

Early contact with anesthesiologists at anesthesiology consulting clinic and preoperative anxiety remission in the parturients scheduled for cesarean section: A case control study

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Abstract

Background: Surgery and anesthesia can be traumatic for parturients scheduled for cesarean section, leading to anxiety, and anxiety may accumulate during preoperative period. We conducted this study to determine if early contact with anesthesiologists could contribute to relieving preoperative anxiety of parturients scheduled for cesarean section.

Method: This is a single center case control study. From June 1, 2021, to August 30, 2021, parturients scheduled for cesarean section surgery with intraspinal anesthesia, ASA ~ , without preoperative psychiatric disorder. The State Anxiety Inventory was used to estimate the participants' preoperative anxiety symptoms one day preoperative. Participants who sought to communicate with anesthesiologists at the anesthesiology consulting clinic were categorized as having early contact with anesthesiologists. Multiple logistic regression analysis was used to explore the association between early contact with anesthetists and preoperative anxiety symptoms. The odds ratio (95% confidence interval [CI]) of early contact with anesthesiologists in relation to the preoperative anxiety of the parturients (measured by State Anxiety Inventory). Multiple linear regression and stratified analysis using the Edinburgh Postnatal Depression Scale (EPDS) score were used for sensitivity analysis.

Results: A total of 226 participants completed the study; 83 (36.7%) experienced moderate-to-severe preoperative anxiety, with 45.37 ± 5.31 State Anxiety Inventory points. Early contact with anesthesiologists was associated with a lower risk of moderate-to-severe preoperative anxiety (odds ratio = 0.23; 95% confidence interval: 0.10, 0.52) and lower anxiety score ($\beta = -4.18$, 95% CI: -6.32, -2.05). The results of the stratified analysis by depression level (measured by Edinburgh Postnatal Depression Scale) showed that this association was also statistically significant among parturients with lower (depression score <10) and higher (depression score ≥ 10) depression levels.

Conclusion: Early contact with anesthesiologists is associated with lower risk of preoperative anxiety for parturients scheduled for cesarean section. It suggested that anesthesia consulting clinic is clinical significant and could routinely serve parturients.

Registration: This study was registered in chictr.org.cn, on 28/05/2021; identifier ChiCTR2100046798)

1 Introduction

One in five pregnant or postpartum women has a diagnosed mood or anxiety disorder, which is the most common mental health illness during the perinatal period.^{1,2} Preoperative anxiety activates neuroendocrine systems, resulting in the impairment of uterine function,³ increased postoperative acute pain^{4,5} and increased analgesic requirement.^{6,7,8} Moreover, anxiety decreases the parturients' compliance, influences fetal development,⁹ and increases the risk of postpartum depression and general anesthesia.^{2,10-12}

The causes of preoperative anxiety is multifactorial. Ramsay first defined preoperative anxiety as an unpleasant state of uneasiness or tension secondary to a patient being concerned about a disease, hospitalization, anesthesia, surgery, or the unknown.⁶ Patients' anxiety may result from lacking of information during the preoperative period and can be reduced by a sense of security, being well informed, and having positive expectations.¹³ In contrast to doctors in the patient ward, anesthesiologists generally come in contact with patients only 1 day before surgery in China. Parturients know little about intraspinal anesthesia and usually receive misleading information, which aggravates excessive worry.^{4, 6}

Scheduled cesarean sections surgery are always arranged several weeks before operation, so anxiety may accumulate over time before the operation. However, current studies mostly conducted preoperative education 1 day before surgery without considering negative moods accumulation.^{10, 15-20} At present, there is no clear evidence that points to an ideal methodology nor proper time to communicate with anesthesiologists.¹⁴ How effective the methods might be is also controversial. Existing antenatal anesthesia consulting clinics generally aim at manage high risk parturients, those parturients without severe complications do not routinely build early contact with anesthesiologists.

In this study, we aimed to explore whether early contact with anesthesiologists at an anesthesiology consulting clinic could relieve preoperative anxiety in parturients scheduled for cesarean section. We assumed that early contact with anesthesiologists can relieve preoperative anxiety. The reporting was guided by the STROBE Statement guidelines for reporting case-control studies (corresponding checklist is on supplemental file 1).

