

Maternal perceptions of explanations for emergency obstetric interventions: Effects of timing, personnel, and explanatory approaches on understanding and childbirth satisfaction

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Abstract

Inadequate explanations during emergency obstetric interventions increase the risk of maternal trauma and postpartum depression; however, acute clinical deterioration often impairs communication. This web-based cross-sectional survey investigated how explanation timing, personnel, and methods influence maternal subjective understanding and childbirth satisfaction in Japan. We analyzed 818 women who underwent a single emergency intrapartum intervention (labor augmentation, vacuum extraction, or emergency cesarean section) within the past 5 years using ordinal logistic regression and predicted-probability simulations. Only ~30% received explanations before labor onset. Combining written and verbal explanations during antenatal visits significantly increased the odds of adequate explanation (adjusted odds ratio [aOR] = 1.29; 95% confidence interval [CI]: 1.10–1.52) and subjective understanding (aOR = 1.21; 95% CI: 1.00–1.46). Predicted probabilities showed that multimodal antenatal communication increased adequate explanation rates from 66.80% to 83.61%. Physician–midwife collaboration yielded the highest understanding (91.08%; aOR = 4.11; 95% CI: 2.25–7.50), whereas physician-led explanations maximized childbirth satisfaction (84.85%; aOR = 2.53; 95% CI: 1.65–3.86). Improving communication requires a multi-stage approach rather than relying solely on acute intrapartum explanations. Proactive antenatal information combined with postpartum debriefing builds baseline understanding and fosters birth satisfaction through interprofessional collaboration and strong physician involvement.

Background

Informed consent (IC) prior to medical intervention is a legal, ethical, and regulatory requirement. However, in practice, the explanation and consent process in clinical settings has often become a formality, primarily aimed at ensuring legal immunity for healthcare personnel and maintaining complete records, rather than fulfilling the original purpose of supporting patient self-determination. This issue remains an international concern [1].

In emergency obstetric interventions during labor, rapid decision-making often prioritizes fetal health over explicit maternal consent owing to severe labor pain and time constraints, potentially undermining women's autonomy [2,3]. Consequently, such interventions, without sufficient explanation or psychological preparation, increase the risk of traumatic childbirth experiences and postpartum depression [4,5].

Skinner et al. reported that unexpected surgical deliveries, such as vacuum extraction or forceps deliveries, lead to negative childbirth perceptions; however, post-birth explanations can prevent trauma [6]. Emergency interventions also increase the risk of childbirth-related post-traumatic stress disorder (CB-PTSD) [7], potentially impairing mother-infant bonding and sensitivity [8,9]. The World Health Organization estimates that 13% of women worldwide experience postpartum mental illness, supporting the view that promoting a positive childbirth experience is a global priority [10,11]. To address these challenges, the American College of Obstetricians and Gynecologists strongly recommends the universal implementation of trauma-sensitive approaches to ensure patients' psychological safety [12]. Furthermore, the European Association of Perinatal Medicine, European Board and College of Obstetrics and Gynaecology, and European Midwives Association have issued a joint statement defining care with inadequate information as disrespectful care [13]. While postpartum debriefing as a means of communication to compensate for insufficient explanations and reduce trauma has been reported [14,15], the types of explanations that foster psychological acceptance and childbirth satisfaction among women have not yet been clarified [16].

To optimize the appropriateness of explanations and consent for emergency obstetric interventions, this study investigated how timing, personnel, and explanatory modalities influence mothers' subjective understanding and childbirth satisfaction. We focused on how women perceive and evaluate these explanations, examining the interconnected factors that ultimately contribute to maternal satisfaction.

Methods

Participants and recruitment

A web-based cross-sectional survey was conducted in March 2026 on an online research platform in Japan. The inclusion criteria were as follows: (1) women who had given birth to a singleton, full-term infant (at 37 weeks of gestation or later) in Japan within the past 5 years, and (2) those who had experienced emergency obstetric interventions: labor augmentation, vacuum extraction, or emergency cesarean section. Participants with multiple eligible births during the study period were instructed to respond based on their most recent experience. To ensure privacy and anonymity, no personally identifiable information, such as names or specific dates of birth, was requested. Data collection continued until the number of valid responses reached 1,000. Upon completion, participants received reward points through the research platform.

Study population

The analysis was limited to women who underwent only one of the three specified obstetric interventions (labor augmentation, vacuum extraction, or emergency cesarean section). Cases involving overlapping interventions were excluded to isolate the effects of each procedure on patient outcomes. Participants who received no explanation at any stage were excluded from the analysis of explanation adequacy and understanding.

Questionnaire development

An original questionnaire was developed by an interdisciplinary team of obstetricians, midwives, nurses, and medical law scholars, based on prior literature and clinical expertise, and administered to Japanese participants. The items presented in Additional file 1 are the English translations used for reporting. The questionnaire was organized into four key sections to evaluate the information provision process and its impact on maternal outcomes.

