Journal of Pain Research

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Factors Influencing Chronic Pain After Hysterectomy for Uterine Fibroids: Development and Validation of a Nomogram Prediction Model

Hui Liang, Yihong Luo, Xuqing Chen, Tao Hou

Department of Gastroenterology, Meizhou People's Hospital, Meizhou, Guangdong Province, 514011, People's Republic of China

Correspondence: Tao Hou, Department of Gynecology, Meizhou People's Hospital, No. 63 Huangtang Road, Meijiang District, Meizhou, Guangdong, 514011, People's Republic of China, Tel +8613670827939, Email Hungakhg@126.com

Objective: To develop and validate a nomogram prediction model for chronic pain after hysterectomy for uterine fibroids.

Methods: A retrospective study was conducted on 315 patients who visited our hospital from January 2022 to July 2024. The patients were stochastically assigned into training dataset (n=220) and validation dataset (n=95) in a 7:3 ratio. The training dataset was assigned into non chronic pain group (n=164) and chronic pain group (n=56) based on whether chronic pain persists for more than 3 months after surgery. Multivariate logistic regression was used to screen for predictive factors. R software was used to construct nomogram models. The calibration curve was used to evaluate the calibration degree of nomogram. ROC curve was used to evaluate the discrimination of nomogram. The clinical decision curve analysis was used to discuss and evaluate the net profit of the nomogram.

Results: Preoperative pain, history of abdominal or pelvic surgery, endometriosis, anxiety, and high Pain Catastrophic Scale (PCS) score were independent risk factors for chronic pain after hysterectomy for uterine fibroids (P<0.05). The nomogram model showed high predictive performance in both the training and validation datasets, and the calibration curves showed good consistency and calibration degree, the Hosmer-Lemeshow test showed χ^2=1.654, 3.181, P=0.990, 0.922; the AUC values in ROC curve were 0.841 (95% CI: 0.781~0.900) and 0.825 (95% CI: 0.762~0.887). The clinical decision curve analysis indicated that decisions based on the nomogram model could provide higher net benefits for patients undergoing hysterectomy for uterine fibroids within a prediction probability threshold range of 0.08~0.75.

Conclusion: The nomogram developed in this study accurately predicts the risk of chronic pain after hysterectomy for uterine fibroids, which is beneficial for preoperative planning and patient consultation.

Keywords: uterine fibroids, hysterectomy, chronic pain, influencing factors, nomogram model

Introduction

Uterine fibroids are the most common benign tumors in women of reproductive age, and they are associated with heavy bleeding, reduced fertility, and decreased quality of life.[1,2] Surgery is the preferred treatment for patients with clinically symptomatic uterine fibroids, with the most common traditional surgical options being myomectomy to remove the fibroids or total hysterectomy, with the latter being more frequently performed.[3,4] Chronic postsurgical pain is defined by the International Association for the Study of Pain (IASP) as persistent or recurrent pain that arises after a surgical procedure, located in or around the surgical site, and lasting for at least three months.[5,6] Postoperative chronic pain is a common complication after hysterectomy, typically related to changes in damaged neurons, inflammation, and the release of pain-inducing substances following tissue injury, which excite nociceptors and contribute to the development of chronic pain. Persistent pain hinders recovery and negatively affects patient well-being.[7] Early identification of high-risk patients can provide a critical window for reducing the risk of postoperative chronic pain and improving patients' quality of life. Studies have shown that the Numerical Rating Scale (NRS) is a validated and simple tool for assessing postoperative chronic pain and is now widely used in clinical practice.[8,9] However, using the NRS alone to assess

Received: 12 March 2025
Accepted: 4 August 2025
Published: 18 August 2025

postoperative pain has relatively low efficiency and makes it difficult to predict pain early. Therefore, to assess the risk of developing chronic pain after uterine fibroid hysterectomy, this study analyzed several identified risk factors and combined them with new risk factors to develop a nomogram prediction model.

Objects and Methods

Patients

This study retrospectively included 315 patients who visited our hospital between January 2022 and July 2024. The patients were randomly divided into a training dataset (n=220) and a validation dataset (n=95) in a 7:3 ratio. Inclusion criteria: (1) Patients diagnosed with uterine fibroids in accordance with diagnostic standards,[10] with indications for hysterectomy; (2) Ethics approval from the Meizhou people's hospital was obtained for the study; (3) Age ≥18 years. Exclusion criteria: (1) History of uterine malignancies or other cancers; (2) Significant organ dysfunction; (3) Mental disorders or cognitive impairments; (4) Drug abuse or alcoholism; (5) Uterine adenomyosis or pelvic floor dysfunction. The flowchart for patient inclusion is shown in Figure 1.

