 10-point visual analogue scale, patients will indicate the extent to which each statement applies to them in the past 3 months within a graphical representation on a disk as a polygon with larger surface area indicating greater disease burden. From the validation interviews (n = 13), 92.3% of patients felt it would facilitate communications with their healthcare providers, including addressing symptoms and areas of impact that are not normally discussed during office visits. The average time to complete the tool was 56 minutes (range = 4.0−7.5 minutes).

Conclusions: This visual disk-shaped patient-reported tool has the potential to assess the multidimensional burden of the unmet clinical care needs of patients suffering with endometriosis. Further quantitative validation studies are required to evaluate psychometric properties of the tool and its ability to facilitate patient-physician discussions about symptoms and effects on quality of life, and visually display changes in disease burden over time. Future utilization of this tool may benefit from translation to other languages.

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Women with heightened dysmenorrhea and silent bladder sensitivity exhibit broad abnormalities in pain experience and quantitative sensory testing

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Introduction: Chronic pelvic pain conditions lack clearly defined antecedents and risk factors. Few studies have characterized or identified a putative at risk group for visceral pain. In the present study we characterize a novel hypothesized at-risk cohort of young women who appear at risk for developing chronic pelvic pain syndromesdefined as comorbid silent bladder pain sensitivity on a noninvasive bladder filling task, and heightened dysmenorrhea. Because the profile of QST in dysmenorrhea is inconsistent in prior studies, we contrasted their QST findings with women with isolated dysmenorrhea, dysmenorrhea with provoked bladder pain sensitivity, pain-free controls, and bladder pain syndrome.

Methods: Women providing consent completed extensive questionnaires for the above outcomes (generally in the luteal phase, off hormonal contraception), underwent standardized clinical assessment (including transvaginal palpation, and tampon testing) and were tested in controlled settings using standardized tests of noninvasive provoked bladder filling, internal and external pressure pain thresholds, cold pressor task/conditioned pain modulation, and temporal summation (without acute exposure to any short acting analgesics).

Results: We recruited the following groups: participants with dysmenorrhea (n = 212), pain-free controls (n = 44), and BPS (n = 27). A noninvasive, experimentally monitored bladder filling task identified a subset of women with dysmenorrhea and bladder pain hypersensitivity (DYSB; n = 46). In our largely single, nulliparous group young cohort (24 ± 1 yo), roughly a quarter (46/212) of the heightened dysmenorrhea sufferers tested positive for the DYSB phenotype. Demographic and pelvic exam findings for both pain and pelvic floor function did not differ by group, except for tampon test sensitivity, which was worse in DYSB and isolated dysmenorrhea sufferers vs pain-free controls (2.6 ± 0.3 and 1.7 ± 0.2, vs 0.7 ± 0.2, $P < 0.05$). Consistent with heightened pelvic sensitivity, participants with DYSB also had more pain during intercourse, urination and bowel movements (Ps < 0.01). Participants with DYSB had PROMIS Global Physical T-scores of 47.71, lower than in women isolated dysmenorrhea (52.26), and pain-free controls 56.10 ($P < 0.001$). Similarly, they had lower PROMIS Global Mental T-score than pain-free controls (47.8 vs 52.77, $P = 0.017$). Isolated dysmenorrhea, DYSB and BPS participants had lower vaginal mechanical thresholds, reported more pain to a cold stimulus during a conditioned pain modulation task, and greater pelvic exam after-pain than pain-free controls (Ps < 0.05). DYSB participants also had reduced body mechanical thresholds, and less conditioned pain modulation compared to pain-free controls and DYS participants (Ps < 0.05). Among QST paradigms, experimental bladder pain was the only significant predictor of self-reported menstrual pain (r = 0.26), bladder pain (r = 0.57), dyspareunia (r = 0.39), and bowel pain (r = 0.45).

Conclusions: Women with DYSB (dysmenorrhea with provoked bladder pain hypersensitivity despite the absence of chronic pelvic pain) exhibit broad psychosocial and sensory disturbances, suggesting that they may reflect an intermediate phenotype for chronic pelvic pain disorders. These at risk women urgently need to be identified and their preclinical course and risk for future chronic pain syndromes formally characterized.

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Impact of endometriosis on womens life decisions and goal attainment: survey results

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Introduction: Endometriosis-associated pelvic pain has been directly linked to impaired health-related quality of life and productivity losses; however, the impact of the disease at critical points across the lifecourse has not been characterized. Here we aim to better understand how disruptive living with endometriosis may be, and how women perceive disease-related burden on life decisions and goal attainment.

Methods: Participants were recruited from members of MyEndometriosisTeam.com; invitations with an anonymized link to the online survey were sent to members by email and posted to the MyEndometriosisTeams Facebook page. The link first requested consent to participate and then proceeded to the survey. Participation was limited to women 19 year old who self-identified as having a surgical or non-surgical diagnosis of endometriosis. Survey questions were designed to assess demographics, disease severity, duration of endometriosis-associated symptoms, severity of average pelvic pain over the course of life, and the impact of endometriosis-associated pain on life experiences and decisions.

Results: The survey was live from October 3 to 25, 2018 during which 742 women (US: 473; non-US: 269) completed the survey, with 73% <40 year old. While 48% of women did not know their revised American Society for Reproductive Medicine (rASRM) endometriosis stage, 30% of participants reported their condition as stage 4. Eighty-eight percent of women self-reported receiving laparoscopy or laparotomy to confirm their endometriosis diagnosis. Seventy-eight percent of participants had at least some college education or higher, and 57% worked full-time. Symptoms of endometriosis typically began before the age of 20 (68%), and the average time to diagnosis was 9 years. About half of the participants (56%) experienced pain daily with the median score for pain over the past 12 months being 9 (range: 1.9) on a scale of 0 to 10. Less than a quarter of participants (21%) reported that their pain had improved over the years. Over half of the participants have missed work (74%) or school days (56%) due to endometriosis-associated pain. Also, women agreed or strongly agreed that their disease experience has impacted their education and career achievements with 39% unable to achieve their educational goals, 48% not able to work at their preferred job, and 51% earning less money than they believe they could have earned. Eighty percent of participants also agreed or strongly agreed that because of endometriosis they are less positive about their future and 75% of women felt that they have not reached their full life potential. Among women who strongly agreed they have not reached their full life potential, only 30% have a college degree or higher and 46% work full time. In the overall study population, 81% of women indicated they have lost time in their life; 58% indicated they have traveled less than they would like to; and 22% do not live where they would like to due to their health care needs.

Conclusions: Members of an international patient support group for endometriosis, with a large proportion of responders self-reporting severe disease, report a negative impact of endometriosis-associated pain on their education and career. Most participants perceived that endometriosis has been a major barrier to reaching their life goals. Awareness of this disease burden is needed to direct attention to the importance of early intervention and effective management of endometriosis-associated pelvic pain.

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Efficacy of a novel interdisciplinary chronic pelvic pain program

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Introduction: CPP is a significant issue for women, with approximately 14% of women experiencing CPP at least once in their lifetime. CPP is debilitating and associated with significant costs and morbidity, and its etiology is multifactorial often complicating medical treatment and symptom management. Best practice guidelines recommend an interdisciplinary and biopsychosocial approach to treatment. The aim of this study was to evaluate the efficacy of a novel interdisciplinary group-based CPP program at the Michael G. DeGroote Pain Clinic.

Methods: The Institutional ethics board approved this study. Female patients were referred to the program from community gynecologists and urologists, and were scheduled for an orientation to learn about the program. Patients were then scheduled for an interdisciplinary assessment (psychology, physiotherapy, internal pelvic examination), and if appropriate were scheduled for the program. The group-based program occurred once a week for 8 weeks, and each day consisted of pelvic floor physiotherapy, psycho-education classes, goal setting, cognitive behavioral therapy, and mindfulness. Self-report questionnaires were administered and completed by patients attending their first and last day of the program. Data were analyzed using descriptive statistics and paired-sample *t*-tests.

Results: The women were 39.00 ± 11.11 years of age, had been in pain for 9.90 ± 10.27 years, and had been off work for 1.89 ± 1.61 years. They were primarily married or common-law (58.1%), employed (51.6%), Caucasian (100%), with at least some university/college education (93.6%), and an average of one child. Five group programs were run, with 20 patients enrolled, and 18 completed the program. For those who completed, improvements in scores were demonstrated in all of the outcome measures, and statistically significant changes were observed in pain catastrophizing ($t = 3.90$, $P < 0.01$), symptoms of depression ($t = 2.18$, $P = 0.04$), stress ($t = 2.61$, $P = 0.02$), readiness for change (action stage: $t = 3.48$, $P < 0.01$), and pain self-efficacy ($t = 2.42$, $P = 0.03$).

Conclusions: CPP is a complex condition that requires interdisciplinary management and care. Our interdisciplinary CPP program is a novel treatment for women following a biopsychosocial and self-management approach. Preliminary results from 18 patients demonstrate short-term benefits and significant improvements in outcomes post-group.

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A prospective, multi-center, clinical trial of 10 kHz spinal cord stimulation system in the treatment of chronic pelvic pain

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Introduction: Chronic pelvic pain (CPP) is known to disproportionately affect women and have multiple causes such as traumatic injury and post-surgical changes. Standard-of-care treatments often fail to resolve the pain, leaving CPP patients with long term disabilities. Low frequency SCS (LF-SCS) has been shown to provide some pain relief in this condition1. Given that 10 kHz SCS has been previously shown to provide superior long-term relief for chronic low back and leg pain patients compared to LF-SCS, this study was designed to assess the safety and efficacy in CPP2,3.

Methods: In this multicenter, prospective study, subjects clinically diagnosed with CPP of 5 cm (on a 0–10 cm VAS) refractory to conservative therapy for 3 months were enrolled following institutional review board (IRB) approval. Significant spinal stenosis, epidural scarring or symptoms of myelopathy and other progressive neurological diseases were causes for exclusion. Subjects were implanted with 2 epidural leads spanning appropriate vertebral bodies as determined by the location of pain and were implanted with a Senza system (Nevro Corp, Redwood City, CA) if they had successful trial stimulation (50% pain relief). Interim 12-month results are presented as mean ± 95% CI in the permanent implant population.