Participant characteristics and obstetric history

Demographic (e.g., age and residential area) and obstetric background data, including parity, were collected. This section specifically identified the most recent singleton full-term births that involved emergency obstetric interventions (labor augmentation, vacuum extraction, or emergency cesarean section).

Timing and personnel providing explanations

Participants were asked whether they received explanations about the specific intervention they underwent and the timing of such explanations (antenatal visits, after admission prior to labor onset, intrapartum as necessity arose, or postpartum). This section also identified the information provider (physician, midwife, or a combination of the two).

Adequacy, understanding, and childbirth satisfaction

As indicators of women's own perceptions, evaluations were conducted using Likert-scale questions focusing on whether the explanation was adequate (adequacy), the clarity of the content (understanding), and the level of satisfaction with the delivery (childbirth satisfaction).

Overall experience and qualitative feedback

The final section assessed overall childbirth satisfaction and included an open-ended, free-text question regarding the attitudes and communication of healthcare personnel (physicians and midwives) throughout the labor and delivery process.

Conventional content analysis was performed to analyze the qualitative data from the open-ended responses. Two board-certified obstetricians and gynecologists (MT and AF) independently and thoroughly reviewed the free-text comments to identify emergent codes and categorized them into themes based on the areas of maternal dissatisfaction. Any discrepancies in coding or categorization between the two evaluators were resolved through discussion until full consensus was reached, enhancing the objectivity and trustworthiness of the qualitative analysis.

Variable definitions and score creation

To evaluate the explanations provided by healthcare professionals, the following variables were created:

(1) Explanation method scores

The explanation methods at each of the four timings in the labor process (during antenatal visits, after admission prior to labor onset, intrapartum as necessity arose, or postpartum) were scored based on the intensity of the explanation intervention as follows: none (0 points), written only (1 point), verbal only (2 points), or verbal explanation with written documentation (3 points). In this analysis, these were treated as discrete variables with ordinal scores to evaluate the contribution of greater explanatory quality to the outcome [17,18].

(2) Explainer

Healthcare professionals who provided explanations were classified into three groups: physicians only, physicians and midwives, and no physician intervention (reference group).

(3) Obstetric intervention

To account for the clinical intensity of the delivery process, the type of intervention was entered into the model as an ordinal covariate and ranked from least to most invasive: (1) labor augmentation, (2) vacuum extraction, and (3) emergency cesarean section.

(4) Facility type

Clinics and hospitals were included in the study.

Outcomes

For the subjective evaluation of medical interventions by pregnant women, three items were used as dependent variables: adequacy of explanation (adequacy), understanding of explanation (understanding), and satisfaction with childbirth (childbirth satisfaction). After obtaining responses on a 5-point Likert scale for each evaluation item, the data were reclassified into three groups for analysis: positive evaluations (top two groups), neutral (the third group), and negative evaluations (bottom two groups).

Statistical analysis

Ordinal logistic regression analysis was performed to identify the factors associated with each evaluation index. The models included primary independent variables (explanation method scores and the healthcare professionals providing the explanation) and covariates (facility type, parity, maternal age, and labor progress). Multicollinearity was assessed using the Variance Inflation Factor (VIF); all variables demonstrated a VIF of ≤ 3 , indicating no multicollinearity affecting model stability. The assumption of proportional odds, a prerequisite for ordinal logistic regression, was verified using a test of parallel lines to ensure that the proportional odds assumption was met. The results were expressed as odds ratios (ORs) and 95% confidence intervals (CIs).

In addition, to complement the interpretation of the regression coefficients, the predicted probabilities for each explanation method across the different phases were calculated. This simulation demonstrated how changes in the explanation method influenced the probability of being classified into the sufficient, neutral, or insufficient categories, with other independent variables fixed at their mean values, thereby clarifying the quantitative expected value of specific interventions for improving maternal subjective evaluations.

Subsequently, a hierarchical ordinal logistic regression analysis was conducted to examine the psychological process via which adequacy of explanation and maternal understanding influence overall childbirth satisfaction. In Model 1, maternal subjective understanding was the dependent variable into which the adequacy of explanation and the covariates were entered to evaluate the direct impact of communication on understanding. Meanwhile, in Model 2, childbirth satisfaction was the final outcome variable, and maternal subjective understanding was simultaneously entered alongside the variables in Model 1. By comparing the changes in the adjusted ORs (aORs) of explanation adequacy from Models 1 to 2, the dynamics of the direct effect of explanations on childbirth satisfaction and their indirect effect mediated through maternal understanding were quantitatively evaluated.

All statistical analyses were performed using IBM SPSS Statistics (version 32.0; IBM Corp., Armonk, NY, USA), and the statistical significance level was set at a two-tailed $p < 0.05$.