Collection of Clinical Data

Clinical data were collected for patients undergoing uterine fibroid hysterectomy, including: age, body mass index (BMI), marital status, education level, preoperative pain, menopause status, hypertension, diabetes, surgical approaches (laparoscopic, abdominal, vaginal) and anesthesia methods (general anesthesia, neuraxial anesthesia), history of abdominal/pelvic surgery, number of pregnancies, number of deliveries, endometriosis, surgical method, anxiety, Pain Catastrophizing Scale (PCS) score, adnexal removal, surgical duration, intraoperative blood loss, postoperative infection, postoperative nausea and vomiting, and uterine weight. Preoperative pain was assessed using the Numerical Rating Scale (NRS), with a total score of 10, where a higher score indicates more severe pain (0 indicates no pain, and >0 indicates pain). Anxiety was assessed using the GAD-7 Anxiety Disorder Scale, which includes 7 items with a total score of 21; a higher score indicates more severe anxiety, and a score ≥5 was considered indicative of anxiety. The PCS scale consists of 13 items, each scored on a 5-point scale (0–4), with a total score of 52. A higher total score indicates more severe pain catastrophizing. Chronic pain assessment: Patients were followed up via telephone or outpatient visits 4 months postoperatively to determine if they experienced persistent postoperative pain due to surgical factors (NRS score >0), lasting more than 3 months. The training dataset was divided into two groups based on the occurrence of chronic pain: a non-chronic pain group (n=164) and a chronic pain group (n=56).

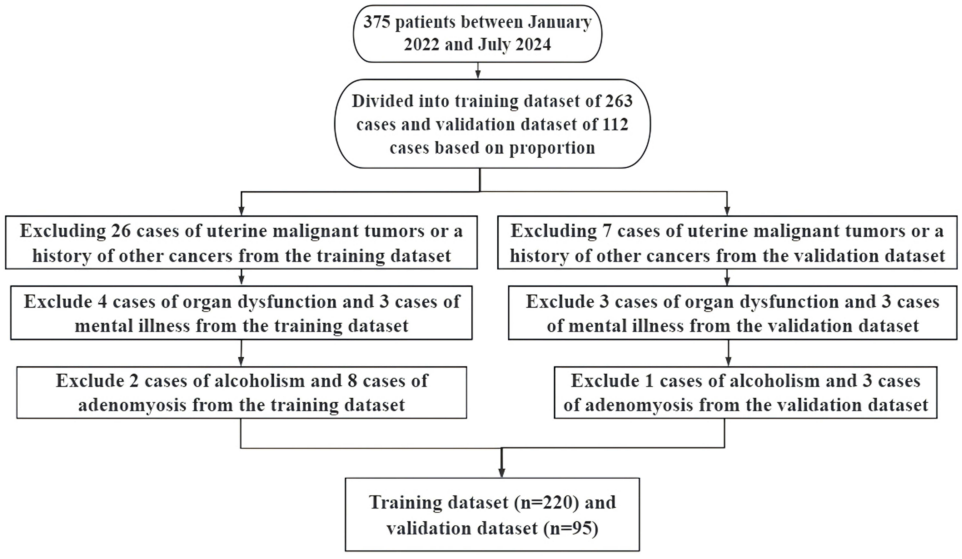

Figure 1 Case collection process diagram.

Statistical Analysis

All statistical analyses were performed using SPSS version 25.0. Categorical variables were presented as n (%) and continuous variables (after testing for normal distribution) as mean ± standard deviation ($\bar{x} \pm s$). Comparisons between groups were made using the χ^2-test for categorical variables and the independent samples *t*-test for continuous variables. All variables with $P < 0.05$ in the univariate analysis showed no multicollinearity after collinearity analysis. Multivariate logistic regression analysis was used to identify predictors of chronic pain following uterine fibroid hysterectomy. A nomogram model was constructed using R software version 4.3.3 to predict the risk of chronic pain after uterine fibroid hysterectomy. Internal validation was performed using the bootstrap method. Calibration curves were used to compare the predicted probabilities with actual outcomes. Receiver operating characteristic (ROC) curves were plotted, and the area under the curve (AUC) was calculated to evaluate the discriminative ability of the nomogram. Clinical decision curve analysis was performed to assess the net benefit of the nomogram. A p-value of <0.05 was considered statistically significant.