Results: Twenty-four subjects were enrolled in the study of whom 3 failed screening. Twenty-one subjects underwent trial stimulation and 17 had successful trial (80.9% trial success rate) and received a permanent implant. Baseline pain scores of 7.9 ± 0.6 cm (n = 17) improved to 1.9 ± 0.5 cm (n = 17), 2.8 ± 1.5 cm (n = 14), 2.8 ± 1.6 cm (n = 13), 2.0 ± 2.8 cm (n = 6), 1.1 ± 1.2 cm (n = 5) at the EoT, 3- and 6-month, 9-month and 12-month follow-ups, respectively. Baseline PDI of 43.3 ± 3.0 (n = 17) improved to 18.3 ± 4.7 (n = 13) and 7.0 ± 3.8 (n = 5) at 3-month and 12-month follow-ups, respectively. Significant improvements were also reported in all domains of MPQ including affective scores and 3-item pain and sleep questionnaire.

Conclusions: Interim study results show 10 kHz SCS could potentially provide clinically meaningful pain relief to the patients with CPP, a condition that is traditionally difficult to treat.

Source of Financial Support: Nevro Corp.

Disclosures/Conflicts of Interest: Drs Tate, Stauss and Li are consultants to Nevro Corp. Dr. Subbaroyan is an employee of Nevro Corp.

References: [1] Kapural et al. *Pain Med* 2006; 7(5):440–3. [2] Kapural L et al. *Anesthesiology*. 2015;123(4):851–60. [3] Kapural L et al. *Neurosurgery*. 2016;0:1–10.

A systematic review evaluating the efficacy of high intensity laser therapy (HILT) for vulvodynia and musculoskeletal pain

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Introduction: Vulvodynia is characterized by vulvar pain of at least 3 months duration. Although not fully understood, the etiology of vulvodynia is taught to be multifactorial involving a combination of inflammatory, neuroproliferative and muscular factors. There is growing evidence that vulvodynia shares common pathophysiological mechanisms with other musculoskeletal chronic pain conditions. For instance, increased tone of the pelvic floor muscles, as other skeletal muscles, may be a consequence of pain, inflammation and psychological factors. Among the different treatment approaches available, high level laser therapy (HILT) targeting myalgia showed promising efficacy in reducing pain and improving function in various musculoskeletal pain conditions. While this treatment modality is merely emerging in vulvodynia with limited research, there are several studies available for musculoskeletal pain conditions. The aim of this study was to review the literature to investigate the efficacy of HILT in vulvodynia and in other musculoskeletal chronic pain conditions that could share similar pathophysiological pathways.

Methods: This systematic review was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The protocol was registered at PROSPERO, number CRD42018112399. We followed the World Association of Laser Therapy standard for the design and conduct of systematic reviews. Literature search: Electronic databases (Amed, CINAHL, EBSCO, PubMed, Embase, Scopus, Cochrane library) and the grey literature (Proquest, clincaltrials.gov as well as IPPS, ISSWHS and WALT congresses) were searched until June 2018. Two independent reviewers identified the relevant literature. Discrepancy was solved by a third party. As for the eligibility criteria, intervention studies investigating HILT with no tissue ablation or necrosis effects were included. Given the limited literature for laser treatment in women with vulvodynia, randomized controlled trials (RCTs), prospective and retrospective cohorts, case reports, and study protocols were included in the review. As for the musculoskeletal population (eg, chronic myalgia, low back pain), only RCTs were included. Data Extraction: Study sample, HILT intervention details, outcome measures and time points, statistical analysis, results, and conclusions were extracted from each study by 2 independent reviewers. The data obtained were then compared, discussed and synthesized narratively. In addition, effect sizes were calculated whenever feasible. Risk of bias assessment: The Revised Cochrane Collaboration tool ROB 2.0 and ROBINS-I tool were used to assess risk of bias for RCTs and non-RCT studies, respectively.

Results: For vulvodynia, 167 studies were retrieved from the search. Of these, 1 retrospective study met the inclusion criteria. For musculoskeletal pain studies, 1092 studies were retrieved and of them, 9 relevant RCTs were included (8 comparing HILT vs sham/active comparator and 1 comparing different HILT

wavelengths). The only vulvodynia study included was judged as having high risk of bias in 5 out of 7 assessed domains. They reported favorable results for reducing pain during intercourse. As for the musculoskeletal pain studies, 5 studies were considered at low risk of bias, 3 had some concerns and 1 trial at high risk of bias. HILT was found more effective than the sham/active treatment for decreasing pain in 7 trials out of 8. As for function, 7 trials showed significant improvement in the HILT group compared to the sham/active group. Effect sizes could be computed in 5 studies. With the only exception of one study showing moderate effect size for functional outcomes, all remaining studies had large effect sizes for all outcomes. The stationary mode of HILT application appears to yield the most favorable outcomes. None of the included studies reported adverse effects for HILT.

Conclusions: There is insufficient data supporting the use of HILT in vulvodynia. Although based on a limited number of studies, findings suggest that HILT is effective for reducing pain and improving function in musculoskeletal pain conditions. More studies with high quality for reporting laser parameters are needed to identify the most effective laser protocols. These promising findings encourage conducting research for HILT in women with vulvodynia.

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Disclosures/Conflicts of Interest: None.

Safety and efficacy of ilioinguinal and iliohypogastric nerve blocks for treatment of pelvic pain

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Introduction: Pelvic pain accounts for a high percentage of gynaecology consultations and can significantly impact a patients quality of life. Current evidence suggests that IINBs may be an effective means of managing pelvic pain, which prompted us to investigate further within a gynaecologic population.

Methods: Charts of patients who received IINBs at a tertiary referral centre for pelvic pain between January 2012 and July 2017 were reviewed. Patient demographics, history, physical examination findings, and block data were extracted. Chi-square and Mann-Whitney U tests explored differences in patient characteristics between women with and without effective response to their initial IINB at the $P < 0.05$ level.

Results: Amongst 131 meeting inclusion criteria, 465 IINBs were performed. At time of consult, most patients reported a history of chronic pain (n = 123.94%), endometriosis (n = 82.63%), and/or lower abdominal surgery (n = 117.89%). On examination, 65 patients (52%) had tenderness within the ilioinguinal/iliohypogastric nerve distribution, 80 (64%) had point tenderness, 42 (34%) demonstrated a positive Carnetts sign, and 25 (19%) had allodynia. Information for initial block effectiveness was known for 99/131 patients. Of these patients, 70% (n = 69) reported a great improvement, 9% (n = 9) reported some improvement, 18% (n = 18) reported no change, and 3% (n = 3) reported a worsening in pain. Compared to patients with an effective response (some/great improvement in pain) to their initial block, patients without an effective response had a significantly greater ratio for history of vulvodynia (5% vs 19%) and unilateral pain (56% vs 81%). Seven patients (5%) reported minor adverse events which could be related to blocks.

Conclusions: Ilioinguinal/iliohypogastric nerve blocks provide pain relief for those with pelvic pain localized to the lower abdominal wall, with a low rate of minor adverse events. Future prospective studies on IINB safety and efficacy are warranted.

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Medical marijuana for endometriosis an effective alternative to narcotic pain medications?

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Introduction: Marijuana is becoming increasingly available, with medical knowledge lagging behind the rapid uptake in use. There is growing evidence to suggest that cannabis is beneficial for the treatment of chronic pain, and clinical experience shows that pelvic pain patients are exploring this option, although there is minimal published literature on the use of cannabis for chronic pelvic pain. Endometriosis is a common cause of chronic pelvic pain in women, and women with this condition may pursue a variety of treatment options; use of narcotic medications is high within this population. Epidemiological and clinical trial evidence suggests that the use of cannabis for chronic pain is associated with a decrease in use of and morbidity from narcotic medications; this survey seeks to query endometriosis patients about their experience with marijuana, and to characterize the effect of marijuana use on use of narcotic medications.

Methods: A recruitment email with a hyperlink to the REDCap survey was distributed with repeat email solicitation one week later. The survey remained open for one month. Participation included 137 clinic patients, and 352 contacts of the EA. Data analysis was performed with SPSS: descriptive statistics, t-tests and Pearson chi-square tests.

Results: Survey participation was 1.5% (352 of 24,259) for EA contacts, and 19.5% (137 of 701) for clinic patients. Of 242 EA participants, 78 (32.2%) reported having tried medical marijuana; of 124 clinic participants, 58 (46.8%) reported having tried medical marijuana. In both groups, the majority reported marijuana to be very effective (45.6%), or moderately effective (24.8%). Of 247 EA participants, 171 (69.2%) reported having tried prescribed narcotic pain medications; of 124 clinic participants, 103 (83.0%) reported having tried prescribed narcotic pain medications. In both groups, the majority reported prescribed narcotic pain medications to be moderately effective (45.5%), or very effective (29.4%). In both groups, participants were most likely to report their use of narcotics was eliminated by the use of marijuana (47.2%, 42 participants), or decreased (33.7%, 30 participants). Only 1 participant (1.1%) reported their use of narcotics was increased after initiation of marijuana use.

Conclusions: Use of medical marijuana is common amongst women with endometriosis and pelvic pain, and reported efficacy is higher than that reported for prescribed narcotic pain medications. Use of medical marijuana is most likely to result in cessation or reduction of prescribed narcotic pain medication use.

Source of Financial Support: Dignity Health Medical Group, Department of OB/GYN, Advanced Gynecologic Surgery Division.

Disclosures/Conflicts of Interest: None.

Prospective evaluation of image guided treatment of pudendal neuralgia

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Introduction: Treatment options for pudendal neuralgia include CT guided pudendal nerve blockade, cryoablation, and pulsed radiofrequency (pulsed RF). Duration of symptom relief varies amongst the procedures and ranges from 1 to 3 months for blockade and up to 15 months for pulsed RF. It is common for patients to receive multiple treatments of one or more modalities.

Methods: Patients being considered for enrollment into the study will be approached on the day of the procedure. If amenable to participation, research team members will obtain consent using University of Maryland, Baltimore IRB-approved consent documents. Participants will then be asked to complete the SF-MPQ 2 prior to the procedure. Patients will be treated with CT guided pudendal nerve block. Bupivacaine and Methylprednisolone are injected at the ischial spine and into Alcock's canal. Some patients will also be receive pulsed radio frequency treatment. Patients will undergo a series of up to 3 treatments. The SF-MPQ 2 will be completed at 2 weeks, 4 weeks, and 6 months post-procedure. Follow-up data collection will consist of completing the SF-MPQ 2 either in person in conjunction with routine standard of care follow-up doctor visits or via a RedCap invitation to complete the survey or by telephone. Participation in the study will end upon completion of the 6 month post-procedure study visit.