Results

This study included 1,000 women who underwent emergency obstetric interventions during childbirth, such as labor augmentation with uterotonic agents, vacuum extraction, or emergency cesarean section. Of these, 818 women received only one intervention (Additional file 2). Overall, 470 women (57.46%) were primiparous, 309 (37.78%) were ≥ 35 years old at the time of delivery, and 280 (34.23%) gave birth at a clinic.

The method of providing information differed at four stages during pregnancy and childbirth (antenatal visits, after admission prior to labor onset, intrapartum as necessity arose, or postpartum) (Additional file 3). At "antenatal visits" and "after admission prior to labor onset," the percentage of women who reported "no explanation" exceeded 30%, at 36.31% and 33.37% respectively. In contrast, for "intrapartum as necessity arose," the percentage of women who received verbal explanations increased to 40.59%. Furthermore, 50.24% received some form of explanation after delivery, most commonly verbal (23.23%). When asked when they preferred to receive an explanation, the most frequent answer was during antenatal visits (56.36%) (Table 1, and Additional file 4).

Baseline characteristics of participants and their evaluations regarding information timing, method, and provider are presented in Table 1. For conciseness, this main table reports only the proportions of participants with 'positive' evaluations; the full distribution across all response categories (positive, neutral, and negative) is detailed in Additional file 4. The analysis of explanation adequacy and understanding included 762 participants who reported receiving explanations from medical professionals during labor, while the analysis of childbirth satisfaction included 818 participants. Overall, 74.93% reported that the explanation was "sufficient", 82.93% reported "understanding" the content, and 76.77% reported being "satisfied" with the birth overall.

In the ordinal logistic regression analysis, higher explanation scores were significantly associated with increased odds of adequate explanation during antenatal visits (aOR = 1.29; 95% CI: 1.10–1.52) and after admission prior to labor onset (aOR = 1.21; 95% CI: 1.03–1.43). Similarly, higher explanation scores were associated with greater subjective understanding during antenatal visits (aOR = 1.21; 95% CI: 1.00–1.46, $p = 0.046$) (Table 2). Estimated probabilities based on the regression model (Figure 1) showed that changing the explanation method from written only to a combination of written and verbal explanations increased the proportion of respondents who answered that the explanation was adequate from 66.80% to 83.61% during antenatal visits and from 69.56% to 82.18% after admission prior to labor. Improvements were also observed during antenatal visits, where subjective understanding increased from 78.45% to 87.18% and childbirth satisfaction increased from 75.91% to 83.15%.

Regarding the personnel providing explanations, satisfaction, understanding, and childbirth satisfaction improved when physicians were involved compared to when they were not.

Satisfaction and understanding improved when physicians and midwives collaborated to provide explanations. On the other hand, the improvement in satisfaction was strongest when physicians alone were involved (aOR = 2.53, 95% CI: 1.65–3.86) (Table 2). Estimated probabilities demonstrated that the proportion of patients reporting adequate explanations increased from 62.70% when physicians were not involved, to 78.94% with physicians alone, peaking at 84.52% under physician–midwife collaboration. Similarly, maternal understanding reached its highest level (91.08%) under physician–midwife collaboration, compared with 70.83% without physicians and 88.13% with physicians alone. In contrast, overall childbirth satisfaction was highest when explanations were provided by physicians alone (84.85%), higher than under physician–midwife collaboration (81.95%) and without physician involvement (70.24%) (Figure 2).

To evaluate the sequential cognitive mechanisms of intrapartum communication, a hierarchical ordinal logistic regression analysis was performed (Table 3). In Model 1, compared to women who felt the explanation was inadequate (reference category), those who reported an adequate explanation had a significantly higher odds of high understanding (aOR = 22.67; 95% CI: 12.12–42.41). Similarly, those who felt the explanation was neutral had a significantly higher likelihood of optimal understanding (aOR = 7.73; 95% CI: 4.67–12.81).

In Model 2, when maternal subjective understanding was simultaneously entered into the model, the direct impact of the adequacy of explanation on childbirth satisfaction substantially diminished; the aOR for an adequate explanation sharply decreased from 22.67 in Model 1 to 7.76 in Model 2 (95% CI: 4.05–14.88), and that for a neutral explanation decreased from 7.73 to 3.97 (95% CI: 2.42–6.50). Maternal subjective understanding emerged as a powerful and independent predictor of childbirth satisfaction in Model 2. Compared to the group with insufficient understanding (reference category), women with sufficient understanding (aOR = 8.21; 95% CI: 3.52–19.16) and neutral understanding (aOR = 3.26; 95% CI: 1.94–5.48) were significantly more likely to achieve high childbirth satisfaction.

