OBSTETRICS

Vasa previa in singleton pregnancies: diagnosis and clinical management based on an international expert consensus

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BACKGROUND: There are limited data to guide the diagnosis and management of vasa previa. Currently, what is known is largely based on case reports or series and cohort studies.

OBJECTIVE: This study aimed to systematically collect and classify expert opinions and achieve consensus on the diagnosis and clinical management of vasa previa using focus group discussions and a Delphi technique.

STUDY DESIGN: A 4-round focus group discussion and a 3-round Delphi survey of an international panel of experts on vasa previa were conducted. Experts were selected on the basis of their publication record on vasa previa. First, we convened a focus group discussion panel of 20 experts and agreed on which issues were unresolved in the diagnosis and management of vasa previa. A 3-round anonymous electronic survey was then sent to the full expert panel. Survey questions were presented on the diagnosis and management of vasa previa, which the experts were asked to rate on a 5-point Likert scale (from "strongly disagree"=1 to "strongly agree"=5). Consensus was defined as a median score of 5. Following responses to each round, any statements that had median scores of ≤3 were deemed to have had no consensus and were excluded. Statements with a median score of 4 were revised and re-presented to the experts in the next round. Consensus and nonconsensus statements were then aggregated.

RESULTS: A total of 68 international experts were invited to participate in the study, of which 57 participated. Experts were from 13 countries on 5 continents and have contributed to >80% of published cohort studies on vasa previa, as well as national and international society guidelines.
Completion rates were 84%, 93%, and 91% for the first, second, and third rounds, respectively, and 71% completed all 3 rounds. The panel reached a consensus on 26 statements regarding the diagnosis and key points of management of vasa previa, including the following: (1) although there is no agreement on the distance between the fetal vessels and the cervical internal os to define vasa previa, the definition should not be limited to a 2-cm distance; (2) all pregnancies should be screened for vasa previa with routine examination for placental cord insertion and a color Doppler sweep of the region over the cervix at the second-trimester anatomy scan; (3) when a low-lying placenta or placenta previa is found in the second trimester, a transvaginal ultrasound with Doppler should be performed at approximately 32 weeks to rule out vasa previa; (4) outpatient management of asymptomatic patients without risk factors for preterm birth is reasonable; (5) asymptomatic patients with vasa previa should be delivered by scheduled cesarean delivery between 35 and 37 weeks of gestation; and (6) there was no agreement on routine hospitalization, avoidance of intercourse, or use of 3-dimensional ultrasound for diagnosis of vasa previa.

CONCLUSION: Through focus group discussion and a Delphi process, an international expert panel reached consensus on the definition, screening, clinical management, and timing of delivery in vasa previa, which could inform the development of new clinical guidelines.

Key words: clinical guideline, clinical management, Delphi, expert consensus, practice guideline, prenatal diagnosis, survey, ultrasound, vasa previa

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Introduction

Vasa previa, defined as unprotected fetal vessels that traverse the amniotic membranes over the cervix, is associated with a substantial risk of perinatal death when undiagnosed prenatally.[1—10]

It affects approximately 1 in 1200 pregnancies.[11] There are 3 types of vasa previa. In type 1, there is a velamentous cord insertion, whereas in type 2, unprotected fetal vessels run over the cervix between the main placenta and an accessory placental lobe.[4,12—14] In type 3, unprotected fetal vessels exit the placental edge to run through the membranes, and then "boomerang" to reinsert into the placental edge at another location.[15—18] In type 3, there is usually not a velamentous cord insertion, and there is a single placental mass. When the membranes rupture in late pregnancy or in labor, fetal exsanguination often

AJOG at a Glance

Why was this study conducted?
There are limited and conflicting data to guide the diagnosis and management of vasa previa.

Key findings
Expert consensus is that all pregnancies should be screened for vasa previa at the second-trimester anatomy scan. Screening should be conducted by identifying placental cord insertion and using color Doppler over the cervix. The definition of vasa previa should not be limited to vessels 2 cm from the internal os. Outpatient management is reasonable for asymptomatic low-risk patients with vasa previa. Patients with vasa previa should be delivered by cesarean delivery between 35^0 and 37^0 weeks of gestation.