Results

Comparison of Clinical Data Between the Training and Validation Datasets

There were no statistically significant differences between the training and validation datasets in terms of age, BMI, marital status, education level, preoperative pain, menopause status, hypertension, diabetes, anesthesia duration, type of anesthesia, postoperative analgesia, history of abdominal/pelvic surgery, number of pregnancies, number of deliveries, endometriosis, surgical method, anxiety, PCS score, adnexal removal, surgical duration, intraoperative blood loss, postoperative infection, postoperative nausea and vomiting, and uterine weight ($P > 0.05$). See Table 1.

Table 1 Comparison of Clinical Data Between Training Dataset and Validation Dataset [n (%)/ ($\bar{x} \pm s$)]

Index	Training Dataset (n=220)	Validation Dataset (n=95)	χ^2/*t*	*P*
Age (years)	47.81±7.95	48.26±8.12	0.458	0.647
BMI (kg/m^2)	22.92±2.96	22.76±3.08	0.435	0.664
Married	185 (84.09)	84 (88.42)	0.998	0.318
Education			2.325	0.127
High school and above	158 (71.82)	76 (80.00)		
Junior high school and below	62 (28.18)	19 (20.00)		
Preoperative pain	74 (33.64)	22 (23.16)	3.438	0.064
Menopause	48 (21.82)	25 (26.32)	0.754	0.385
Hypertension	59 (26.82)	18 (18.95)	2.226	0.136
Diabetes	19 (8.64)	13 (13.68)	1.852	0.174
Anesthesia duration (min)	118.23±26.10	113.42±24.98	1.520	0.129
Type of anesthesia			1.035	0.309
General anesthesia	177 (80.45)	81 (85.26)		
Intrathecal Block	43 (19.55)	14 (14.74)		
Postoperative analgesia			0.450	0.502
Yes	166 (75.45)	75 (78.95)		
No	54 (24.55)	20 (21.05)		
History of abdominal or pelvic surgery	19 (8.64)	15 (15.79)	3.526	0.060
Pregnancy times (times)	2.37±0.85	2.26±0.75	1.091	0.276
Delivery times (times)	1.85±0.52	1.88±0.56	0.459	0.647
Endometriosis	13 (5.91)	11 (11.58)	3.030	0.082

(*Continued*)

https://doi.org/10.2147/JPR.S523744

Table 1 (Continued).

Index	Training Dataset (n=220)	Validation Dataset (n=95)	χ^2/t	*P*
Operation			0.924	0.336
Laparoscopic	194 (88.18)	80 (84.21)		
Open	26 (11.82)	15 (15.79)		
Anxiety	42 (19.09)	16 (16.84)	0.223	0.636
PCS score (Points)	18.61±5.65	19.27±5.84	0.942	0.347
Adnexectomy	37 (16.82)	22 (23.16)	1.752	0.186
Operative time (min)	111.33±22.85	108.34±26.46	1.015	0.311
Intraoperative bleeding volume (mL)	24.31±4.96	23.75±3.68	0.989	0.324
Postoperative infection	22 (10.00)	16 (16.84)	2.928	0.087
Postoperative nausea and vomiting	56 (25.45)	18 (18.95)	1.563	0.211

Univariate Analysis of Chronic Pain After Uterine Fibroid Hysterectomy in the Training Dataset

There were no statistically significant differences between the non-chronic pain group and the chronic pain group in terms of age, BMI, marital status, education level, menopause status, hypertension, diabetes, anesthesia duration, type of anesthesia, postoperative analgesia, number of pregnancies, number of deliveries, surgical method, adnexal removal, surgical duration, intraoperative blood loss, postoperative infection, postoperative nausea and vomiting, and uterine weight ($P > 0.05$). However, compared with the non-chronic pain group, the chronic pain group had significantly higher levels of preoperative pain, history of abdominal/pelvic surgery, endometriosis, anxiety, and PCS scores ($P < 0.05$). See Table 2.

Table 2 Univariate Analysis of Chronic Pain After Hysterectomy for Uterine Fibroids in the Training Dataset [n (%)/ ($\bar{x} \pm s$)]