2 Materials And Methods

2.1 Participants

Ethical approval

for this study (36 Sanhao Street, Heping District, Shenyang, Liaoning Province, 110004, China) was provided by the Institutional Research Ethics Committee of the affiliated Shengjing Hospital of China Medical University (Chairperson Prof Yuhong Zhao) on 19 January 2021.

This study was conducted according to the guidelines of the Declaration of Helsinki (registered in chictr.org.cn, on May 28 2021; identifier ChiCTR2100046798). Written informed consent was obtained from all the participants in the study. Parturients scheduled for cesarean section surgery with combined spinal-epidural anesthesia at Shengjing Hospital were recruited.

From June 1, 2021, to August 30, 2021, 300 parturients were assessed for eligibility. The exclusion criteria were as follows: diagnosis of psychiatric or neurologic disorders, severe obstetric disorders or critical systemic disease, newborns hospitalized in the NICU or with congenital malformation, delivered outside working hours or on emergency, contraindications to spinal anesthesia, birth of premature infants (< 37

weeks), and inability to complete the questionnaires without assistance. We also excluded participants with missing information considered to be significant confounding factors. (Fig. 1)

2.2 Definition of early contact with anesthesiologists

Participants who sought to communicate with anesthesiologists at the anesthesiology consulting clinic were defined as early contact with anesthesiologists. We searched in the patient-list of anesthesiology consulting clinic and divided participants into expose and unexposed group in order to avoid recalling bias.

Antenatal anesthesiology consulting clinic was increasingly widespread in the world.^{14,21-23} In this study, parturients of exposed group generally built early contact with anesthesiologists 3 ~ 6 weeks before operation date. Parturients visited the anesthesiology consulting clinic on their own will in order to get more information about anesthesia and corresponding preoperative evaluation. Routine preoperative contact with parturients at the anesthesiology consulting clinic included assessing the risk of anesthesia and providing information about the general process of spinal anesthesia, method of postoperative analgesia, and achievable effect. In addition, parturients could ask any other questions. The entire process lasted for approximately 10 minutes.

2.3 Definition of preoperative anxiety

The State-Trait Anxiety Inventory (STAI)²⁴ consists of State Anxiety Inventory (SAI) and the Trait Anxiety Inventory, SAI is used to quantify current anxiety levels. The self-assessment forms require respondents to rate their agreement with each statement using a scale from 1 to 4 (representing not at all, somewhat, moderately, and very much, respectively). Based on previous studies, SAI < 40, ≥ 40 and < 55, and ≥ 55 points are defined as slight, moderate, and severe preoperative anxiety, respectively.²⁵ SAI ≥ 40 points was defined as preoperative anxiety, which was the major outcome of this study.

2.4 Information collection

Parturients were usually hospitalized 1–2 days before the scheduled operation date. A trained research assistant collected preoperative paper questionnaires 1 days before the scheduled surgery day. Considering that the state of anxiety may vary at different times of the day and be affected by medical treatment, such as enema and routine preoperative education, preoperative anxiety, together with other covariates, was measured at a consistent period from 16:00 to 17:30 before the routine visits of the operating anesthesiologists in order to control information bias.

Using a paper questionnaire and the hospital information system, basic information was collected as follows: age (> 35 years or not), household income (\geq CN¥10000 or not), body mass index (≥ 30 kg/m² or not), education level (≥ 12 years or not), medical insurance (with or without), living address (within or outside Shenyang), occupation (medical worker or not), obstetric-related complications (with or without, including placenta previa, oligoamnios, premature abruption of the fetal membrane, anemia, abnormal fetal position, puerperal infection, and nuchal cord), hypertension (with or without, defined as pregnancy-

induced hypertension and prepregnancy hypertension), diabetes (with or without, including impaired glucose tolerance and gestational diabetes mellitus), scheduling for other gynecology surgery except for cesarean section at the same time (yes or no, including the excision of pelvic focus, tubal ligation, and other surgery), surgical history (yes or no), planned or unplanned pregnancy, parity (primiparous or multiparous), number of fetuses (single or multiple pregnancy), pregnancy via assisted reproductive technology (yes or no), and negative labor history (with or without, including history of miscarriages and mid-trimester induction of labor due to fetal anomalies).