Results: Preliminary results after the first 18 patients. Ave age 56.4 (range 30–87). 16 women and 2 men. 7 Steroid block and 11 steroid block and pulsed RF treatment. Baseline SF-MPQ 2 3.04, 2 week 2.27 and 4 week 1.68. Of patients treated with steroid block; baseline SF-MPQ 2 4.76, 2 week 2.96 and 4 week 2.33. Of patients who received PRF; baseline SF-MPQ 2 2.26, 2 week 1.93 and 4 week 1.41. There is a decrease in the SF-MPQ score from the baseline through the 2 and 4 week follow up of 44%.

Conclusions: Preliminary results demonstrate significant decrease in the SF-MPQ 2 pain scores when comparing the baseline score to the 2 and 4 week questionnaire results.

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Disclosures/Conflicts of Interest: There are no conflicts of interest to disclose.

Crafting comfort with trigger point injections: a low-fidelity simulation model improves basic knowledge and skills

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Introduction: Clinicians in many specialties encounter patients with chronic abdominal wall pain (CAWP). CAWP can be mistaken for visceral pathology and can result in unnecessary, unsuccessful, and potentially dangerous interventions, such as exploratory abdominal surgery. Trigger point injection (TPI) is a straightforward and effective way to address CAWP, but the procedure can be intimidating for clinicians unfamiliar with its practice. TPI is a clinical skill that cannot be learned by simply seeing the procedure done, since the technique is guided by manual perception through the needle of the skin and subcutaneous layers of the abdominal wall. The goal of this project was to build a model that simulates the layers of the abdominal wall, so that learners can become comfortable with the procedure without worrying about causing injury. The model should be easy to make and teach, using inexpensive, commonly available materials, and it should be effective in achieving improved skills and confidence in TPI.

Methods: A model of the layers of the lower abdominal wall (below the arcuate line) was created using items from the bargain bin of the local fabric/craft store: upholstery fabric, upholstery foam, muslin fabric, batting, a wooden block, and a staple gun. When injecting the model, the tip of the needle pierces the outer upholstery fabric (skin), upholstery foam (subcutaneous layer with Campers and Scarpas fasciae), rectus fascia (muslin fabric), and muscle (batting); the wooden block serves to anchor the layers and provides feedback about injection depth (hitting the block with the needle indicates that the needle tip is too deep). The model is combined in a kit for each learner, which includes instructions for administering TPI, empty syringes, and hypodermic needles in a variety of gauges. A short didactic about abdominal wall anatomy, physical exam, and trigger points was presented to medical residents, and then they were allowed to practice injection technique on the model, with guidance from the trainer. Trainees completed a brief pre-test and post-test to assess basic knowledge and changes in comfort level with administering injections, as well as ascertaining their concerns about performing injections in their practice. The pre-test and post-test repeat the same questions: (1) What percentage of women with chronic pelvic pain will be found to have trigger points if examined? a. 25% b. 50% c. 75% d. 85% (best answer c. 75%) (2) What is the name of the physical exam maneuver to elicit abdominal wall pain? a. Chadwicks sign b. Carnetts sign c. Cullens sign d. Chvosteks sign (best answer b. Carnetts sign) (3) How comfortable are you giving a trigger point injection? (numerical scale 0, not at all 10, very comfortable; circle best answer) (4) What concerns do you have about administering trigger point injections in your practice?

Results: A total of 35 medical residents (25 in Family Medicine, 10 in Internal Medicine) participated in the training; 31 completed a pre-test and 33 completed a post-test. Trainees improved both their basic knowledge of trigger points and their comfort with the skill of performing trigger point injections. Knowledge improved, based on questions answered correctly: (1) % of patients with chronic pelvic pain who have trigger points: pre-test 65% post-test 94% (2) Name of physical exam test to detect trigger points: pre-test 29% post-test 94% Comfort level improved, based on self-assessment on a scale from 0 (not at all) to 10 (very comfortable): Mean comfort level: pre-test = 2.3 post-test = 6 Median comfort level: pre-test = 1 post-test = 6. In order to assess possible barriers, participants were asked to describe what concerns do you have about administering TPIs in your practice? Concerns about administering TPIs shifted after the training: from I have never seen one and Im afraid of doing it wrong in the pre-test comments, to none and need more practice, but models helpful and I could do it after some practice in the post-test comments. While some participants were still concerned about causing more pain or injecting too deep, the post-training comments illustrate the improvement noted in self-assessed comfort levels after training.

Conclusions: Clinicians can be trained to perform trigger point injections using an effective, low cost, easy to assemble model, which helps them to develop injection skills and improve their confidence in those skills. Gaining that knowledge and confidence allows clinicians to understand the role of the abdominal wall in CAWP and to offer patients an effective option for trigger point treatment.

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Disclosures/Conflicts of Interest: None.

Effectiveness of pelvic floor muscle injections for chronic pelvic pain: a systematic review and narrative analysis

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Introduction: Chronic pelvic pain is a very complex, debilitating condition for women. One recognized etiology of chronic pelvic pain is myofascial pelvic pain, which refers to pain in the muscles, connective tissue, and surrounding fascia of the pelvic floor. Intramuscular injections have emerged as a novel treatment strategy for this condition. Trigger points may be injected with local anesthetics or botulinum toxin for pain relief. While initial reports have been positive, there are no standardized guidelines for treatment with injectable therapies. Given the paucity of effective treatments for pelvic pain, and the growing popularity of intramuscular injections for its management, examining the existing literature would be beneficial in order to validate their use. Our aim was to establish an evidence-based synthesis of what is known about this treatment to inform clinical practice and future research.

Methods: Participants included women with chronic pelvic pain. Males or animals were excluded. The intervention was any injectable medication infiltrated into pelvic floor muscles, focusing specifically on local anesthetics and botulinum toxin. Outcomes included improvement in pelvic pain and quality of life. Case reports, case series, observational studies, and randomized controlled trials were all included. A medical librarian searched the following databases from inception through April 2019: MEDLINE, Embase, CINAHL, Scopus, Prospero, the Cochrane Library, ProQuest Dissertations and Theses Global. The search strategy was developed using both text words and controlled vocabulary related to chronic pain, pelvis, and intramuscular injections. There were no limitations on language or date of publication. Hand searches of abstracts from research meetings, reference lists from relevant review articles, and reference lists of the included studies were performed. After removal of duplicates, citations retrieved from the search were screened by title and abstract. Two independent reviewers assessed full texts for eligibility. Disagreements were resolved by consensus and consultation with a third reviewer. Relevant data were collected from each included study using a standardized data extraction form. Risk of bias assessment was performed. Data were synthesized qualitatively.

Results: Eight hundred forty-one articles were identified by the database search. After removal of duplicates, 692 abstracts were reviewed for eligibility. After excluding review articles and irrelevant abstracts, 187 full text articles were reviewed. Of these, 37 studies met our inclusion criteria. In addition, 12 studies were retrieved from hand searching, for a total of 49 articles. Of the included studies, 11 involved injection of local anesthetics (in some cases in combination with a steroid), 35 involved injection of botulinum toxin, and 3 involved injections of both to the pelvic floor muscles. 3 of the local anesthetic studies were randomized controlled trials, 2 were prospective cohorts, and 6 were retrospective cohort studies. Of the botulinum toxin studies, 5 were randomized controlled trials, 14 were prospective cohort studies, 8 were retrospective cohorts, and 8 were case reports or case series. One randomized trial compared local anesthetics to botulinum toxin injections plus local anesthetics and 2 case reports used both interventions in the same patient. Varying injection regimens were used. Overall, clinically and statistically significant improvements in chronic pain were reported by all but one of the articles. Of note, the randomized controlled trials of both injectable local anesthetics and botulinum toxin reported statistically significant improvements in chronic pain scores compared with each groups baseline scores. However, none of the trials demonstrated statistically significant differences in pain scores when compared with placebo treatments (most commonly saline injections). Adverse effects were generally mild and of limited duration and the treatments were well tolerated. The studies were of variable quality.

Conclusions: Emerging evidence suggests that intramuscular injections of either local anesthetics or botulinum toxin are likely effective interventions for the management of chronic pelvic pain. The treatment appears to be safe and well tolerated. Future research should aim to clarify the effectiveness of these injectable medications in comparison to that of placebo injections into the pelvic floor.

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Disclosures/Conflicts of Interest: None.

To investigate the effects of multiple component intensified pelvic floor muscle training in women with urinary dysfunction

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Introduction: In myofascial pelvic floor dysfunctions, sensory, motor and reflex effects may occur in pelvic floor muscles. Therefore, pelvic floor dysfunction may be considered as neurological deficit. In rehabilitation of neurological deficits is aimed to improve neural plasticity by using sensory, motor and reflex stimulations. Neurophysiological approaches have been developed for neural plasticity in neurological disorders (Bobath, Constraint Induced Movement Therapy, etc.). Pelvic floor dysfunction may also be considered as a defect of the nervous system, and approaches including intensive sensory, motor and reflex applications can be applied. However, all-day application of these approaches in pelvic floor dysfunction may lead to fatigue or increased dysfunction of the pelvic floor muscles and may increase symptoms such as incontinence. Multiple component intensified pelvic floor muscle training has been developed with the idea that it may be a rehabilitation model that aims to develop neural plasticity based on one-to-one, all-day, neurophysiological principles that include sensory, motor and reflex effects in pelvic floor muscles. Studies shows that pelvic floor rehabilitation has been applied between 20 and 90 minutes per day but there is no study about intensive pelvic floor muscle training that takes 4 to 6 hours a day. The intensive pelvic floor muscle training contains patient education, bladder training, behavioural therapy, pelvic floor muscle exercises and home exercises programme.

Methods: This prospective, randomized controlled study assessed 30 women with mix urinary incontinence (mean age 54.3 ± 7.9 years, range 38–66 years) at a community-based referral gynecology center for evaluation of their incontinence. Participants have been divided into 2 groups. A study group (n = 15) had multiple component of intensive pelvic floor muscle training and control group (n = 15) had classic pelvic floor muscle training during 12 weeks. Multiple components of intensive pelvic floor muscle training (4–6 hours a day) had been applied during a week. Urinary continence symptoms assessments and

muscles EMG were performed before, one week after and at 12th week after the training. Friedman tests were conducted to test whether there is a significant change in pelvic floor muscles functions variables, due to violations of parametric test assumption. The Wilcoxon test was performed to test the significance of pairwise differences using Bonferroni correction to adjust for multiple comparison. The Mann-Whitney *U* test was used to compare pelvic floor muscles functions between the groups.