Index	Non Chronic Pain Group (n=164)	Chronic Pain Group (n=56)	χ^2/t	*P*
Age (years)	47.36±8.02	49.13±7.85	1.434	0.153
BMI (kg/m^2)	22.98±3.02	22.75±2.94	0.495	0.621
Married	136 (82.93)	49 (87.50)	0.653	0.419
Education			1.226	0.268
High school and above	121 (73.78)	37 (66.07)		
Junior high school and below	43 (26.22)	19 (33.93)		
Preoperative pain	42 (25.61)	32 (57.14)	18.595	<0.001
Menopause	35 (21.34)	13 (23.21)	0.086	0.770
Hypertension	41 (25.00)	18 (32.14)	1.085	0.298
Diabetes	12 (7.32)	7 (12.50)	0.840	0.359
Anesthesia duration (min)	119.45±24.56	121.64±25.18	0.572	0.568
Type of anesthesia			0.136	0.712
General anesthesia	131 (79.88)	46 (82.14)		
Intrathecal Block	33 (20.12)	10 (17.86)		
Postoperative analgesia			0.975	0.323
Yes	121 (73.78)	45 (80.36)		
No	43 (26.22)	11 (19.64)		
History of abdominal or pelvic surgery	7 (4.27)	12 (21.43)	15.580	<0.001
Pregnancy times (times)	2.35±0.80	2.43±0.91	0.623	0.534

(*Continued*)

Table 2 (Continued).

Index	Non Chronic Pain Group (n=164)	Chronic Pain Group (n=56)	χ^2/t	P
Delivery times (times)	1.87±0.56	1.79±0.45	0.967	0.334
Endometriosis	3 (1.83)	10 (17.86)	16.513	<0.001
Operation			0.439	0.508
Laparoscopic	146 (89.02)	48 (85.71)		
Open	18 (10.98)	8 (14.29)		
Anxiety	20 (12.20)	22 (39.29)	19.835	<0.001
PCS score (Points)	17.05±5.15	23.18±6.30	7.250	<0.001
Adnexectomy	25 (15.24)	12 (21.43)	1.141	0.285
Operative time (min)	112.58±20.75	116.45±19.09	1.229	0.220
Intraoperative bleeding volume (mL)	24.02±4.71	25.15±5.69	1.832	0.068
Postoperative infection	15 (9.15)	7 (12.50)	0.522	0.470
Postoperative nausea and vomiting	37 (22.56)	19 (33.93)	2.843	0.092

Identification of Predictive Factors for Chronic Pain After Uterine Fibroid Hysterectomy

Based on the univariate analysis of the training dataset, the following factors were included in the multivariate logistic regression analysis: preoperative pain, history of abdominal/pelvic surgery, endometriosis, anxiety, and PCS score. In the regression analysis, the dependent variable was the occurrence of chronic pain, and the variable value assignments are shown in Table 3. The results indicated that preoperative pain, history of abdominal/pelvic surgery, endometriosis, anxiety, and higher PCS scores were independent risk factors for chronic pain following uterine fibroid hysterectomy ($P < 0.05$). The analysis results are shown in Table 4.

Table 3 Logistic Regression Analysis Variable Assignment Table

Influence Factor	Assignment
Preoperative pain	Yes=1, No=0
History of abdominal or pelvic surgery	Yes=1, No=0
Endometriosis	Yes=1, No=0
Anxiety	Yes=1, No=0
PCS score	Continuous variable
Dependent variable	Chronic pain=1, Non chronic pain=0

Table 4 Logistic Regression Analysis of Factors Related to Chronic Pain After Hysterectomy for Uterine Fibroids

Influence Factor	β	SE	Wald χ^2	OR	95% CI	P
Preoperative pain	0.986	0.385	6.568	2.681	1.261~5.701	0.010
History of abdominal or pelvic surgery	1.758	0.611	8.274	5.799	1.751~19.206	0.004
Endometriosis	2.628	0.780	11.346	13.848	3.001~13.905	0.001
Anxiety	1.139	0.444	6.575	3.125	1.308~7.465	0.010
PCS score	0.157	0.037	18.245	1.170	1.089~1.258	<0.001
Constant	−5.254	0.845	38.691	0.005	–	<0.001