One day before the cesarean section, partner satisfaction was assessed using an 11-point Likert scale^{25,26} (range: 0 to 10, with higher scores indicating increased partner satisfaction). Social support was evaluated using the 10-item Social Support Rating Scale (SSRS), with higher scores indicating more social support (< 22 points, low level; 23–44 points, medium level; 45–66, high level of social support). The Edinburgh Postnatal Depression Scale (EPDS) was used to assess antenatal depression (range: 0–30, with higher scores indicating more severe depressive symptoms; the Chinese version has been validated, and a cut-off score of 9/10 was recommended for screening depression).²⁷ The fear of anesthesia was also assessed (yes or no).

One day after delivery, the most serious acute pain within 24 hours following operation was evaluated using the Numerical Rating Scale (NRS) (ranging from 0 to 10, with higher scores indicating increasing acute pain; 0 = no pain and 10 = extreme pain).²⁸ Overall satisfaction with anesthesia was assessed using an 11-point Likert scale (with higher scores indicating higher satisfaction; 0 = extremely dissatisfied and 10 = extremely satisfied). Postoperative nausea and vomiting were recorded and counted regardless of the frequency.

2.5 Statistical analysis

Approximately 40% of the parturients scheduled for cesarean section in our hospital experienced moderate-to-severe anxiety (SAI score \geq 40 points), and we set an odds ratio (OR) of 0.6 as essential. About one-third of the parturients hospitalized in the hospital attended the anesthesiology consulting clinic; thus, we calculated that a sample size of 210 patients was needed, with 90% power and a two-sided alpha of 0.05.

The participants' characteristics were described according to their anxiety status. Continuous variables were normally distributed and examined by variance analysis, and they are presented as mean \pm standard deviation. Categorical variables are presented as proportions (%) and were compared using Pearson's chi-square test.

We used multiple logistic regression models to estimate the odds ratios (ORs) (95% confidence interval [CI]) of early contact with anesthesiologists in relation to the preoperative anxiety of the parturients. Model 1 included demographic characteristics (age, education, medical worker status, household income). Model 2 involved additional adjustments for clinical information (parity, obstetric complications, negative pregnancy history, assisted reproductive technology, other operation and unplanned pregnancy).

Model 3 included further adjustments for sociocultural factors (SSRS and EPDS scores). Because partner satisfactory score and SSRS score are highly collinear, we did not include the former variable.

For sensitivity analysis, multiple linear regression was first used to explore the associations between early contact with anesthesiologists and preoperative anxiety by adjusting the covariates of models 1, 2, and 3. In addition, stratified analysis by EPDS score was conducted. We divided the participants into two subgroups (EPDS < 10 vs. EPDS \geq 10) and performed stratified analysis. Similar to the primary analysis, three regression analysis models and two regression methods were employed in the two subgroups.

Multiple logistic and multivariate linear regression analyses were conducted to assess the association between early contact with anesthetics and the secondary outcomes of this study, including fear of anesthesia, fear of postoperative pain, postoperative NRS score, and postoperative nausea and vomiting. There were adjustments for all the covariates in model 3.

All statistical tests were two-tailed, and statistical significance was set at $p < 0.05$. Statistical analyses were performed using SPSS (version 26.0; IBM, Armonk, NY, USA).

3 Results

3.1 Descriptive statistics

The characteristics of the included participants are presented in Table 1. All continuous variables were normally distributed and had equal variance. Of the 226 enrolled parturients, 83 (36.7%, case group) experienced moderate-to-severe anxiety, and 143 (63.3%, control group) experienced slight anxiety. The exposure rates of the case and control groups were 18.1% (15/83) and 37.8% (54/143), respectively, with a 19.7% difference ($P = 0.003$). Parturients with lower social support, worse partner relationships, and higher depressive scores were more likely to develop preoperative depression ($p = 0.003$, $p = 0.001$, and $p < 0.001$, respectively; Table 1).

Table 1. Basic characteristics of the participants according to preoperative anxiety status