Results: Before treatment there was no statistical significant difference between the 2 exercise groups concerning degree of incontinence and pelvic floor muscle EMG ($P > 0.05$). There was a statistically significant difference between PERFECT (Power) and intravaginal EMG values at the beginning, first week and 12 weeks in the group with multiple component intensified pelvic floor muscle training (PERFECT [Power] $P = 0.0001$, intravaginal EMG avg $P = 0.007$). There was a significant difference about urinary symptoms in multiple component intensified pelvic floor muscle training group after 1 week ($P < 0.05$), while the control group was unchanged.

Conclusions: Multiple component intensified pelvic floor muscle training can improve more quickly than classic pelvic floor muscle training. However women should need to spend more time in the clinic for rehabilitation. Further studies with a larger sample size are needed investigating multiple component intensified pelvic floor muscle training.

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Botulinum toxin injections for chronic pelvic pain a systematic review

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Introduction: Botulinum toxin (BT) injections is one of the effective treatments for trigger-point inactivation in the setting of chronic pain secondary to myofascial pain (Cheshire et al. 1994). Its use in chronic pelvic pain has been investigated in the last 2 decades with the first presented injections in 1997 by Brin and Vapnek for refractory vaginismus. It acts by entering the endings of cholinergic peripheral nerves and thus inhibiting the presynaptic release of acetylcholine and reducing excessive muscle tone, hence reducing myofascial pain (Thompson 2005). Current chronic pelvic pain guidelines generally include BT as part of the treatment arsenal for female CPP due to myofascial dysfunction, however with variable level of recommendation in its efficacy (EAU 2018, SOGC 2018, RCOG 2012). The last published systematic review including BT as a treatment for CPP was the Cochrane review published in 2014 that included one RCT and simply mentioned BT as a treatment modality thats gaining increasing interest. We aim to conduct a systematic review of the literature published to date on the efficacy and safety of BT injections as an off-label treatment for female CPP.

Methods: MEDLINE, EBM Reviews, PubMed, CINAHL, TRIP Database, EMBASE, Web of Science and grey literature were searched. Studies assessing the treatment efficacy of BT for CPP in adult females, with 10 or more subjects, published in English up to January 2019, were included. The 2 investigators independently conducted data extraction. Quality of evidence was graded using the Jadad (for randomized controlled trials, RCT) or Ottawa-Newcastle scales (for observational studies). Patient demographics, injections methods, co-interventions, follow-up lengths and frequencies, outcome measurements and results were compared among the included studies.

Results: Four hundred sixty-eight records were identified and screened. Twelve full-text articles were assessed, and 11 were included in the review: 2 RCTs and 9 observational studies. The quality of evidence ranged from low to high. All aspects compared varied significantly between studies. All observational studies concluded that BT is an effective treatment for chronic pelvic pain of varying etiologies, while the 2 randomized controlled trials did not find significant difference between BT and placebo. All studies reported the safety of BT injections. There were significant clinical diversity (participants, interventions and outcomes), methodological diversity (study design and risk of bias), and statistical heterogeneity.

Conclusions: Currently there is insufficient evidence to recommend BT injections as a first line treatment for chronic pelvic pain; however its safety of use can be reassured. Future studies of higher quality in its treatment efficacy are indicated.

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The impact of a sacroiliac joint belt on the active straight leg raise in pregnancy related pelvic girdle pain

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Introduction: Posterior pelvic girdle pain (PGP) is common in pregnancy and sacroiliac joint (SIJ) belts are routinely utilized within a multimodal treatment approach. Validated PGP tests including the ASLR are used to diagnose PGP but no good screening test adequately predicts who benefits from belt application and ongoing wear. Aim 1: To determine if the Active Straight Leg Raise (ASLR) severity score is immediately reduced by application of a sacroiliac (SIJ) belt in women with PGP during pregnancy Hypothesis: The application of an SIJ belt will reduce the score of the ASLR by 2 points. Aim 2: To determine if the initial ASLR score change predicts pain reduction with use of an SIJ belt in women with PGP during pregnancy Hypothesis: PGP NRS score will be reduced by 2 points.

Methods: Pregnant women with posterior PGP in second or third trimester were included. Inclusion criteria defined PGP as pain between the upper level of the iliac crests and the gluteal folds in conjunction with or separately from pain in the pubic symphysis and influenced by position and locomotion. Further, had to report a screening ASLR between 2 and 10. Women were excluded if they were Non-English speaking or <21 or >50 year old, if they presented with PGP in the first trimester (<13 weeks gestation), had pubic symphysis (anterior) pain alone, had pain above the upper level of the iliac crest, had a history of lumbar or pelvic fracture, neoplasm, inflammatory disease, active urogenital infection or active gastrointestinal illness, previous surgery of the lumbar spine, pelvic girdle, hip joint or femur, or a history or signs of radiculopathy or other systemic neurologic disease. Participants completed a baseline visit where they completed questionnaires (including NRS, pain diagram, and the Pelvic Girdle Questionnaire), underwent a standardized musculoskeletal exam (including Pelvic girdle pain provocation test, pubic symphysis and long dorsal ligament palpation for tenderness, Patricks Faber test, ASLR with and without belt) and underwent an SIJ belt

fitting. They were instructed to wear the belt as much as possible if providing pain relief. At the follow-up visit 4 weeks later, participants completed the same questionnaires with the addition of the Perceived Global Impression of Improvement (PGII), underwent repeat physical exam tests and provided a weekly diary of SIJ belt wear. We used generalized estimating equations (GEE models) to estimate the mean difference between patients belted and non-belted ASLR scores while controlling for their body mass index (BMI) and whether they received any additional pain interventions. A similar approach was used to compare change in pain scores. In these models, a normal distribution with identity link was specified for the scores and an exchangeable working correlation matrix was used to account for patients within-subject correlation.

Results: Sixty four pregnant women were enrolled in the study with 49 completing a 4-week follow-up. The average age was 29.04 (SD = 4.93) and BMI was 32.02 (SD = 5.74). The median gestation was 28 (IQR: 23–29) weeks with a history of one (IQR: 0–2) prior previous delivery. After controlling for BMI and whether patients received additional pain interventions, patients immediate belted ASLR score was approximately −2.64 (−3.05 to −2.24) points lower than their non-belted ASLR score at visit 1 ($P < 0.001$). At visit 2 patients belted ASLR score was approximately −2.13 (95% CI: −2.60 to −1.66) points lower than their non-belted ASLR score ($P < 0.001$). After 4 weeks of therapy, patients total ASLR score declined by approximately −1.90 (95% CI: −2.56 to −1.23; $P < 0.001$) points, and their belted ASLR score declined by approximately −0.84 (95% CI: −1.50 to −0.18) points ($P = 0.01$). The change in patients belted-ASLR score was comparable to the change in their non-belted ASLR score (Mdiff = 0.56, 95% CI: −0.09 to 1.20; $P = 0.09$). Usual pain scores declined by approximately −1.89 (95% CI: −2.55 to −1.23) points after 4 weeks of therapy ($P < 0.001$). At the end of the study, 81% reported feeling better.

Conclusions: The ASLR test can be used as a predictor of who will benefit from an SIJ belt in pregnancy related PGP. The application of an SIJ belt in pregnancy related PGP provided immediate improvement in both pain and function (assessed by the ASLR).

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A randomized comparison of hands-on versus video-based training program designed to enhance pelvic floor examination in patients presenting with chronic pelvic pain

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Introduction: Pelvic floor myalgia remains a frequently unrecognized and under-treated component of chronic pelvic pain. Sixty-three percent of patients with self-reported chronic pelvic pain examined by a physician and 73.7% of patients examined by a physiotherapist were found to have pelvic floor myalgia. Although palpation remains the best method of assessment for pelvic floor myalgia, few gynecologists perform assessment of the pelvic floor musculature for the presence of myofascial pelvic pain and trigger points. Currently, there is no evidence in regards to the most effective method of teaching the assessment of pelvic floor musculature. The purpose of this study was to compare the effectiveness of hands-on vs video-based training of a comprehensive assessment of the pelvic floor musculature on a pelvic model and to design an effective training program to enhance examination of the pelvic floor musculature for patients presenting with chronic pelvic pain.

Methods: Forty-six participants were enrolled and randomized to video (n = 23) and hands-on (n = 23) groups. Both groups underwent pretraining assessment that consisted of a written examination and an Objective Structured Clinical Examination (OSCE). Both groups had a didactic session. The video group then viewed an instructional video and the hands-on group underwent a hands-on training session with a pelvic floor physiotherapist. Both groups then underwent a post-training assessment.

Results: The mean written assessment and OSCE scores improved significantly pre- and post-training in both hands-on and video-based training groups ($P < 0.001$). The mean written assessment scores improved from 15.6 (13.8–17.4) to 24.8 (23.4–26.2) and from 13.3 (11.5–15.1) to 24.3 (23.0–25.7) in hands-on and video groups respectively. The mean OSCE scores improved from 14.3 (12.5–16.1) to 26.5 (25.2–27.8) and from 11.7 (10.0–13.5) to 24.4 (23.1–25.7) in hands-on and video groups respectively. There was no statistically significant difference in the degree of improvement of the mean written assessment scores ($P = 0.19$), OSCE scores ($P = 0.10$), and comfort level ($P = 0.19$) between training groups. The training program was useful for clinical practice.

Conclusions: Both video and hands-on are effective training methods. There is no difference in degree of improvement of assessment scores between both methods. This study presents a new effective multidisciplinary training program for teaching the assessment of the pelvic floor musculature to identify a possible muscular cause or contribution to chronic pelvic pain and provide early referral for appropriate treatment. The video version of the designed training program is available on the OBGYN Academy Website (https://obgynacademy.com/chronic-pelvic-pain/) and the hands-on version has been developed into a workshop. The researchers also designed a paper-based resource to complement the training program.