https://doi.org/10.2147/JPR.S523744

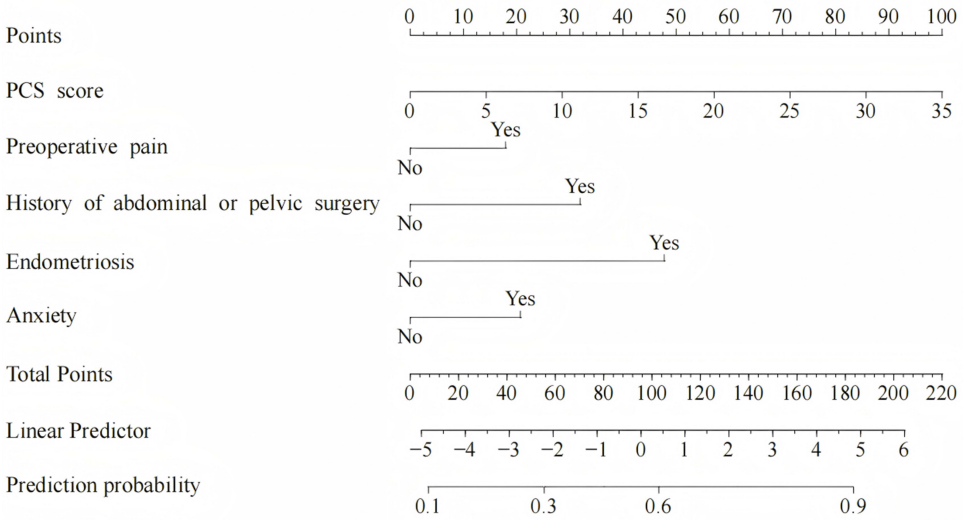

Figure 2 Nomogram model.

Nomogram Model Construction

Based on the multivariate results from the logistic regression analysis, a nomogram was constructed to predict the likelihood of chronic pain following uterine fibroid hysterectomy. See Figure 2. Each risk factor (preoperative pain, history of abdominal/pelvic surgery, endometriosis, anxiety, and PCS score) was assigned a corresponding score. The total score was calculated by summing the individual scores, which were then plotted on the total score scale. A vertical line was drawn down from the total score point to determine the probability of developing chronic pain.

Calibration Curve and ROC Curve Validation of the Nomogram Model in the Training and Validation Datasets

The nomogram prediction model demonstrated high predictive efficacy in both the training and validation datasets. Calibration curves for both datasets showed good consistency and calibration (Figure 3A and B). The Hosmer-Lemeshow test results were χ^2 = 1.654, 3.181, P = 0.990, 0.922. The area under the ROC curve (AUC) was 0.841 (95% CI: 0.781–0.900) in the training dataset and 0.825 (95% CI: 0.762–0.887) in the validation dataset (Figure 3C and D).

Clinical Decision Curve Analysis of the Nomogram Model

The clinical decision curve analysis showed that, compared with the "All treatment" (All line) and "No treatment" (None line) strategies, the decisions based on the nomogram model provided a higher net benefit within the prediction probability threshold range of 0.08 to 0.75 for patients undergoing uterine fibroid hysterectomy. See Figure 4.

Discussion

In this study, the incidence of chronic pain following hysterectomy was 25.45%, lower than the results of an earlier study by Benlolo et al.[11] Additionally, preoperative pain, history of abdominal/pelvic surgery, endometriosis, anxiety, and PCS scores were identified as factors influencing the occurrence of chronic pain after uterine fibroid hysterectomy in this study. After constructing a nomogram based on the independent risk factors identified in the multivariate analysis, it was found that the nomogram demonstrated good predictive performance, with high calibration, discrimination, and clinical net benefit.

As-Sanie et al[12] found that each one-point increase in preoperative localized pain raises the likelihood of persistent pelvic pain six months after hysterectomy by 27%. Similarly, in this study, preoperative pain was identified as a risk factor for chronic pain following hysterectomy, with preoperative pain contributing an additional 17.92 points to the nomogram. Preoperative localized pain (or central sensitization) results from changes in the central nervous system's