Characteristics		Control group	Case group	<i>P</i>
		N = 143	N = 83	
Age ≥35 years	≥35 (%)	37 (25.9)	21 (25.3)	1.00
Household income	≥10000¥ (%) ^a	114 (79.7)	67 (80.7)	1.00
Body mass index ≥30 kg/m ²	≥30 (%)	38 (26.6)	25 (30.1)	0.65
Education	≥12 years (%)	129 (90.2)	73 (88.0)	0.66
Medical insurance	Yes (%)	139 (97.2)	78 (94.0)	0.29
Medical worker	Yes (%)	13 (9.1)	13 (15.7)	0.19
Local resident	Yes (%)	120 (83.9)	68 (81.9)	0.72
Hypertension	Yes (%)	15 (10.5)	6 (7.2)	0.48
Diabetes	Yes (%)	49 (34.3)	26 (31.3)	0.66
Obstetric complication	Yes (%)	32(61.5)	55(61.4)	0.55
Surgery history	Yes (%)	63 (44.1)	39 (47.0)	0.68
Unplanned pregnancy	Yes (%)	37 (25.9)	26 (31.3)	0.44
Parity	Primiparous (%)	106 (74.1)	53 (63.9)	0.13
Multiple pregnancy	Yes (%)	8 (5.6)	1 (1.2)	0.16
Gynecologic surgery	Yes (%)	22 (15.4)	18 (21.7)	0.28
Assisted reproduction	Yes (%)	18 (12.6)	7 (8.4)	0.39
Negative labor history	Yes (%)	24 (16.8)	11 (13.3)	0.57
SSRS score	≥45 points (%)	83 (58.0)	31 (37.3)	0.003
		45.1 ± 7.4	42.5 ± 7.5	0.01
EPDS score	≥10 points (%)	22 (15.4)	38 (45.8)	<0.001
		5.7 ± 3.6	9.6 ± 3.9	<0.001

Analysis of variance or chi-squared test. Categorical variables are presented as number (%) and continuous variables are presented as mean ± standard deviation.

^a Chinese Yuan

Abbreviations: BMI, body mass index; SSRS, Social Support Rating Scale; EPDS, Edinburgh Postnatal Depression Scale;

3.2 Association of early contact with anesthesiologists and preoperative anxiety

Multivariate-adjusted ORs for preoperative anxiety (Table 2) showed that early contact with anesthesiologists was associated with a lower risk of preoperative anxiety in parturients scheduled for cesarean section (OR = 0.23; 95 % CI: 0.10, 0.52, $P < 0.001$). Multiple logistic regression results (model 3) indicated that being a medical worker (OR = 4.41, 95% CI: 1.41, 13.8, $P = 0.11$) and higher EPDS score (per point increment in EPDS, OR = 1.39, 95% CI: 1.25, 1.55, $P < 0.001$) were risk factors for preoperative anxiety in parturients, while high social support level (OR = 0.33, 95% CI: 0.16, 0.67, $P = 0.002$) and primiparity (OR = 0.35, 95% CI: 0.15, 0.80, $P = 0.01$) were protective factors.

Table 2. Association between early contact with anesthesiologists and preoperative anxiety

	Logistic regression		Linear regression	
	OR (95% CI)	<i>P</i>	β (95% CI)	<i>P</i>
Crude	0.36 (0.19, 0.70)	0.002	-4.45 (-7.10, -1.81)	0.001
Model 1 ^a	0.34 (0.17, 0.66)	0.002	-4.54 (-7.23, -1.86)	0.001
Model 2 ^b	0.30 (0.15, 0.61)	0.001	-4.53 (-7.24, -1.82)	0.001
Model 3 ^c	0.23 (0.10, 0.52)	<0.001	-4.18 (-6.32, -2.05)	<0.001

Multiple logistic regression analysis and multiple linear regression analysis of the association between preoperative anxiety (risk of moderate to severe anxiety and SAI score respectively) and early contact with anesthesiologists.

^a Adjusted for age, educational level, medical worker status, household income; ^b further adjusted for parity, obstetric complications, negative pregnancy history, use of assisted reproductive technology, other gynecologic operation except for cesarean section, unplanned pregnancy, and twin birth based on model 1; ^c further adjusted for SSRS score (≥ 45 points) and EPDS score based on model 2.

Abbreviations: OR, odds ratio; CI, confidence interval; SSRS, Social Support Rating Scale; EPDS, Edinburgh Postnatal Depression Scales.

3.3 Sensitivity analysis

The results of the multiple linear regression are presented in Table 2. Early contact with anesthesiologists was associated with a significant decrease in the preoperative SAI score ($\beta = -4.18$; 95% CI: -6.32, -2.05, $P < 0.001$). The results of the stratified analysis by EPDS score are presented in Tables 3 and 4, and they indicated that early contact with anesthesiologists was associated with a lower risk of preoperative anxiety among parturients with higher EPDS (EPDS ≥ 10 , OR = 0.04, 95% CI: 0.01, 0.34, $P = 0.003$; $\beta =$

-6.19; 95% CI: -6.17, -1.35, $P = 0.02$) and lower depression level (OR = 0.34, 95% CI: 0.13, 0.90, $P = 0.03$; $\beta = -3.75$; 95% CI: -11.2, -1.17, $P = 0.002$) (Tables 3 and 4, respectively).