Regarding the open-ended comments on the overall childbirth experience, 686 participants (83.86%) reported having no specific concerns and being satisfied with the care they received. Among participants who provided specific feedback, 59 explicitly mentioned dissatisfaction with or concerns about the explanations they received. The comments identified four primary areas of dissatisfaction, as summarized in Additional file 5. The most prevalent issue was

difficulty in understanding technical jargon (n = 26), representing the largest category of the complaints. This was followed by cognitive overload owing to pain or panic (n = 17), which hindered effective processing of information during labor. Additionally, some participants reported that perceived perfunctory communication led to anxiety (n = 8), whereas others noted a complete lack of information or perceived absence of an explanation (n = 8).

Discussion

This study determined the association between how the timing, method, and provider of medical explanations during emergency obstetric interventions and maternal outcomes regarding explanations (adequacy and subjective understanding) and overall childbirth satisfaction. Our findings indicate that the impact of explanation adequacy on childbirth satisfaction is mediated through maternal subjective understanding and highlight the impact of explanation timing and provider. Pre- and post-labor explanations actively support maternal understanding. Meanwhile, understanding is best achieved through physician–midwife collaboration, whereas overall satisfaction is most strongly driven by direct physician involvement.

Timing and methods of explanation

Regarding the period prior to labor onset (during antenatal visits and after admission prior to labor onset), our findings revealed that explanation utilizing written materials significantly enhanced both subjective understanding and explanation adequacy. A potential explanation for this finding is that providing information before labor onset may afford women more time to review clinical details. This process of cognitive preparation is strongly supported by a nationwide survey in the Netherlands by van der Pijl et al. that demonstrated that structured discussions prior to active labor are crucial for safeguarding maternal autonomy [19]. Furthermore, this is consistent with the clinical guidelines of the Japan Society of Obstetrics and Gynecology, which suggest that proactive antenatal explanations regarding instrumental delivery can facilitate clinician-patient trust [20]. Collectively, these data suggest that establishing a baseline understanding during antenatal care may contribute to higher maternal perceptions of explanation adequacy.

Interestingly, during the intrapartum period, an increase in explanation scores demonstrated no significant association with maternal subjective understanding or childbirth satisfaction. Pain and exhaustion during labor can impede the process of receiving, understanding, and consenting to complex clinical information; i.e., providing more thorough explanations during labor does not automatically correspond to improved understanding. One participant's comment vividly illustrated this barrier: "When I was panicking from the intensity of the labor pain, being given a document, explained to, and asked for a signature meant absolutely nothing to me." These findings do not imply that physicians and midwives must refrain from explaining interventions during labor; rather, they underscore the cognitive limitations of intrapartum communication, reinforcing the need to establish baseline understanding before labor onset, followed by postpartum dialogue to support maternal acceptance [21]. Importantly, these cognitive constraints do not justify omitting explanations during labor; attempting to communicate prior to intervention remains a standard clinical and ethical responsibility [22].

In the postpartum period, the estimated probability of high understanding was maximized when verbal explanations were provided. This dynamic is consistent with previous studies indicating that women strongly desire to have their experiences acknowledged through verbal debriefing [15, 23]. As emphasized by Nicholls et al., IC in obstetrics should be approached as a continuous process spanning the entire perinatal period, rather than as a single event executed during an acute crisis [24].

Personnel providing explanations

Regarding maternal subjective understanding, collaborative explanations by physicians and midwives demonstrated the highest aOR, suggesting that midwives play a crucial role in complementing technical explanations and addressing patients' individual concerns. In contrast, for overall childbirth satisfaction, direct involvement of the physician performing the intervention showed the strongest positive association. When physicians directly explain, it reinforces trust and facilitates maternal acceptance of the intervention. According to Demirel et al., higher perceptions of support and self-control during birth are associated with reduced fear and higher satisfaction [25]. These findings suggest that thorough information provision may help foster a sense of maternal control during a clinical crisis, ultimately enhancing overall childbirth satisfaction.

Importantly, these results do not undermine the value of midwifery care. Rather, interpreting this collaborative approach, previous literature suggests a multidisciplinary framework in which physicians primarily address the medical validity of interventions and midwives complement this by supporting mothers' emotional concerns [26]. In accordance with this established framework, our data show that such a division of labor optimizes both maternal understanding and the subjective maternal experience, reinforcing the need for structured provider training for standardized patient communication [27].

Qualitative insights into communication barriers

Several participants expressed strong feelings of isolation when explanations were directed exclusively to their partners. Importantly, even when women appear overwhelmed by severe labor pain, they remain acutely aware of whether healthcare personnel are engaging with them directly or bypassing them. Such experiences leave lasting impressions and can diminish trust. Additionally, participants described how intense pain compromised their ability to process complex information, a cognitive barrier consistent with the findings of Valente et al. [28], who reported that technical jargon hinders understanding. Furthermore, mechanical delivery of information heightened anxiety, suggesting that explanations were sometimes conducted as a routine legal obligation rather than patient-centered care. Even during acute intrapartum crises, maintaining patient-centered communication—such as directly addressing the laboring woman, even briefly—is vital to prevent feelings of alienation and to safeguard maternal autonomy [19, 29].