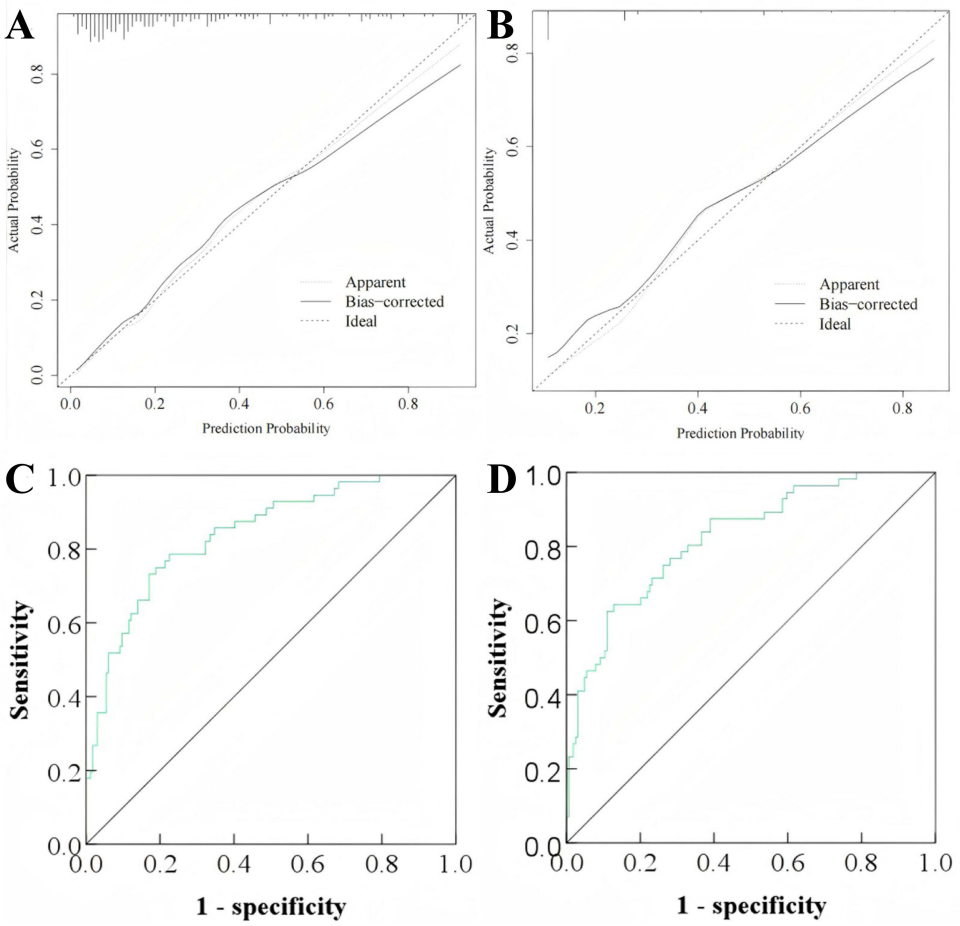

Figure 3 Calibration curve and ROC curve of nomogram model. (**A**) Calibration curve in the training datasets; (**B**) Calibration curve in the validation datasets; (**C**) ROC curve of the training datasets; (**D**) ROC curve of the validation datasets.

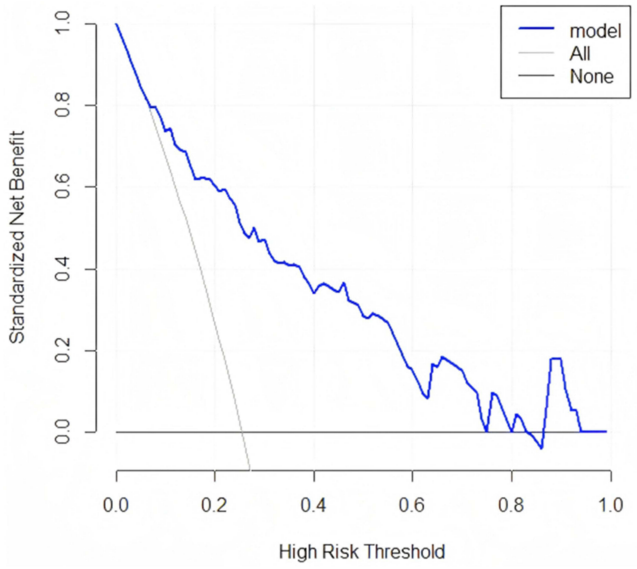

Figure 4 Clinical decision curve analysis of nomogram model.