What does this add to what is known?
An international panel of experts achieved consensus on the diagnosis and overall management of vasa previa.

occurs, with a reported perinatal mortality of approximately 56% and substantial morbidity in survivors of vasa previa not diagnosed prenatally.[7,8] Ultrasound has made it possible to diagnose the condition prenatally and to deliver the patients by cesarean delivery before the rupture of the membranes, thereby avoiding this high perinatal mortality.[8,19−28] This approach has, in recent years, changed the outcome of patients with vasa previa in many countries with advanced health care resources, and survival rates in prenatally diagnosed vasa previa are excellent.[29−33]

However, there are limited data to guide the diagnosis and management of vasa previa.[1−3] In particular, there are no randomized controlled trials, and studies on vasa previa consist almost exclusively of cohort studies, case series, and case reports, with the largest of these having approximately 150 patients.[4] Thus, there is a paucity of information and a lack of consensus on the criteria to use in clinical practice for the definition of vasa previa, whether the condition should be screened for, how and when the diagnosis should be made, and the optimal management for vasa previa. There are also controversies about who should be screened, whether patients should be hospitalized, administration of steroids and their timing, and the optimal gestational age for delivery. The accurate diagnosis, monitoring, and management of vasa previa continue to pose daily challenges for clinicians due to these unresolved issues. Furthermore, the current national societal guidelines are based on interpretations of a few retrospective cohort studies, which could introduce bias.[1−3]

The aim of this study was to achieve, through focus group discussion (FGD) and a Delphi process, expert consensus on the essential clinical issues in the diagnosis and clinical management of vasa previa.

Materials and Methods

For this study, we used 2 strategies to formulate the statements for the first round of the Delphi survey. The first entailed a comprehensive literature review, and the second involved a FGD with a core panel of experts. We then conducted a Delphi study of a larger group of international experts on vasa previa to aim at consensus recommendations on the diagnosis and clinical management of the condition.

Literature review
We performed a comprehensive literature review of all publications on the PubMed database using the MeSH (Medical Subject Headings) key words "Vasa Previa" and "Vasa Praevia".

Expert definition
Experts were selected primarily on the basis of their publication record, following a comprehensive literature search for publications on vasa previa, including the databases PubMed, UpToDate, and national societal guidelines. Individuals with >2 publications as the first or senior author were preliminarily identified as experts. In addition, some experts were recommended by their peers because of their extensive clinical expertise and established national/international reputation in diagnosis and management of vasa previa.

Focus group discussion
The primary aim of the FGD was to create a comprehensive list of statements for the first round of the Delphi process, capturing expert opinions that might not have been addressed in the literature review. According to our criteria (see "Expert definition"), those with the highest number of publications were identified as the core group.

Each expert was personally contacted and invited for an online FGD. Because of differences in time zones and to ensure effective discussions, 4 separate group discussions were held. The FGDs were conducted by videoconferencing on the Zoom platform (Zoom Video Communications, San Jose, CA), and each lasted 1 hour. Each session was led by 2 moderators (Y.O. and A.A.S.) who posed open and undirected questions focused on the diagnosis and management of vasa previa. All sessions were both video- and audio-recorded. Transcriptions were made after sessions and cross-checked with the notes of the note-taker (A.J.).

For analysis, the transcripts were reviewed, and primary areas of discussion were identified using thematic analysis.[34] To formulate the statements for the Delphi survey, these transcripts were segmented, coded, and then categorized according to the identified themes. These statements were then validated (Y.O., A.A.S., E.K., A.J., R.D.) before being used in the first round of the Delphi process.

The Delphi process
The Delphi method, a qualitative research technique, addresses questions that existing literature might fail to answer.[35] This method seeks consensus

across an expert panel through multiple iterative rounds.[36,37] The structured format of the Delphi technique facilitates the quantitative collection and categorization of expert opinions. This technique allows for the inclusion of an unlimited number of experts and uses an iterative process where each round is adapted according to feedback from the previous round. This process continues until consensus is achieved. The Delphi process collects responses anonymously and is based on consensus (agreement by the overwhelming majority), thereby removing the influence of strongly opinionated or dominant individuals that usually occurs when discussions are held face-to-face.