Notably, despite these identified communication barriers, > 80% of the free-text responses indicated that participants were satisfied or had no specific complaints. While contemporary international literature frequently focuses on friction or negative maternal experiences during acute obstetric crises, our findings show that healthcare personnel strive to provide supportive care and achieve high maternal satisfaction even under highly demanding clinical conditions. Although the participants of this study were exclusively Japanese women, our findings align with international literature from the United Kingdom

[24], the Netherlands [3], Australia [15], and France [2], suggesting that balancing consent procedures with adequate information provision is a universal challenge in modern obstetrics.

This study had some limitations. First, this was a cross-sectional study based on subjective perceptions, meaning that the accuracy of the explanations was not objectively verified. Therefore, recall bias may have influenced these responses. However, because IC depends on how patients subjectively understand information, focusing on maternal perceptions remains highly relevant. Second, we did not collect clinical data on neonatal outcomes such as Apgar scores or neonatal intensive care unit admissions. Poor neonatal outcomes inevitably affect maternal psychology; however, previous literature demonstrates that childbirth can function as an independent stressor and that CB-PTSD can develop regardless of the newborn's objective medical prognosis. Chan et al. confirmed that intrapartum factors, including the adequacy of explanations, independently drive maternal distress separate from neonatal well-being [30]. Third, information regarding the use of labor analgesia was not collected in this study. In Japan, although the utilization of labor analgesia has been gradually increasing—accounting for 13.8% of all childbirths according to national survey data from 2023—it remains relatively low compared to many Western countries. As this study was designed as an initial assessment to clarify the overall implementation status and maternal perceptions of intrapartum explanations across general clinical settings, detailed subgroup analyses based on labor analgesia were beyond its primary scope. However, effective pain management can alleviate emotional distress and alter a patient's capacity to process explanations. Future studies should account for pain management practices as labor analgesia becomes more widely adopted in Japan. Fourth, because the survey was conducted online, a selection bias may have existed, as the respondents may have had a particularly strong interest in their childbirth experiences.

In addition, our findings suggest a potential sequential model wherein adequate explanation facilitates subjective understanding, which in turn enhances overall childbirth satisfaction. To test such a chain of effects, prospective longitudinal studies are warranted.

Overall, this initial assessment clarifies the status and maternal perceptions of intrapartum explanations. Future research should evaluate how provider communication, material design, and individual factors—such as health literacy and obstetric history—interact to optimize patient understanding and birth experiences.

Conclusion

The findings of this study suggest that improving communication for emergency intrapartum interventions requires a multi-stage approach, rather than relying solely on explanations offered only when interventions become necessary during labor. Providing written and verbal explanations during antenatal visits helps to build baseline understanding, while postpartum verbal debriefing can foster maternal acceptance of emergency interventions. Maternal understanding drives childbirth satisfaction; therefore, optimizing communication involves physician–midwife collaboration, while appropriate physician involvement further enhances overall satisfaction.

Abbreviations

aORs: adjusted odds ratios

CB-PTSD, childbirth-related post-traumatic stress disorder

CI: confidence intervals

IC, Informed consent

ORs: odds ratios

Declarations

Ethics approval and consent to participate

At the beginning of the web-based survey, the study's purpose, the voluntary nature of participation, data anonymity, and intended use of the data were clearly explained. IC was obtained using an opt-in format; participants were required to select an “I agree” button to confirm their understanding and willingness to participate before proceeding to the questionnaire. This retrospective study was approved by the Institutional Review Board of the Institute of Science, Tokyo, Japan (approval number: M2023-368) and conducted in accordance with the tenets of the Declaration of Helsinki.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are based on questionnaire survey data. Although no personally identifiable information was collected, the data are not publicly available but 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

MT: Data curation; Formal analysis; Investigation; Methodology; Project administration; Visualization; Writing – original draft; Funding acquisition. **FA:** Data curation; Funding acquisition; Writing – review & editing. **MM:** Formal analysis; Funding acquisition; Writing – review & editing. **MK:** Validation; Writing – review & editing. **TN:** Conceptualization; Methodology. Writing – review & editing **YO:** Conceptualization; Methodology, Writing – review & editing. **NM:** supervised, Writing – review & editing. All authors reviewed the results, contributed to manuscript writing, and approved the final version of the manuscript.