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Factors associated with mucosal vs muscular pain in provoked vestibulodynia: a cross-sectional analysis from the national vulvodynia registry

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Introduction: Provoked vestibulodynia (PVD) is pain for at least 3 months, localized to the vulvar vestibule and provoked by touch or vaginal penetration. Diagnostic criteria for PVD focus on pain originating from the vestibular mucosa, however, research suggests that assessment of vestibular pain alone may be inadequate to characterize the pains impact on sexual function. Our objective was to (1) evaluate how mucosal vs muscular pain severity impacts sexual functioning and (2) determine whether time of pain onset, contraceptive use, mood disorders, and presence of comorbid pain conditions, influences mucosal and muscular pain.

Methods: Data was prospectively obtained from 202 women with PVD originally enrolled in the NVR from 2009 to 2014. Vestibular mucosa pain was assessed using cotton swab testing

and muscular pain was evaluated using single digit pressure application (of at least 2 kg pressure) to the vaginal muscles. A summary score (range 0–50) for static mucosal pain was generated by adding 5 numeric rating scale scores (NRSS; 0–10) from cotton swab sensitivity tests at 5 locations around the vestibule. A summary score (range 0–50) for muscular pain was generated by adding the 5 NRSS (0–10) from pressure applied to the (right and left) bulbocavernosus and levator muscles, and the perineal complex. Prior to evaluation, participants completed the short form of the McGill Pain Questionnaire, the modified Gracely Pain Scale, the Female Sexual Function Index (FSFI), the State-Trait Anxiety Inventory (STAI), and the Beck Depression Inventory (BDI). Presence and number of co-morbid pain conditions was determined by patient history. Spearman correlation, unadjusted and adjusted (ANCOVA) multivariable analysis were conducted for the relationship between NRSS and McGill and Gracely pain scores as well as sexual function, frequency of intercourse, other pain co-morbidities and psychiatric variables.

Results: The mean summary mucosal pain NRSS was 21.5 (95% CI 19.9–23.0), the mean muscular pain NRSS was 13.2 (95% CI 12.4–15.4), the mean bulbocavernosus NRSS was 5.7 (95% CI 5.2–6.5) and mean levator NRSS was 8.2 (95% CI 7.3–9.2). In adjusted analysis, only pain duration ($P = 0.033$) was associated with mucosal pain whereas higher muscle pain correlated with co-morbid pain conditions ($P = 0.003$). Higher pain at the bulbocavernosus muscle correlated with physical abuse ($P = 0.016$) and co-morbid pain conditions ($P = 0.005$) but not with sexual abuse or any of the other variables. Depression and co-morbid pain conditions were associated with higher levator pain NRSS ($P = 0.034$, $P = 0.044$ respectively) and this association persisted in adjusted analysis. Higher mucosal pain NRSS significantly correlated only with a lower FSFI arousal score ($r = -0.17$, $P = 0.032$). Higher muscle pain NRSS correlated with lower arousal ($r = -0.16$, $P = 0.042$), orgasm ($r = -0.23$, $P = 0.0038$), overall satisfaction sub-scores ($r = -0.16$, $P = 0.037$), and higher FSFI pain score ($r = -0.21$, $P = 0.01$). A higher bulbocavernosus pain NRSS significantly correlated with lower arousal ($r = -0.18$, $P = 0.022$), orgasm ($r = -0.23$, $P = 0.0052$), and satisfaction score ($r = -0.15$, $P = 0.054$). The levator pain NRSS negatively correlated with the FSFI orgasm score ($r = -0.19$, $P = 0.0018$). After adjusting for age and number of comorbid pain conditions, the relationship between higher muscle score and decreased intercourse frequency (after onset of pain) remained significant ($P = 0.0466$). There was no significant association between mucosal score and change in intercourse frequency, even after adjusting for muscle pain NRSS and other factors. We found a significant relationship between muscle pain NRSS (not mucosal pain) and the STAI state anxiety sub-score ($P = 0.015$), indicating association of muscle pain with greater anxiety; this persisted after adjustment for comorbid pain conditions ($P = 0.012$). There was no association between STAI trait or Beck Depression Inventory (BDI) scores vs the mucosal or muscle pain NRSS before or after adjusting for potential confounders.

Conclusions: PVD patients with muscular pain may be phenotypically different from those with mucosal pain, and muscular pain may be a better predictor of sexual dysfunction. Additionally, co-morbid pain conditions and anxiety correlate with muscular, not mucosal, pain. This research highlights the importance of incorporating a muscular pain assessment into the clinical evaluation and research of with PVD.

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Impact of pain and non-pain co-morbidities on opioid use in women with endometriosis

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Introduction: Previous research shows that women with endometriosis have a higher probability of opioid use and prolonged opioid use, compared to those without this disorder. However, the factors that influence the higher risk for opioid use remain largely unknown. Our objective was to determine whether pain and non-pain conditions influence the risk of opioid use in women before and after they receive a diagnosis of endometriosis.

Methods: We queried data of women who: (1) had at least 2 outpatient or 1 inpatient diagnosis of endometriosis (identified through ICD-9 code 617.x or ICD-10 code: N80.x) from January 2006 through December 2016, (2) were age 18–49 years, and (3) had at least 1-year continuous pharmacy enrollment before and after they were diagnosed with endometriosis. Final sample included patients whose earliest date of endometriosis diagnosis was between January 1, 2013 and December 31, 2016. The earliest date of endometriosis diagnosis was defined as the index date and the 12 month-period prior to the index date was defined as the baseline period. Descriptive statistics were conducted using frequencies (%) for categorical variables and means and median for continuous variables. Poisson regression with robust standard errors and linear regression modeling was used to describe associations between the outcome variables (whether opioid was dispensed, days of opioids supply and whether days of opioid supply was >90 days) and presence and number of baseline pain co-morbidities (back/neck pain, arthritis/joint pain, migraines/headache, Irritable Bowel Syndrome [IBS], Interstitial Cystitis [IC], fibromyalgia, vulvodynia, non-cancer pain), presence and number of psychiatric co-morbidity (anxiety, depression, episodic mood disorder, stress), presence of opioid use or abuse, and other potentially relevant gynecological non-pain conditions (Polycystic Ovary Syndrome [PCOS], fibroids, and infertility) in the baseline period. The final regression models adjusted for and age, geographic region and income when evaluating the association between the co-morbidities detected at baseline and the opioid use outcomes in the 12-months after diagnosis.

Results: The study sample was composed of 114,151 women with endometriosis whose mean age at first diagnosis was 36.7 years (SD = 7.9, Median 37, 18–49). In the baseline period, 23.5% of the women with diagnosis had one co-morbidity, 17.0% had 2 co-morbidities, 19.8% had 3 or more co-morbidities, 50.3% had a pain co-morbidity and 28.3% had a psychiatric co-morbidity. The prevalence of specific co-morbidities was as follows: 19.8% anxiety, 35.1% arthritis/joint pain, 27.8% neck/back pain, 18.2% depression, 7.1% fibromyalgia, 3.9% IBS, 1.1% IC and 0.9% vulvodynia. Considering cohort characteristics before the index date, multivariable analysis showed that women were 60% more likely to be prescribed opioids after diagnosis if they were opioid users at baseline (RR = 1.61; 95% CI: 1.60–1.63), however, this risk did not differ by number or type of co-morbidity. Compared to those who do not have a co-

morbidity, days of opioid use was 2.44 days longer for those with 1 co-morbidity ($P < 0.001$), 5.70 days longer for women with 2 co-morbidities ($P < 0.001$), and 11.39 days longer for women with 3 or more co-morbidities ($P < 0.001$). The risk of prolonged use of opioids, greater than 90 days of supply, increased by 50% if the endometriosis patients had at least one or more co-morbidity compared to none at baseline (RR = 1.50; 95%: 1.45–1.55). The risk of prolonged opioid supply, was also higher for endometriosis patients who had a prolonged prescriptions (greater than 90 days of supply) at baseline (RR = 14.66; 95% CI: 14.16–15.17). If a psychiatric co-morbidity was present at baseline, the risk of prolonged opioid prescription increased by 11% (RR = 1.11; 95%: 1.08–1.14) whereas, if a pain co-morbidity was present the risk increased by 46% (RR = 1.46; 95% CI: 1.42–1.51).

Conclusions: The presence of additional pain or psychiatric co-morbidities are associated with an increased number of opioids days of supply and prolonged (>90 days) opioid use (>90 days). This risk persists even after adjusting age, geographic region, income and whether other co-morbidities or opioids use were present prior to being diagnosed with endometriosis.

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Disease-relevant function brain network alterations in provoked vestibulodynia

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Introduction: Provoked vestibulodynia (PVD) is a chronic pain disorder characterized by pain localized to the vulvar vestibule, usually evoked by touch (eg, sex, tampon use). Recent neuroimaging studies have demonstrated morphometric and microstructural alterations in cortico (ie, primary sensory and motor cortex)-spinal-thalamic-basal ganglia tracts involved in sensorimotor integration and pain processing as well altered intrinsic resting state functional connectivity in sensorimotor regions that correlated with vulva pain and muscle tenderness. The overall aim of this research is to elucidate central mechanisms contributing to symptoms in PVD. In this study we hypothesized that PVD compared to HCs will show differences in the functional connectivity of sensorimotor cortices, subcortical regions and brainstem nuclei associated pain processing, descending modulation and sensorimotor integration that are associated with symptom measures. We also hypothesized that functional connectivity would differ between patients with and without comorbid chronic pain conditions (COPCs).

Methods: Resting state brain images were obtained in 208 women (108 PVD, 100 HC) on a 3T Siemens Prisma scanner. Pain in the vulvar vestibule was mapped by touching the vestibule perpendicularly with the cotton end of swab at 6, 7 (posterior vestibule), 10, and 2 oclock (peri-urethral). Patients rated pain (0–10 scale) at each site (0–10 scale). Internal muscle tenderness was also assessed with a single lubricated digit, applying approximately 2 kg of pressure for 2 seconds on the bulbocavernosis muscles (muscles at the vaginal entrance) and the levator ani complex (in the vagina). Patient ratings were summed to derive a total vulvar pain and muscle tenderness scores. Whole brain region to region functional connectivity analysis was computed using the CONN toolbox based on 438 cortical, subcortical, and brain stem regions based on the Schaeffer 400 functional cortical parcellation atlas, Harvard-Oxford subcortical cortical atlas, and the Harvard ascending arousal network atlas. Groups differences in functional connectivity of regions of interest (sensorimotor, subcortical, and brainstem region) with the whole brain were tested using independent *t* test and thresholding significance at with a false discovery rate of 5%. Spearman correlations were used to correlate symptom with brain connectivity showing significant group differences.