Data collection

The Delphi study consisted of 3 distinct rounds, all conducted via an anonymous electronic survey using the Survey-Monkey online platform (Survey-Monkey Inc., San Mateo, CS). In the first round, experts were asked to rate each statement on a Likert scale, which ranged from 1 ("completely disagree") to 5 ("completely agree"). Alongside each statement, a comment box was made available, offering experts the opportunity to provide feedback or propose modifications to the statement. To ensure maximum participation, automatic reminder emails were sent out on a weekly basis, totaling 3 reminders before the round's closure. Once the first round concluded, the median score of each statement was determined. Statements that achieved a median score of 5, and for which no further modifications were proposed, were considered to have reached consensus. In contrast, those with a median score of ≤3 were deemed nonconsensus and subsequently excluded from further consideration. Statements with a median score of 4 were adjusted according to the experts' feedback and subsequently incorporated into the second round. Notably, for 3 pivotal questions concerning gestational age at routine hospital admission, routine administration of steroids, and delivery in asymptomatic patients, a survey format was opted for instead of the conventional Likert scale, allowing the

research team to better gauge the spread of expert responses. For these 3 questions, the survey format consisted of answers stratified by gestational age (eg, 28−29$^{6/7}$ weeks, 30−31$^{6/7}$ weeks, etc.) (Supplemental Table 4). The questionnaires in each round are available in Supplemental Tables 1 to 5. Only those who completed a round were advanced to the next round. No other experts were invited to replace those who did not respond to any round of the survey.

During the initial round of the Delphi survey, participants were asked about their years of experience in diagnosing and treating vasa previa, the estimated annual number of vasa previa patients assessed at their respective institutions, and their academic degree to further validate and represent their expertise.

The second round of the Delphi study closely mirrored the first in its methodology. Statements that were presented in this round and achieved a median score of 4 underwent further refinements based on expert suggestions and were then advanced to the third round. In the third round, experts were provided with the revised statements and were simply asked to either agree or disagree with each one. Consensus was recognized for any statement that garnered agreement from >75% of participating experts.[38] As a final measure to ensure the integrity and acceptance of the findings, all 57 participants who responded to the survey were presented with the consolidated list of both consensus and nonconsensus statements, seeking their confirmation before finalizing the results. This was in the form of an agree/disagree statement with comments allowing open feedback.

Ethical considerations

The protocol of this study received exemptions from the institutional review boards (IRBs) at both Beth Israel Deaconess Medical Center (IRB approval P2022P000981; approval date: November 26, 2022) and Boston Children's Hospital (IRB approval IRB-P00044255; approval date: January 22, 2023). Before recording the FGDs, verbal consent was obtained from all participants. For the Delphi process, the

consent of participants was sought through the invitation email.

Results

We identified 68 experts. Of these, 18 experts from 8 countries participated in the FGDs. Fifty-seven experts participated in the first round of the Delphi survey. These 57 respondents reported a median of 20 years (interquartile range [IQR], 12−25) of experience in diagnosing and treating vasa previa. In addition, they reported evaluating a median of 10 patients (IQR, 5−15) with vasa previa annually at their respective institutions. Thematic analysis of the FGD transcripts revealed the following categories that the experts identified as requiring attention:

1. Vasa previa definition
2. Screening and diagnosis:
   - Universal vs targeted screening
   - Imaging modalities and screening techniques
   - Timing of screening
3. Management:
   - 3a. Monitoring and ultrasound frequency:
     - Outpatient management in asymptomatic patients from the time of diagnosis to 32 weeks
     - Outpatient management in asymptomatic patients after 32 weeks until delivery/admission
     - Cervical length monitoring
     - Biophysical profile assessment
     - Growth scan
     - Cardiotocography
   - 3b. Hospitalization:
     - Admission indication in asymptomatic patients after 32 weeks
     - Gestational age at admission for asymptomatic patients
     - Steroids administration
   - 3c. Miscellaneous:
     - Sexual intercourse
     - Physical activity
     - Fetoscopic laser photocoagulation of vasa previa
4. Timing of delivery in asymptomatic patients

In the first Delphi round, 44 statements and 8 multiple-choice questions

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TABLE 1
List of consensus statements

Definition

- In my routine practice, I make the diagnosis of VP at any gestational age, but it should be confirmed later in the pregnancy.
- The diagnosis of VP made in the second trimester should be confirmed during the third trimester or before delivery.
- Although there is no consensus regarding a definition for VP based on distance from the internal os, I feel the definition of VP should not be limited to vessels within 2 cm of the internal os.