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Tables

Table 1. Participant characteristics and proportions of positive evaluations regarding explanation adequacy, understanding, and childbirth satisfaction

	Total N = 818	Adequacy of explanation N = 571	Understanding of explanation N = 632	Childbirth Satisfaction N = 628
Primiparity (a)	470(57.46)	323(68.72)	355(75.53)	358(76.17)
Age ≥ 35 years (a)	309(37.78)	218(70.55)	248(80.26)	248(80.26)
Private clinics (a)	280(34.23)	200(71.43)	222(79.29)	220(78.57)
Emergency obstetric interventions				
Augmentation of labor (a)	521(63.69)	380(72.94)	411(78.89)	407(78.12)
Vacuum extraction (a)	126(15.40)	69(12.08)	83(65.87)	92(73.02)
Emergency cesarean section (a)	171(20.90)	123(71.93)	138(80.70)	129(75.44)
Timing and Level of Information Provision				
Information mode score				
Antenatal visits (b)	1.65(1.24)	1.79(1.23)	1.73(1.23)	1.63(1.25)
After admission prior to labor onset (b)	1.69(1.20)	1.81(1.18)	1.72(1.19)	1.63(1.22)
Intrapartum (as necessity arose) (b)	1.84(1.08)	1.85(1.10)	1.85(1.08)	1.78(1.12)
Postpartum (b)	1.25(1.25)	1.26(1.26)	1.27(1.00)	1.23(1.25)
Received any information				
Antenatal visits (a)	521(63.69)	412(79.08)	445(85.41)	420(80.61)
After admission prior to labor onset (a)	545(66.63)	428(78.53)	456(83.67)	433(79.45)
Intrapartum (as necessity arose) (a)	605(73.96)	446(73.72)	501(82.81)	479(79.17)
Postpartum (a)	414(50.61)	305(73.67)	345(83.33)	331(79.95)
Both modes* at any timing (a)	445(54.40)	363(81.57)	380(85.39)	364(81.80)
Personnel Providing the Explanation				
Physician only (a)	321(39.24)	253(78.82)	283(88.16)	273(85.05)
Physician and Midwife (a)	180(22.00)	152(84.44)	164(91.11)	147(81.67)
No physician involvement (a)	261(31.91)	166(63.60)	185(70.88)	183(70.11)
Patients' preferred timing for explanations				
Antenatal visits (a)	461(56.36)	345(74.84)	376(81.56)	364(78.96)
After admission, before labor onset (a)	358(43.77)	269(75.14)	294(82.12)	285(79.61)
Intrapartum (as necessity arose) (a)	265(32.40)	180(67.92)	203(76.60)	203(76.60)

Data are presented as n (%) (a) or mean ± standard deviation (b). Categorical variables were compared using the chi-square test. Ordinal or continuous data among groups were compared using the Kruskal–Wallis test. *Both written and verbal modes.

To highlight the characteristics associated with favorable outcomes, Table 1 shown only the proportions of participants reporting 'positive' explanation provision. The full distribution across all response categories (positive, neutral, and negative) is available in Additional file 4.

Table 2. Adjusted odds ratios of explanation characteristics for maternal outcomes

	Adequacy of explanation			Understanding of explanation			Childbirth Satisfaction		
	aOR* ¹	95% CI* ²	P	aOR* ¹	95% CI* ²	P	aOR* ¹	95% CI* ²	P
Timing and Mode of Explanation									
Antenatal visits: Explanation mode score	1.29	1.10- 1.52	0.002	1.21	1.00-1.46	0.046	1.04	0.87-1.23	0.69
After admission prior to labor: Explanation mode score	1.21	1.03-1.43	0.024	0.97	0.80-1.18	0.779	0.90	0.75-1.07	0.22
Intrapartum (as necessity arose): Explanation mode score	1.05	0.87-1.26	0.631	1.02	0.83-1.25	0.887	1.00	0.83-1.21	0.97
Postpartum: Explanation mode score	0.85	0.72-1.01	0.063	1.03	0.84-1.25	0.797	1.14	0.95-1.37	0.15
Both written and verbal modes at any timing (ref.no)	1.61	1.11-2.38	0.013	1.19	0.76-1.85	0.458	1.52	0.99-2.27	0.05
Personnel Providing the Explanation (ref. no physician involvement)									
Physician only	2.17	1.47-3.21	<0.001	3.22	2.04-5.09	<0.001	2.53	1.65-3.86	<0.0
Physician and Midwife	2.74	1.66-4.50	<0.001	4.11	2.25-7.50	<0.001	1.90	1.17-3.08	0.00
Facility Type (ref. hospital)									
Private clinic	1.18	0.82-1.70	0.378	1.46	0.95-2.25	0.085	1.31	0.91-1.89	0.14
Parity (ref. multipara)									
Primipara	0.97	0.68-1.38	0.863	0.76	0.50-1.15	0.188	0.93	0.66-1.33	0.70
Maternal Age (ref. under 35 years)									
35 years and older	1.01	0.70-1.45	0.970	0.79	0.51-1.21	0.273	0.73	0.50-1.05	0.08
Obstetric intervention* ³	1.19	0.95-1.50	0.134	1.27	0.97-1.65	0.084	1.36	1.09-1.70	0.00

*¹ aOR: Adjusted Odds Ratio, *² CI: Confidence Interval, *³ Intervention intensity was treated as an ordinal variable: 1, labor augmentation; 2, vacuum extraction; and 3, emergency cesarean section.