https://doi.org/10.2147/JPR.S523744

pain processing and has been shown to be closely related to pain severity and disability, as well as predictive of both acute and chronic postoperative pain.[13] These changes in the central nervous system, caused by preoperative localized pain, cannot be easily resolved through hysterectomy, leading to persistent postoperative pain. Tan et al[14] also found that a history of abdominal/pelvic surgery could predict pain four months after hysterectomy. Consistent with prior reports, this study identified a history of abdominal/pelvic surgery as a contributing factor to chronic pain after hysterectomy, with this factor adding 32.48 points to the nomogram. It is suggested that a history of abdominal/pelvic surgery, particularly the increasingly common cesarean section history, may lead to postoperative adhesions between the bladder and cervix, making the separation of these structures during hysterectomy more complex. In this study, endometriosis contributed 46.82 points to the constructed nomogram model. Endometriosis is an estrogen-dependent inflammatory disease that affects women of reproductive age. Its pain pathophysiology involves both sensory and somatic pain mechanisms.[15] Women with endometriosis are more sensitive to pain, and this abnormal pain perception results from the chronic inflammatory process of the disease. Over time, this inflammatory process leads to weakened pain inhibition and amplified sensory input, which in turn results in central sensitization. As a result, women with endometriosis are more likely to experience chronic pain after hysterectomy.[16] However, since the number of patients with combined endometriosis in this study is relatively small, the results of the multivariate analysis may have some bias and therefore require further validation in future studies. The uterus is a uniquely significant organ, performing essential physiological functions such as pregnancy and childbirth, and plays an important role in maintaining a woman's self-esteem. Some women may feel that losing their uterus equates to losing their femininity, as perceived by other societal groups.[17] Therefore, hysterectomy can have a profound impact on a woman's psychological state. Xie et al[18] found that psychological interventions could effectively reduce sexual dysfunction, pelvic organ prolapse, and chronic pelvic pain in patients after hysterectomy. The findings of this study on the impact of anxiety on postoperative chronic pain are consistent with the aforementioned research. Pain catastrophizing is defined as a negative cognitive and emotional response to anticipated or actual pain, and is a multidimensional concept that includes elements such as rumination, magnification, and helplessness.[19] The presence of catastrophizing is associated with various pain conditions, including endometriosis, neuropathic pain, and the development of postoperative pain, with the PCS being used to assess catastrophizing.[20] Chen et al[21] found that the higher the PCS score, the more severe the pain catastrophizing, and the higher the risk of chronic pain following hysterectomy. The findings of this study are generally consistent with those of the previous research. In this study, for each 1-point increase in the PCS score, the incidence of chronic pain post-hysterectomy increased by 17% (OR = 1.170). In the nomogram, for each 5-point increase in the PCS score, the nomogram score increased by 14.76 points. This study validated the predictive efficacy of the nomogram using ROC curves, calibration curves, and clinical decision curve analysis, and found that it demonstrated high predictive effectiveness. The AUC in both the training and validation datasets was 0.841 and 0.825, respectively, and the actual outcomes were closely aligned with the predicted outcomes. Decisions based on the nomogram model provided a higher net benefit within a broad range of prediction probability thresholds for patients undergoing uterine fibroid hysterectomy.

This study is a retrospective investigation exploring the factors influencing chronic pain after uterine fibroid hysterectomy. The advantages of this study include the use of clinically validated postoperative pain measurement tools, the incorporation of both intraoperative and postoperative outcomes, and a 4-month follow-up with a relatively high retention rate of participants. Despite these advantages, the study still has several limitations: Firstly, like all previous retrospective cross-sectional studies, this study is unable to establish causal relationships. Second, although the retention rate was high, the results may still be biased due to the exclusion of some patients. Furthermore, the data in this study were derived from a single large academic medical center, which may introduce selection bias as well as variations in surgical techniques and experience, therebylimiting the generalizability of the findings to other populations. For example, the incidence of chronic pain after hysterectomy in this study was lower than in earlier research, which may be attributed to the fact that many of the hysterectomies at this institution were performed by a group of surgeons extensively trained in the multimodal management of uterine fibroids. Therefore, in the future, multicenter prospective studies will be conducted to validate the external applicability and reliability of the model.

In summary, the nomogram model based on independent risk factors demonstrated high predictive efficacy and can effectively predict the risk of chronic pain following uterine fibroid hysterectomy. This model is useful for developing more effective and personalized treatment plans in the future. Example of nomogram application: For a patient undergoing hysterectomy for uterine fibroids, with a PCS score of 15, a history of preoperative pain, no history of abdominal or pelvic surgery, presence of endometriosis, and no anxiety, the total score is 42.56 + 17.81 + 0 + 46.93 + 0 = 107.30 points. Drawing a vertical line downward from this total score to the predicted probability axis corresponds to a value of 0.62, indicating a 62% risk of developing postoperative chronic pain.

Data Sharing Statement

The datasets in this study are available from the corresponding author.

Research Involving Human Participants

The study was in accordance with Meizhou People's Hospital Ethics Review Board (No.2025-C-13) and with the 1964 Helsinki Declaration. Written informed consent to participate in this study was provided by the participants.

Funding

There is no funding to report.

Disclosure

The authors declared no conflicts of interest in this work.