Results: In PVD compared to HCs, extensive increases were observed in the connectivity of sensorimotor cortices with regions comprising dorsal attention as well as salience/ventral attention, default mode and cognitive control networks. Similarly PVD showed increased connectivity between subcortical-cortical regions including: (1) amygdala and thalamus with cognitive control and attention regions (2) increases connectivity of globus pallidus and amygdala with visual processing regions, and (3) increased connectivity of thalamus, caudate and nucleus accumbens with default mode region. However, hippocampal cortex connectivity to a key inhibitory cognitive control region, the lateral prefrontal cortex was reduced in PVD compared to HCs. Additionally, the parabrachial complex connectivity was increased with a dorsal attention region but decreased secondary somatosensory cortex. Alterations in the functional connectivity of sensorimotor regions with dorsal attention, salience/ventral attention, and default mode regions showed small effect size correlation with total pain and muscle tenderness scores ($|rs| = 0.21–0.30$, $P = 0.04–0.007$). Women with PVD + COPC (n = 79) compared to PVD only (N = 39) generally exhibit decreased connectivity between the sensorimotor regions with default mode and salience/ventral attention and default mode with default network with dorsal attention, and salience/ventral attention regions. We also observed connectivity differences in the globus pallidus and in reticular formation in the rostral ventromedial medulla known to respond to vestibular and vaginal stimulation.

Conclusions: These finding support the hypotheses that functional alterations of the brain, particularly in primary and secondary sensorimotor cortices, as well as subcortical regions and brainstem nuclei associated with sensorimotor integration, pain processing and modulation, are closely associated with symptoms, and may be responsible for the hypersensitivity to pain, or are secondary responses to the chronic pain experienced in PVD. We further show that the presence of widespread pain is associated with specific central alterations in PVD.

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Vulvar pain symptom improvements after mindfulness based stress reduction for provoked vestibulodynia are correlated with changes in brain functional connectivity

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Introduction: Provoked vestibulodynia (PVD) is a chronic pain disorder that affects up to 8% to 18% of women. PVD consists of pain localized to the vulvar vestibule, usually evoked by touch (eg, sex, tampon use). Compared to healthy women, women with PVD display symptom-associated anatomical and functional brain differences, specifically in regions comprising sensorimotor, default, emotional

arousal, and salience network. A centrally target treatment, mindfulness based stress reduction treatment has been shown to improve symptoms in chronic pain and specifically in women with PVD. Additionally, MBSR has been shown to change brain structure and function and in these brain changes have been associated with symptom improvement in chronic pain patients. We hypothesized that MBSR would alter functional connectivity between default, sensorimotor, salience, and emotional arousal network regions and that these changes would correlate with changes in mindfulness and vulvar pain.

Methods: Two groups (n = 11, n = 10) of women with PVD completed an 8 week MBSR group treatment. A subgroup of women underwent structural and resting-state magnetic resonance imaging (MRI) pre- and post-MBSR on a 3T Siemens Prisma scanner. Mindfulness was assessed with the Five Facets of Mindfulness (FFM) Questionnaire. Pain in the vulvar vestibule evoked by touching the vestibule perpendicularly with the cotton end of swab at 6 oclock (posterior vestibule) was recorded (0–10 scale). Internal muscle tenderness was also assessed with a single lubricated digit, applying approximately 2 kg of pressure for 2 seconds on the bulbocavernosus muscles (muscles at the vaginal entrance) and the levator ani complex (in the vagina). Patient ratings were summed to derive a total muscle tenderness score before and after MBSR. Whole brain region to region functional connectivity analysis was computed using the CONN toolbox based on 438 cortical, subcortical, and brain stem regions based on the Schaeffer 400 functional cortical parcellation atlas, Harvard-Oxford subcortical cortical atlas, and the Harvard ascending arousal network atlas. Dependent *t* test was used to determine pre-post differences. We report differences as significant at $P < 0.0006$. Pearson correlation coefficient was applied to compute the correlation of significant changes in brain connectivity with changes in symptoms and mindfulness.

Results: MBSR increased mindfulness as measured by FFM total score ($t(18) = 3.9$, $P = 0.001$). Participants also reported decreases in vulvar pain at 6 oclock ($t(18) = -2.62$, $P = 0.018$) but not total muscle tenderness ($P = 0.78$). Several significant changes were observed in functional connectivity in regions comprising dorsal attention, salience/ventral attention, and default and cognitive control networks. In subcortical regions, greater connectivity was observed between the periaqueductal gray and dorsal prefrontal cortex (PFC), and locus coeruleus complex, a key noradrenergic arousal region, with a core salience/ventral attention region (medial parietal cortex). We also saw reduced connectivity between visual association cortex with mesencephalic reticular formation, a midbrain region that responds to vestibular and vaginal stimulation. We also observed a decrease in right amygdala-PFC connectivity. Several connections showing changes were correlated with pain and mindfulness scores. For example, significant increases in anterior insula connectivity with orbital frontal cortex was associated with decreased vulvar pain scores at 6 o'clock ($r = -0.69$, $P = 0.03$), Altered connectivity of the superior parietal lobe, a dorsal attention region, with ventral and lateral PFC were correlated with increased mindfulness scores, $r = -0.68$, $P = 0.04$, $r = 0.78$, $P = 0.01$, respectively.

Conclusions: MBSR increased mindfulness and improved vulvar pain but not muscle tenderness. MBSR altered the functional connectivity of cortical, subcortical and brainstem regions. Symptom improvements and increased mindfulness were correlated with changes in the functional connectivity of the brain at rest. These preliminary finding provide tentative support for the notion that changes in brain function may underlie MBSR-induced symptom improvement in women with PVD.

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Vulvodynia and pudendal neuralgia: a literature review

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Introduction: VD and PN are 2 types of vulvar pain that share similar symptoms. Each are associated with vulvar discomfort and are diagnosed clinically by meeting established criteria and by exclusion of other disorders. The ISSVD updated consensus terminology for vulvar pain in 2015, categorizing vulvodynia separately from pain associated with a specific recognized disorder, such as PN. In this definition, PN is classified as a neurologic cause of vulvar pain, and vulvodynia unexplained pain, which may have associated factors. While pudendal neuralgia is most commonly associated with nerve entrapment, Nantes diagnostic criteria published in 2008 include potential causes similar and often undifferentiated from VD, including musculoskeletal and inflammatory etiologies.

Methods: A Multi-field literature search was performed in MEDLINE for the terms Vulvodynia, AND Pudendal Neuralgia using All Fields. These results were compared using the advanced search option on a second database, PubMed also using All Fields.

Results: The terms Vulvodynia, AND Pudendal Neuralgia were searched in both MEDLINE and PubMed and resulted in the same 14 articles in each database. The first connection between PN and VD was discussed in 1991, in a paper that postulated PN as a primary cause of VD. Only 2 of the 14 articles were published following the new 2015 definition of vulvodynia. The first, a case series of 21 patients treated successfully with dorsal root ganglion stimulation listed PN and VD as potential diagnoses within the broader diagnosis of chronic pelvic pain without attempting to link or compare the 2. A single case study was published in 2019 describing a woman who had PN symptoms emerge after treatment for VD. A total of 12 papers were published prior to the release of the new consensus terminology. Of these, 3 papers discuss diagnosis or review VD with mentions of PN as a cause of vulvar pain. Conversely 4 papers discuss and review primarily PN as a type of VD. A total of 3 articles evaluate treatments for either PN or VD in an undifferentiated manner; offering treatment for general vulvar pain or chronic pelvic disorders. These include one prospective cohort, one trial, and one novel technique discussion. The last 2 articles are a literature review evaluating the relationship between vestibulodynia and bladder pain syndrome and a 2015 editorial with a call to alter the terminology of vulvar and pelvic pain.

Conclusions: A lack of consensus and understanding between VD and PN exists in the literature. Overlapping treatment options for both disorders, and possible common etiologic pathways, including shared neurologic origins (pudendal nerve), inflammatory cytokines, or neural cross-talk have been described. Further research is needed to determine if these disorders constitute a continuum, are overlapping disorders or are unrelated. Collaboration between experts in OBGYN, pain, neurology, microsurgery and urology may be helpful to gain a broader understanding of PN and VD, and perhaps new terminology of vulvar and pelvic pain can then be considered.

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Centrally sensitized co-morbidities of vulvodynia

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Introduction: Vulvodynia is defined as a chronic pain disorder of the vulva of at least 3 months duration, without clear identifiable

cause and with potential associated factors. The etiology of vulvodynia is unknown, although central sensitization, whereby a reconditioning of the nervous system to state of high reactivity occurs, resulting in either persistent pain or a heightened pain reaction to any stimulus. Other disorders which are associated with central sensitization include, but are not limited to, fibromyalgia, temporomandibular joint disease (TMJ), migraine headaches, and irritable bowel syndrome. Fibromyalgia has been estimated to occur in up to 24% of women with vulvodynia. Previous studies have estimated co-morbidity of other pain disorders at 27% (fibromyalgia, interstitial cystitis, or irritable bowel syndrome) and 45% (chronic fatigue syndrome, endometriosis, fibromyalgia, interstitial cystitis, or irritable bowel syndrome). A survey of 1457 women showed a 24% incidence of one co-morbidity and 50% incidence of 2 (temporomandibular joint and muscle disorders, interstitial cystitis, fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome, endometriosis, and chronic headache). No previous studies screened for all 9 co-morbidities listed in the CSI (restless leg syndrome, chronic fatigue, fibromyalgia, temporal-mandibular joint disease, migraine or tension headache, irritable bowel, multiple chemical sensitivities, neck injury, anxiety/panic or depression). The aim of this study was to determine the number of centrally-sensitized co-morbidities in women with vulvodynia.

Methods: Participants with vulvodynia were asked to complete the CSI on presentation to a Vulvovaginal Health Center.

Results: A total of 48 women with vulvodynia completed the CSI. Of these 48 women, 38 self-reported at least one co-morbidity (79.6%), 10 reported 2 co-morbidities (20.8%) and 15 reported 3 or more (31.3%) The range of co-morbidities ranged from 1 to 8, with an average of 2.52. The most common co-morbidities were Irritable bowel syndrome (48.9%); depression (34.7%) and anxiety (32.7%).