Table 3 Association between early contact with anesthesiologists and preoperative anxiety stratified analysis by EPDS score

	EPDS<10		EPDS≥10	
	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Crude	0.44 (0.19, 0.99)	0.05	0.23 (0.07, 0.76)	0.02
Model 1 ^a	0.38 (0.16, 0.89)	0.03	0.20 (0.05, 0.78)	0.02
Model 2 ^b	0.33 (0.13, 0.80)	0.01	0.08 (0.01, 0.51)	0.01
Model 3 ^c	0.34 (0.13, 0.90)	0.03	0.04 (0.01, 0.34)	0.003

Multivariate logistic regression analysis of the relationship between preoperative anxiety and early contact with anesthesiologists.

^a Adjusted for age, educational level, medical worker status, household income; ^b further adjusted for parity, obstetric complications, negative pregnancy history, use of assisted reproductive technology, other gynecologic operation except for cesarean section, unplanned pregnancy, and twin birth based on model 1; ^c further adjusted for SSRS score (≥45 points) and EPDS score based on model 2.

Abbreviation: SSRS, Social Support Rating Scale; EPDS, Edinburgh Postnatal Depression Scale

Table 4 Association between STAI score and early contact with anesthesiologists stratified by EPDS score

	EPDS <10		EPDS ≥10	
	β (95% CI)	<i>P</i> ^a	β (95% CI)	<i>P</i>
Crude	-4.05 (-9.57, 0.40)	0.004	-4.59 (-6.81, -1.28)	0.07
Model 1 ^a	-4.19 (-10.41, 0.74)	0.003	-4.84 (-6.98, -1.40)	0.09
Model 2 ^b	-4.49 (-11.30, 0.30)	0.002	-5.50 (-7.35, -1.64)	0.06
Model 3 ^c	-3.75 (-11.21, -1.17)	0.002	-6.19 (-6.17, -1.35)	0.02

Multivariate linear regression analysis of the association between preoperative anxiety and early contact with anesthesiologists.

^a Adjusted for age, educational level, medical worker status, household income; ^b further adjusted for parity, obstetric complications, negative pregnancy history, use of assisted reproductive technology, other

gynecologic operation except for cesarean section, unplanned pregnancy, and twin birth based on model 1; ^c further adjusted for SSRS score (≥ 45 points) and EPDS score based on model 2.

Abbreviation: SSRS, Social Support Rating Scale; EPDS, Edinburgh Postnatal Depression Scale

3.4 Secondary outcomes

Multivariate regression analysis showed that early contact with anesthesiologists was associated with lower risks of fear of anesthesia (OR = 0.38, 95% CI: 0.19, 0.76, $P = 0.01$), fear of postoperative pain (OR = 0.43, 95% CI: 0.23, 0.80, $P = 0.01$). The association between early contact with anesthesiologists and postoperative pain as well as postoperative nausea and vomiting was not statistically significant.

4 Discussion

4.1 Major finding

The results indicated that early contact with anesthesiologists at the antenatal anesthesiology consulting clinic was associated with lower preoperative anxiety in parturients scheduled for cesarean section surgery.

4.2 Relationship between early contact with anesthesiologists and preoperative anxiety

According to current evidence, many factors, such as low economic status,²⁹ pregnancy at older ages, low economic and educational status,¹⁷ recurrent pregnancy loss,³⁰ and insufficient social support,³¹ are risk factors for anxiety. Confounding factors that were previously reported or considered clinically significant, including demographic, clinical, and sociocultural information,¹⁵ were adjusted through multivariate logistic regression. The adjusted result was accordance with the unadjusted result. Sensitivity analysis results proved the stability of the results.