References

1. Dolmans -M-M, Petraglia F, Catherino WH, et al. Pathogenesis of uterine fibroids: current understanding and future directions. *Fertil Steril*. 2024;122(1):6–11. doi:10.1016/j.fertnstert.2024.02.048
2. Harris HR, Petrick JL, Rosenberg L. The epidemiology of uterine fibroids: where do we go from here? *Fertil Steril*. 2022;117(4):841–842. doi:10.1016/j.fertnstert.2022.01.037
3. Duyar S, Tsai S, Milad MP, et al. Attitudes and beliefs about hysterectomy in patients with uterine fibroids. *J Minim Invasive Gynecol*. 2023;30(10):797–804. doi:10.1016/j.jmig.2023.05.012
4. Ahmad A, Kumar M, Bhoi NR, et al. Diagnosis and management of uterine fibroids: current trends and future strategies. *J Basic Clin Physiol Pharmacol*. 2023;34(3):291–310. doi:10.1515/jbcpp-2022-0219
5. Treede R-D, Rief W, Barke A, et al. Chronic pain as a symptom or a disease: the IASP classification of chronic pain for the International Classification of Diseases (ICD-11). *Pain*. 2019;160(1):19–27. doi:10.1097/j.pain.0000000000001384
6. Zhang L, Hao L-J, Hou X-L, et al. Preoperative anxiety and postoperative pain in patients with laparoscopic hysterectomy. *Front Psychol*. 2021;12:727250. doi:10.3389/fpsyg.2021.727250
7. Yeo J, Sia AT, Sultana R, et al. Analysis of SCN9A gene variants for acute and chronic postoperative pain and morphine consumption after total hysterectomy. *Pain Med*. 2020;21(11):2642–2649. doi:10.1093/pm/pnaa109
8. Goudman L, Pilitsis JG, Billet B, et al. The level of agreement between the numerical rating scale and visual analogue scale for assessing pain intensity in adults with chronic pain. *Anaesthesia*. 2024;79(2):128–138. doi:10.1111/anae.16151
9. Lee H-J, Cho Y, Joo H, et al. Comparative study of verbal rating scale and numerical rating scale to assess postoperative pain intensity in the post anesthesia care unit: a prospective observational cohort study. *Medicine*. 2021;100(6):e24314. doi:10.1097/MD.0000000000024314
10. Makary MS, Zane K, Hwang GL, et al. ACR appropriateness criteria® management of uterine fibroids: 2023 update. *J Am Coll Radiol*. 2024;21(6S):S203–S18. doi:10.1016/j.jacr.2024.02.022
11. Benlolo S, Hanlon JG, Shirreff L, et al. Predictors of persistent postsurgical pain after hysterectomy-a prospective cohort study. *J Minim Invasive Gynecol*. 2021;28(12):2036–2046.e1. doi:10.1016/j.jmig.2021.05.017
12. As-Sanie S, Till SR, Schrepf AD, et al. Incidence and predictors of persistent pelvic pain following hysterectomy in women with chronic pelvic pain. *Am J Obstet Gynecol*. 2021;225(5):568.e1–568.e11. doi:10.1016/j.ajog.2021.08.038
13. Basem JI, Haffey PR. Novel therapies for centralized pain: a brief review. *Curr Pain Headache Rep*. 2022;26(11):805–811. doi:10.1007/s11916-022-01085-z
14. Tan HS, Sultana R, Han N-LR, et al. The association between preoperative pain catastrophizing and chronic pain after hysterectomy - secondary analysis of a prospective cohort study. *J Pain Res*. 2020;13:2151–2162. doi:10.2147/JPR.S255336
15. Abril-Coello R, Correyero-León M, Ceballos-Laita L, et al. Benefits of physical therapy in improving quality of life and pain associated with endometriosis: a systematic review and meta-analysis. *Int J Gynaecol Obstet*. 2023;162(1):233–243. doi:10.1002/ijgo.14645
16. Yagur Y, Engel O, Burstein R, et al. Pain after laparoscopic endometriosis-specific vs. hysterectomy surgeries: a retrospective cohort analysis. *PLoS One*. 2024;19(10):e0301074. doi:10.1371/journal.pone.0301074
17. Ahdi Derav B, Narimani M, Abolghasemi A, et al. Effectiveness of group cognitive-behavioral therapy for managing anxiety and depression in women following hysterectomy for uterine cancer. *Asian Pac J Cancer Prev*. 2023;24(12):4237–4242. doi:10.31557/APJCP.2023.24.12.4237

18. Xie M, Huang X, Zhao S, et al. Effect of psychological intervention on pelvic floor function and psychological outcomes after hysterectomy. *Front Med*. 2022;9:878815. doi:10.3389/fmed.2022.878815
19. Petrini L, Arendt-Nielsen L. Pain catastrophizing in the elderly: an experimental pain study. *Scand J Pain*. 2024;24(1). doi:10.1515/sjpain-2023-0035
20. Akbas A, Dagmura H, Daldal E, et al. Association between shoulder range of motion and pain catastrophizing scale in breast cancer patients after surgery. *Breast Care*. 2021;16(1):66–71. doi:10.1159/000506922
21. Chen Y, Ju P, Xia Q, et al. Potential role of pain catastrophic thinking in comorbidity patients of depression and chronic pain. *Front Psychiatry*. 2022;13:839173. doi:10.3389/fpsyt.2022.839173