Table 3. Hierarchical ordinal logistic regression analysis for childbirth satisfaction

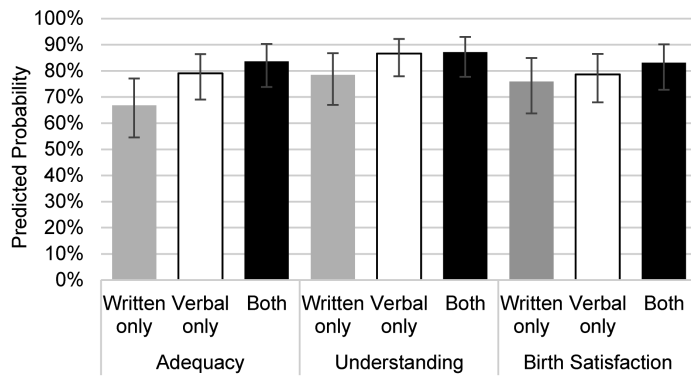
	Model 1				Model 2			
	Understanding of explanation				Childbirth satisfaction			
	aOR* ¹	95% CI* ²		P	aOR* ¹	95% CI* ²		P
		Upper	Lower			Upper	Lower	
Adequacy of explanation (ref. negative)								
positive	22.67	12.12	42.41	< 0.001	7.76	4.05	14.88	< 0.001
neutral	7.73	4.67	12.81	< 0.001	3.97	2.42	6.50	< 0.001
Understanding of explanation (ref. negative)								
positive					8.21	3.52	19.16	< 0.001
neutral					3.26	1.94	5.48	< 0.001

*¹ aOR: Adjusted Odds Ratio, *² CI: Confidence Interval

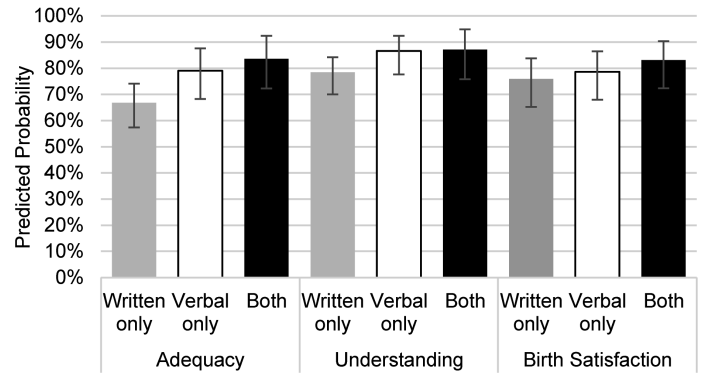
Both Models 1 and 2 were fully adjusted for the following covariates to control for potential confounding effects: timing of explanation, mode of information, personnel providing the explanation, facility type, parity, maternal age, and obstetric intervention (Intervention intensity was treated as an ordinal variable: 1, labor augmentation; 2, vacuum extraction; and 3, emergency cesarean section).

Figures

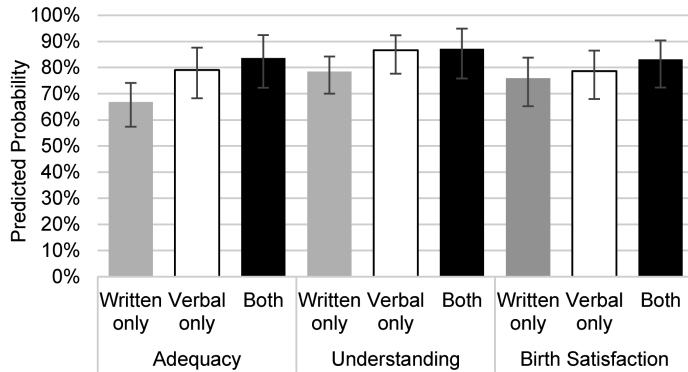
a. prenatal visits.



b. after admission, before labor onset



c. intrapartum (as necessity arose)



d. postpartum

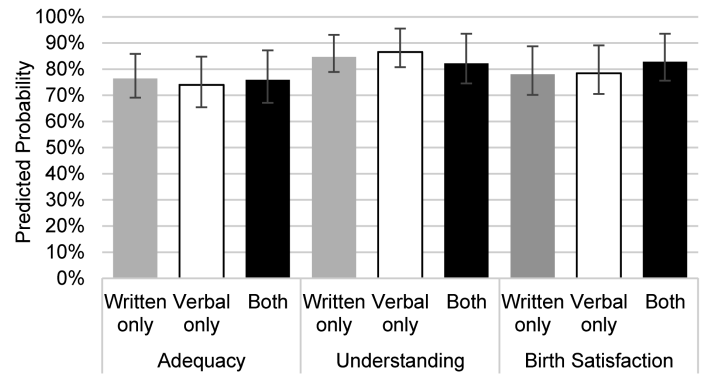


Figure 1

Estimated probabilities of positive outcomes and methods of information provision by pregnancy stage