Previous studies have found the effectiveness of providing preoperative information to patient in relieving preoperative anxiety,^{10, 15-19} while, some show no effect.^{14, 20, 32} Egbert et al found that the visit of anesthesiologists was more effective than medication in reducing preoperative anxiety.¹⁰ Twersky et al concluded that patients did not benefit from reducing preoperative anxiety by visiting the anesthesiologist before the day of surgery.³⁰ These distinct results are probably related to operation type, sample size, demographic characteristics, and sociocultural factors. Different with this study, current studies mostly conducted preoperative education after parturients were hospitalized without considering consistent anxiety during the pregnancy period. Few studies have focused on the timing of building contact with anesthesiologists. Besides, most current studies measured anxiety of patients immediately after communicating with anesthesiologists or receiving related information, which may unconsciously guide patients to hide their anxiety mood and enlarge the effect of the intervention. In addition, current studies mostly focus on imparting knowledge through various indirect forms,¹⁶ including the We-chat

communication platform, educational video,^{15, 17} and virtual reality,^{18, 19} which are convenient but occasionally misleading.

Interestingly, previous evidence has indicated that patients who have more knowledge about anesthesia tend to be more concerned about the risks of anesthesia. Similarly, the multiple logistic regression results of this study revealed that parturients who were medical workers were more likely to experience preoperative anxiety, which suggests that knowledge alone may not relieve anxiety. In this study, except for conducting basic preoperative education and dispelling the misgiving of parturients for anesthesia, anesthesiologists earned trust from parturients and built anesthesiologist-patient relationships by face-to-face communication, which may concentrate to the remission of anxiety.

The results of the multiple logistic regression in this study show that higher preoperative depression (EPDS ≥ 10) is a risk factor for moderate-to-severe preoperative anxiety. Stratified analysis by EPDS score indicated that parturients with lower and higher depression levels both showed the association between early contact with anesthesiologists and lower anxiety levels. Purcell-Jones et al found that information videos were associated with lower post-explanation anxiety levels among patients with a higher degree of anxiety, but among patients with a low degree of anxiety, there appeared to be no additional benefit.³⁴ Similarly, by comparing the OR and regression coefficients of participants with different depression levels (Tables 3 and 4), we found that the association between early contact with anesthesiologists and remission of anxiety was stronger among parturients with higher depression levels. Consequently, it indicate parturients with negative moods to build early contact with anesthesiologists.

Considering the association between early contact with anesthesiologists and the secondary outcomes of this study, reports indicate that anxiety leads to increased severity of perceived pain and decreased pain tolerance^{4, 35} and pain aggravates anxiety. The link between mood disorders and acute pain has been proven to be significant, since the link is bidirectional,^{4, 5, 34, 35} and anxiety has been shown to be a mediator in the causal pathway between pain and disability. However, in this study, the association between early contact with anesthesiologists and remission of preoperative anxiety was not statistically significant after adjustments for covariates in model 3. We attribute this to the insufficient adjustment for additional factors associated with surgery, the application of oxytocin, and detailed analgesic use. Previous studies have argued that patient satisfaction is strongly influenced by patient-doctor communication variables.³⁷

4.3 Limitations

There were several limitations. First, although STAI was designed for the general population and widely applied to measure the anxiety state of parturients, there are some problems when using it to measure parturients,^{22, 39} as sleep and somatic symptoms may be mistaken for symptoms of anxiety. However, there is no commonly used screening tool specific to the perinatal period at present.²⁴ Anesthesiology consulting clinic of Shengjing hospital open up for all patients as everyday work, for ethic concerns, an observational study but not randomized controlled trail was conducted. Unavoidably, there were

unidentified covariates that may unevenly distribute between the two groups, such as self-respect and personality.⁴⁰ In addition, the baseline anxiety levels of both groups before early contact with anesthesiologists were not measured in this study; therefore, we could not compare and adjust the baseline anxiety levels of the two group.

4.4 Conclusion

We concluded that preoperative contact with anesthesiologists at the anesthesia consulting clinic is associated with lower level of preoperative anxiety for parturients scheduled for cesarean section, especially for those with higher depression level. In future studies, high quality studies that focus on “How, When, and who” should contact with anesthesiologists pre-operatively should be conducted. Future antenatal anesthesiology consulting clinic shall consider conduct early contact with parturients routinely in daily clinical practice.

Declarations

Ethics approval and consent to participate: This study was conducted according to the guidelines of the Declaration of Helsinki. Ethical approval for this study (36 Sanhao Street, Heping District, Shenyang, Liaoning Province, 110004, China) was provided by the Institutional Research Ethics Committee of the affiliated Shengjing Hospital of China Medical University (Chairperson Prof Yuhong Zhao) on 19 January 2021. Written informed consent was obtained from all the participants in the study.