Conclusions: Vulvodynia has been recognized to have a high incidence of co-morbid conditions, many of which are also characterized as pain syndromes, and most of which have poorly or incompletely understood pathophysiology. Many seem to involve central sensitization. A unifying explanation which may explain this association has not been determined. This study, which screened for 10 centrally sensitized disorders, demonstrates a 79.2% incidence of at least 1 of these disorders as a co-morbid condition in this cohort of women with vulvodynia. Depression and anxiety are 2 of the 3 most common reported co-morbidities. Whether they represent independent disorders or are a result of this chronic pain condition remains unclear. Nevertheless, health care providers that care for women with vulvodynia need to be vigilant in the recognition of the potential for one or more co-morbid conditions in their patients, screen for them appropriately and incorporate an interdisciplinary care team as needed.

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Ecological momentary assessment: a valuable contextual tool for 24-hour heart rate variability and chronic pelvic pain

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Introduction: The study posits that changes in autonomic state (as reflected in high frequency heart rate variability HRV) drive changes in the pelvic pain experience in both IC/BPS and MPP groups. We developed an EMA questionnaire to help us track pain flares, and to explore how momentary fluctuations in affect may mediate or moderate these associations.

Methods: Over one 24-hour period each week for 24 consecutive weeks, HRV was monitored continuously while an EMA survey was completed every 85 minutes during waking hours (via Nexus S5 smartphone) to assess: (1) general and domain-specific pelvic pain, and (2) emotional states sampled on 5-point scales (1–5) from all 4 quadrants of the affective circumplex (ie, positive high arousal, positive low arousal, negative high arousal, negative low arousal states). This collection will result in a large quantity of data (180 subjects with 24 weekly EMA responses within a typical day including 10–13 questionnaires with 66 questions each), about 52,000 EMA questionnaires. We also assess the response and completion rates. So far, 29 of the first 40 subjects (ie, 72.5%) have completed each of the first 4 weeks of EMA surveys. Respondents on average have taken about 3 minutes to complete each EMA survey (or 87% of a possible total of 1188 surveys). We present here the data spread and variability for completed IC/BPS (n = 10), MPP (n = 11), and HC (n = 19) participants for the first 3 weeks of the protocol. Descriptive statistics and correlations among this momentary data separate EMA emotion states into the 4 quadrants of the affective circumplex model used to construct the affective question sets, as well as the prevalence of pelvic pain exacerbations (defined here as a rating of somewhat intense or more of pelvic pain or higher for at least one pelvic pain diary entry in any day).

Results: There was notable participant attrition in the EMA study from week 3 to week 4 (N = 42 at week 1, N = 40 at week 2, N = 37 at week 3, and N = 29 at week 4). Thus, the results that follow will focus on the first 3 weeks of the EMA protocol. Univariate tests for the first week show that averaging momentary affect for pain-exacerbation and non-pain exacerbation days relates to less positive high arousal during pain exacerbation [$F(2, 30) = 4.330$, $P = 0.021$]. In addition, repeated measures ANOVA tests show non-significant trends for between-subjects effects for participant group on average daily negative high arousal [$F(2, 24) = 2.928$, $P = 0.073$] and positive high arousal [$F(2, 24) = 2.293$, $P = 0.123$], such that the MPP (vs. HC) group shows more negative high arousal [p(t) = 0.023] (M = 1.840 vs M = 1.386) and less positive high arousal [p(t) = 0.045] (M = 1.851 vs M = 2.481). This was not true of the BPS group for negative high arousal [p(t) = 0.543] (M = 1.535 vs M = 1.386) nor positive high arousal [p(t) = 0.543] (M = 2.388 vs M = 2.481).

Conclusions: Based on our communications with the subjects they seem willing to complete the EMA protocol (at least in the first couple weeks) and seem to do so relatively quickly. Given drops in EMA compliance by week 4, there appear to be barriers to completing the EMA protocol for the 24-week trial. Thus, we have gone back and integrated some extra steps in participant instructions to boost compliance over time. We are finding that getting subjects to comply over such a long study period with weekly gaps requires some extra efforts to keep subjects engaged. However, the existing EMA variability imply meaningful data with (1) the MPP (vs. HC) group showing less positive daily affect and (2) flare (vs. non-flare) days associated with less positive daily affect in the first week. Further work will require developing the right statistical approach to mine the large quantity of data and relate it meaningfully to the HRV record.

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The role of catastrophizing in symptom expression and psychosocial well-being of women with persistent genital arousal symptoms: preliminary support for the fear avoidance model

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Introduction: Persistent genital arousal disorder (PGAD) is characterized by symptoms of distressing physiological sexual arousal (such as genital vasocongestion and/or sensitivity) that occur in the absence of sexual desire. There continues to be a lack of systematic research on this condition. Little is known about the psychological, sexual, or relationship well-being of individuals who experience PGA symptoms. The aim of this controlled study was to compare these psychosocial outcomes in an age-matched sample of women with and without symptoms of PGA. A second aim was to examine what symptom factors (associated distress, symptom severity) and cognitive factors (eg, catastrophizing of vulvar sensations) were associated with psychosocial outcomes in women with symptoms of PGA. Given the proposed similarities between PGAD and chronic vulvar pain (Markos & Dinsmore, 2013; Jackowich et al., 2018), the results for the present study and findings from past literature were examined in the context of the fear avoidance model (FA model) of chronic pain.

Methods: Age-matched samples of women with (n = 72) and without (n = 72) symptoms of PGA completed a comprehensive online survey. Participants in the 2 groups were compared on validated measures of psychosocial functioning (depressive and anxiety symptoms, catastrophizing of vulvar sensations, sexual functioning and distress, and relationship functioning). Within the PGA symptom group, the relationship between catastrophizing of vulvar sensations, psychosocial, and symptom outcomes was examined.

Results: Women with symptoms of PGA reported significantly greater depressive and anxiety symptoms, sexual distress, and suicidal ideation, as well as significantly poorer relationship functioning than women without PGA symptoms. For women who experienced PGA symptoms, greater catastrophizing of vulvar sensations was related to PGA symptom ratings (greater severity and distress) and psychosocial outcomes (greater depression, anxiety, and sexual distress). Previous studies have also found women with PGAD frequently report monitoring their arousal sensations, experience associated negative affective and impairment in daily functioning. The results of the present study, paired with these findings from previous studies, provide some initial support for the FA model in understanding PGA symptoms.

Conclusions: PGA symptoms are associated with significant health and psychological difficulties. These results highlight the need for continued research in this area to improve identification and treatment for this population, including empirical validation of the FA model in PGAD.

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Effect of pelvic floor muscle training programme on sexual function in elderly

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Introduction: Sexuality is an important component of emotional and physical well being that men and women experience through their lives. Female sexual dysfunction and male erectile dysfunction increase with age. About a third of the elderly population has at least one complaint with their sexual function. Pelvic floor muscle training is the most commonly recommended physical therapy treatment for sexual dysfunction in elderly.

Methods: The Turkish version of FSFI and IIEF was used to assess the severity of sexual dysfunction. Participants have attended pelvic floor muscle training class twice a week (2 hours weekly) during 12 weeks. This programme contains information about pelvic anatomy, education about pelvis functions and pelvic floor mucsles exercises. Pelvic floor muscle training programme has been performed by an expert pelvic health physiotherapist and participants were assesed at the beginning and the end of pelvic floor muscle exercise programme. The data were analysed by using the SPSS 22.0 stastistical analysis software. Wilcoxon test was used to compare the difference between before and after exercise programme for their sexuality score.

Results: There is a statistically significant difference in the desire ($P = 0.01$), arousol ($P = 0.01$), lubrication ($P = 0.002$) and orgasm ($P = 0.02$) sub-parameters and total score ($P = 0.001$) of the FSFI and all parameters (erectil function-$P = 0.02$; orgasmic function-$P = 0.04$; sexual desire-$P = 0.009$; intercourse satisfaction-$P = 0.01$ and overall satisfaction-$P = 0.02$) of IIEF scores in both gender in elderly.

Conclusions: There is decline in sexual function with age that may affect the quality of life. Our results indicate that pelvic floor muscle training programme improve sexual health in women and men aged over 65. People aged over 65 should participate in pelvic floor muscle training programme for better sexual function.

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Assessment of the endometriosis burden in Canada: I-examining the heath-related quality of life using the EQ-5D-5L questionnaire

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Introduction: Endometriosis is an estrogen-dependent gynecologic disease that is associated with several pain symptoms like dysmenorrhea, non-menstrual pelvic pain and pain during sex. Little data exists on the health-related quality of life burden of endometriosis in Canada and how it may be negatively impacted by the endometriosis-pain symptoms. Thus, this study aimed to fill this gap using a cross-sectional survey design. Prior analysis of this survey data was used to report the prevalence, diagnostic delay and treatment patterns among women with self-reported diagnosis of endometriosis.

Methods: A cross-sectional survey was fielded online to women aged 18 to 49 residing in Canada who were members of 3 survey panels (survey sampling international panel in addition to other patient

panels) between December 2018 and January 2019. The survey was divided into 2 parts: a prevalence screener administered to all women and an endometriosis-specific portion that was administered only to women indicating they have received an endometriosis diagnosis in the prevalence screener. The prevalence screeners included questions about demographics, symptomatic experience, standardized questionnaire assessing fatigue and health-related quality of life like the EQ-5D-5L. The data were weighted by age, geographical region, education level and household income levels to calculate nationally representative estimate of the female Canadian population. Differences in EQ-5D-5L-based outcomes were compared between women with a reported diagnosis of endometriosis who were experiencing at least one of the primary endometriosis-related pain symptoms in the 4-weeks preceding the survey administration (dysmenorrhea, non-menstrual pelvic pain and pain during sex) and those who did not report a diagnosis using T-tests. In addition, the impact of experiencing a patient-reported moderate to severe form of each of the 3 primary symptoms of endometriosis (dysmenorrhea, non-menstrual chronic pelvic pain and pain during sex) on EQ-5D-5L outcomes was also examined using *t*-tests.