The bar charts illustrate the estimated probabilities of three maternal outcomes across four clinical stages: (a) antenatal visits, (b) after admission prior to labor onset, (c) intrapartum, and (d) postpartum. Within each stage, outcomes are compared among three communication modes: written materials only, verbal explanations only, and both. Error bars indicate the upper and lower bounds of the estimated probabilities.

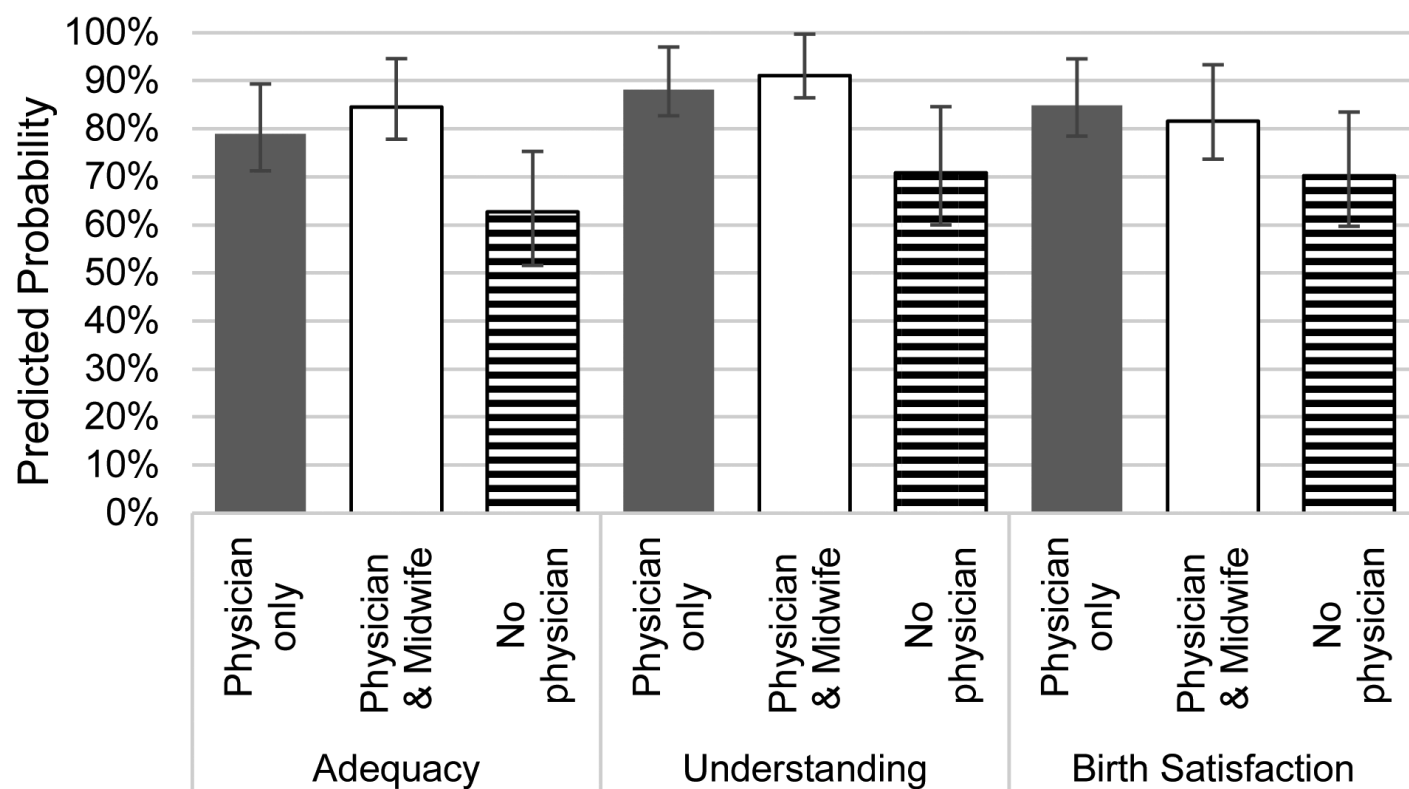


Figure 2

Estimated probabilities of explanation adequacy, understanding, and childbirth satisfaction by personnel providing explanations

The bar chart illustrates the estimated probabilities across three maternal outcomes based on the presence and collaboration of physicians and midwives during emergency obstetric interventions. Error bars indicate the upper and lower bounds of the estimated probabilities.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdditionalFile1.docx](#)
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