Consent for publication: not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: Lanlan Zheng: Study design and drafting the article; Jun Li: Patient recruitment; Hang Xue: Revise the manuscript; Xinping Zhang: data collection and analysis; Fanshu Ni: data management; Hhehua Zhang: carefully revising the draft critically for important intellectual content; Qijun Wu: Study design; Ping Zhao: study design and revising the manuscript critically for important intellectual content.

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Figures

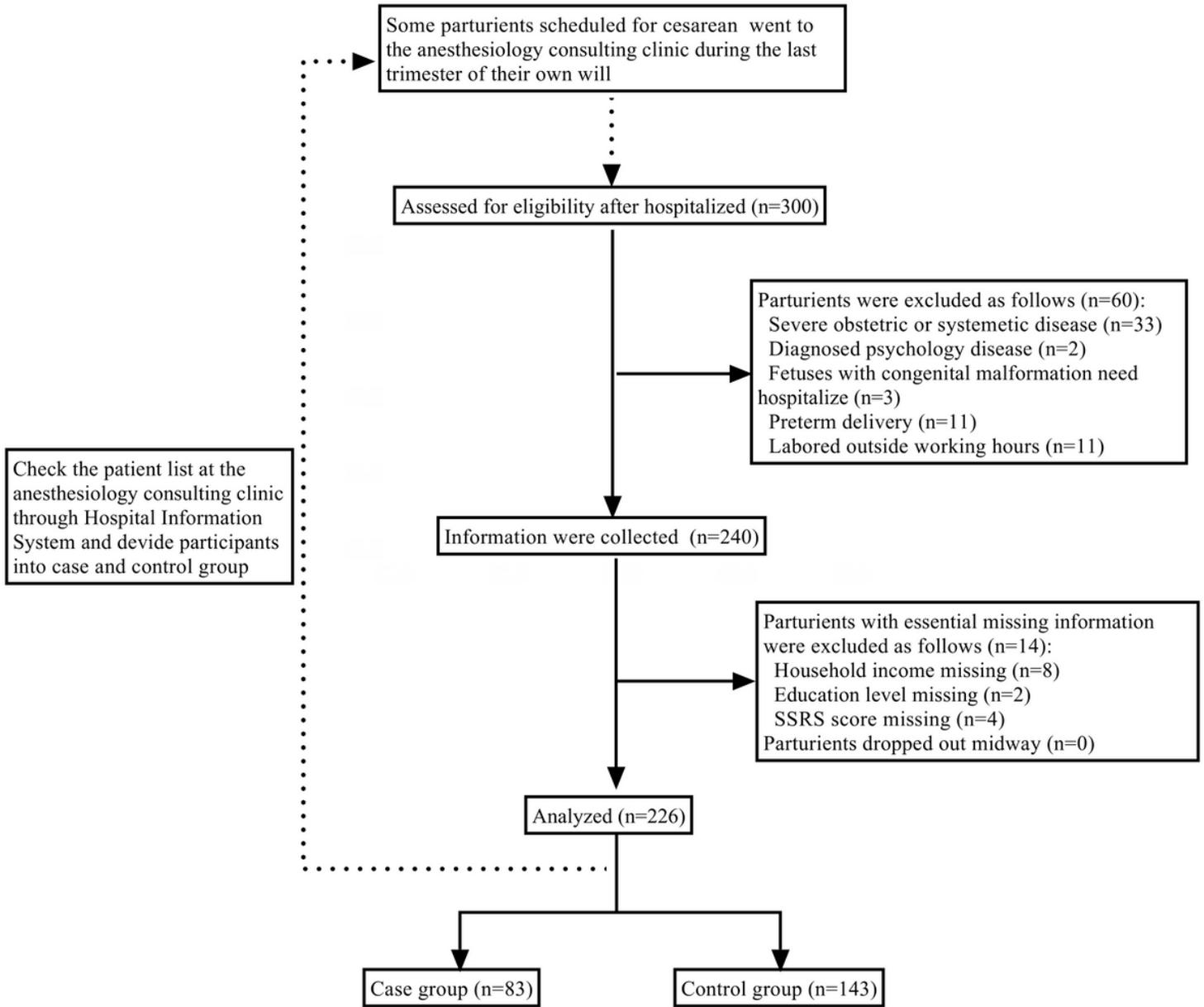


Figure 1

Flow diagram showing participants flow through each stage of this observational study.