Results: The prevalence screener was completed by a total of 30,000 women; 2004 of which reported a diagnosis of endometriosis and complete the endometriosis-specific section. At time of survey administration, average age of endometriosis respondents was 35.5 years (SD = 8.1) which was significantly higher than women without an endometriosis diagnosis (mean = 33.6 years; SD = 9.2). Approximately, 71.4% of the endometriosis respondents were experiencing at least one of the primary endometriosis-related pain symptoms in the 4-weeks preceding the survey administration. Compared to women without a diagnosis of endometriosis, endometriosis respondents who were experiencing at least one of the primary endometriosis-related pain symptoms had a significantly lower VAS score (69.7 vs 72.9; $P < 0.001$) reflecting a poorer health related quality of life. The same relationship was observed for the EQ-5D-5L index score where endometriosis respondents who were experiencing at least one of the primary endometriosis-related pain symptoms had a significantly lower score (0.77 vs 0.82; $P < 0.001$). For all endometriosis respondents, experiencing moderate to severe dysmenorrhea vs mild or no dysmenorrhea was associated with a significantly lower VAS score (67.5 vs 72.8; $P < 0.001$) and EQ-5D-5L index score (0.73 vs 0.81, $P < 0.001$). The same relationship was observed for endometriosis respondents experiencing moderate to severe non-menstrual pelvic pain vs mild or no non-menstrual pelvic pain for VAS scores (65.6 vs 72.4; $P < 0.001$) and EQ-5D-5L index score (0.70 vs 0.80; $P < 0.001$). The impact of experiencing pain during sex was a bit less compared to the 2 previous mentioned symptoms where endometriosis respondents experiencing moderate to severe pain during sex also had a slightly lower VAS score (70.3 vs 70.7; $P = 0.005$) and EQ-5D-5L index score (0.74 vs 0.79; $P < 0.001$) compared to endometriosis respondents with mild or no pain during sex.

Conclusions: Endometriosis is associated with a significant impairment in health-related quality of life in Canada. Experiencing endometriosis-related pain symptoms results in poorer health-related quality of life. Additional research is needed to evaluate the clinical meaningfulness of the health-related quality of life impairments observed in this study.

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Development of pelvic floor dysfunction awareness scale

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Introduction: The aim of this study was to develop a pelvic floor awareness questionnare.

Methods: Four hundred eighty-six adult men and woman aged 25 to 70 years consenting to participate in the study and able to independently complete the scale was eligible for the study. The participants were asked to marked their agreement with each of the items on a Likert type scale which ranged from totally disagree to totally agree and they were excluded if they failed to respond questions.

Results: To discover factor structure of PFDAS Exploratory factor analysis (EFA) (Principle Axis Factoring) was performed on 30-item. The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy was sufficient (KMO = 0.913). According to EFA results 15 items were deleted from the scale. The remaining 15 items showed single factor structure and explained 36.9% of the total variance. Factor loadings of items were ranging from 0.408 to 0.762. Coefficient alpha was calculated for internal reliability analysis. Coefficient alpha for the total PFDAS was 0.875.

Conclusions: Awareness of pelvic floor dysfunctions should be increased among men and women. Raising public knowledge regarding pelvic floor dysfunction is a crucial element for success in this area.

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Characterization of patients with chronic pelvic pain in a pelvic pain unit in Colombia

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Introduction: Chronic pelvic pain (CPD) is a severe and disabling condition that approximately 15% to 20% of women in reproductive age. At present, in the Comfamiliar Clinic of Pereira there is an ALGIA unit where patients with chronic pelvic pain of different etiologies are constantly being treated but until now there are no clear statistics about this population. In order to know the epidemiological profile of chronic pelvic pain in the region, taking into account that there are few studies in Colombia, the present study aims to describe the socio-demographic profile and the prevalence of pathologies diagnosed as causes of chronic pelvic pain observed in patients with chronic pelvic pain treated in the ALGIA Unit of the Comfamiliar Pereira Clinic between 2007 and 2015.

Methods: The inclusion criteria were: a. patients who have been treated in ALGIA from 2007 to 2015, b. patients with diagnosis of chronic pain confirmed. A secondary information source was used (electronic medical records), Analysis of relative and absolute frequencies was carried out along with measures of central tendency as applicable for each level of measurement of the variables. Multiple correspondence analysis was performed with the diagnostic variables, the relationship between the diagnoses was examined to determine the associations between them. The analyzes were performed in STATA 14.0. It was approved by the research and bioethics committee of the Comfamiliar Clinic.

Results: One thousand three hundred three met inclusion criteria, the mean age of the patients was 35.1 years (range 13 and 83 years), The diagnoses found according to the prevalence were painful bladder syndrome (82.3%), pelvic congestion syndrome (54.3%), pelvic floor tension myalgia (51.3%), vulvodynia (46.9%), constipation (38.1%), endometriosis I–II (36.4%), adenomyosis (26.8%), inguinal hernia (22.6%), pudendal neuralgia (20.6%), endometriosis III–IV (19.6%), adhesions syndrome (18.3%), myofascial syndrome (17.4%), Irritable bowel (11%), Symptomatic retroverted uterus (9.6%), Other peripheral neuropathies (8.4%), Sciatica hernia (2.6%), Fibromyalgia (2.6%), Depression (1.9%), Depressive and anxious disorder (1.8%), Mullerian malformation (0.8%), Idiopathic (0.8%) and Femoral hernia (0.7). The Multiple correspondence analysis revealed 2 groupings in the diagnoses with an association between them, a first group composed of: pelvic floor myalgia, constipation, vulvodynia, pelvic congestion syndrome and a second group represented by: fibromyalgia, myofascial syndrome, irritable bowel and pudendal neuralgia.

Conclusions: This is the first study that characterizes patients with chronic pelvic pain in a Colombian population. Similar to previous studies in the world, pelvic pain depends mainly on other origins than gynecological, as can be seen in this study, in addition, is rarely unicausal (less than 10% in the studied population), which reaffirms that chronic pelvic pain is a multicausal condition and, therefore, should be its management, in charge of a multidisciplinary team in specialized units for comprehensive management of patients and seek an improvement in the quality of life of patients.

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Sleep, fatigue, and life satisfaction after hysterectomy in women with preoperative pain and depression

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Introduction: Previous literature has demonstrated that women who undergo a hysterectomy can have an improvement in quality of life by reduction of pelvic pain, improved physical function, mental health, and social function. In addition, sleep and fatigue contribute significantly to quality of life and are important factors to patients with chronic pain. In other domains of medicine, conditions that may affect sleep and fatigue, once corrected, can lead to improvement in their symptoms and overall quality of life. Many women have complaints of sleep disturbance and fatigue, as well as lesser life satisfaction when presenting for hysterectomy. Reasons for this include chronic pelvic pain, disruption from heavy bleeding, bulk symptoms from fibroids, and dysmenorrhea. An aim of this study was to see if there is an improvement in sleep and fatigue, as well as life satisfaction in women after hysterectomy. Women were also categorized into those with or without preoperative pelvic pain and/or depression to see if these coexisting factors contribute to changes in these quality of life aspects.

Methods: Patients completed validated assessments of life satisfaction, sleep, and fatigue preoperatively and 6-months after hysterectomy. Patients were divided into 4 groups based on preoperative characteristics: pelvic pain only, depression only, pain + depression, and no pain or depression. Pelvic pain was defined as pelvic pain score of >4 at baseline survey.

Results: Preoperatively, women with pelvic pain only reported worse sleep ($P = 0.01$) and fatigue ($P < 0.001$) compared to those with no pain or depression, but no difference in life satisfaction ($P = 0.22$). However, women with pain + depression have worse sleep, fatigue, and life satisfaction compared to women with pain only and no pain or depression (all $P < 0.001$). At 6-month follow-up, women with pelvic pain only reported significant improvements in life satisfaction ($P = 0.04$), sleep ($P < 0.001$), and fatigue ($P = 0.001$), and achieved levels similar to those with no pain or depression. Women with pain + depression demonstrate improved life satisfaction ($P = 0.01$), but still do not achieve the same levels as those with pain only and no pain or depression. Furthermore, these women do not report improvement in sleep ($P = 0.48$) or fatigue ($P = 0.16$), which remain significantly worse than those no pain or depression.

Conclusions: Women with pre-existing pelvic pain only demonstrate improvements in life satisfaction, sleep disturbance, and fatigue following hysterectomy and achieve similar levels to those with no pain or depression. Women with coexisting depression fare significantly worse in these domains than those without.

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Reproducibility of valsalva maneuver derived baroreflex parameters

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Introduction: The valsalva maneuver (VM) can provide estimates of both vagal and sympathetic baroreflex sensitivity.

Methods: As per Singer et al., the vagal baroreflex component (BRS_v) constitutes the RR interval response to a preceding change in BP, either during vagal excitation (BRS_vup, from Phase IV), or vagal inhibition (BRS_vdown, from Phase II early) while Pressure Recovery Time (PRT) to baseline during phase IV reflects adrenergic baroreflex. A custom MATLAB script selected the BP and RR interval correlation with the best R2 among 0, 1 and 2 beat delays, and calculated BRS_v as the linear regression slope. Four subjects were presented in 2018. Improved methodology since 2018 included more precise time assessment for onset and offset of the pressure hold, and a longer baseline (15 vs 5 seconds) prior to heart rate to assess baseline pressures prior to Valsalva onset. We examined 22 VMs collected from 11 subjects over 2 visits and selected the highest quality VM for

analysis based on the best R2 and absence of artifact. Due to the presence of outliers Spearman correlations were used.

Results: Of the 22 Valsalva trials examined, R2 was >0.84 in all but 4. The median, fifth, 95th percentiles values were 0.0059, 0.0019, 0.0189 ms/mm Hg for BRS_vdown, 0.0059, 0.002, 0.0235, ms/mm Hg for BRS_vup and 2.93, 1.19, 4.15 seconds for PRT. Spearman correlations between the 2 visits were 0.645 ($P = 0.032$) for BRSv_up and 0.382 ($P = 0.247$) for BRS_vdown. The correlation between BRS_vup and BRS_vdown for visit 1 was 0.064 ($P = 0.853$) and for visit 2 was 0.809 ($P = 0.003$). The intra-subject correlation for PRT was 0.08.

Conclusions: The VM baroreflex parameters show some intra-subject reproducibility in this larger sample, including BRS_vup, BRS_vdown. Some of the findings are less robust compared to 2018 with more subjects in the analysis. It is curious that the best correlation was between BRS_vup and BRS_vdown for visit 2. Perhaps there is a learning effect of some type, with visit 1 values less consistent then visit 2 values due to subject comfort. There is little correlation between the BRS values which represent primarily vagal baroreflex function, and the PRT which reflects primarily adrenergic baroreflex function.

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