Screening

- I recommend screening for VP in all pregnant persons.
- I recommend screening at the time of the anatomy scan.
- I recommend a follow-up transvaginal sonography/color Doppler imaging at approximately 32 wk in patients with a previous diagnosis of placenta previa, low-lying placenta, or VP at the time of anomaly scan.
- I recommend routine identification of the umbilical cord insertion into the placenta by transabdominal ultrasound at the time of the mid-trimester anatomy scan in all pregnant individuals.
- In all pregnant individuals, including those without risk factors, I recommend routine transabdominal ultrasound with color Doppler sweep of the lower uterine segment.
- I recommend that when VP is suspected on transabdominal ultrasound, the diagnosis be confirmed with transvaginal ultrasound with Doppler.
- In pregnant persons with any risk factors, I recommend routine screening with transvaginal sonography and color Doppler imaging for VP.
- In the evaluation of suspected VP by transvaginal sonography/color Doppler imaging, I recommend examining the region over the cervix in multiple planes (ie, sagittal, coronal, etc.).
- During the evaluation for suspected VP, whenever possible, the fetal presenting part should not be applied on the cervix to avoid compressing the vessels. Techniques such as manual displacement or positioning the patient in a Trendelenburg position may be used to achieve this.

Management and monitoring

- I recommend admission to VP patients with variable decelerations on the outpatient NST/CTG.
- I recommend admission to VP patients with bleeding or rupture of membranes.
- I offer admission according to the special social circumstances of the pregnant person (including their willingness to become admitted, their anxiety, difficult access to the medical center, etc.).
- I recommend admission to patients with progressive cervical shortening in the third trimester.
- I recommend admission to patients with premature symptomatic uterine contractions.
- I offer/recommend admission to patients with limited access to medical centers in the third trimester.
- Transvaginal ultrasound measurements of cervical length have a role in the management of VP. This may be individualized according to institutional protocols and resources.
- In patients with VP, fetal surveillance, including biophysical profile examinations and growth scans, plays a role in management and should be conducted in accordance with institutional protocols and available resources.
- In asymptomatic patients without risk factors for preterm birth or rupture of membranes, outpatient management is reasonable after appropriate counseling, if the patient desires this, and has easy access to the hospital.
- I do not recommend complete bed rest for patients with VP.
- I believe that fetoscopic laser ablation for VP should be considered experimental and is not routinely recommended.

Time of delivery

- I do not recommend routine delivery earlier than 34+0 wk.
- I do not recommend delivery later than 38+0 wk.
- In asymptomatic patients with VP and a normal cervical length, I recommend routine delivery between 35+0 and 36+6 wk.

Risk factors: placenta previa, low-lying placenta, in vitro fertilization pregnancies, and bilobed and succenturiate lobed placenta. Asymptomatic patients: pregnant patients without vaginal bleeding, regular painful uterine contractions, or loss of fluid. Risk factors for preterm birth or rupture of membranes: history of preterm birth, short cervix, and positive fetal fibronectin.

CTG, cardiotocography; *NST*, nonstress test; *VP*, vasa previa.

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were sent to the 68 experts. No experts declined to participate. A response rate of 84% (57 experts) was achieved. Thus, 11 of the invited experts did not respond, and responses of 57 experts were analyzed. This round resulted in consensus on 12 statements and non-consensus on 14, and 18 statements received a median score of 4.

The second Delphi round involved 24 statements and 4 multiple-choice questions, sent to the 57 experts who responded to the first round. Fifty-three experts (93%) completed the survey. Consensus was reached on 11 statements, 5 did not achieve consensus, and 8 received a median score of 4.

In the third Delphi round, 3 statements were presented to the experts. Of the 53 experts to whom surveys were sent, 47 (91%) responded. All 3 third-round statements achieved agreement levels >75% (Supplemental Table 5). Overall, consensus was achieved on 26 statements, whereas we failed to reach consensus on 10 statements (Tables 1 and 2). Both consensus and non-consensus statements were ratified by the entire expert panel of 57 respondents before this article's publication, and are given in Tables 1 and 2, whereas the responses to multiple-choice questions are given in Figures 1 to 3.

TABLE 2
List of nonconsensus statements

- I routinely recommend an NST/CTG to detect contractions.

- I routinely recommend admission to all patients with VP.

- I do not suggest pelvic rest during pregnancy for asymptomatic patients with VP with normal CL.

- I believe that the caliber and type (main umbilical cord vs peripheral vessels) of VP could affect our general recommendation for the time of delivery.

- I recommend routine delivery whenever estimated fetal weight exceeds 2500 g.

- There is no safe distance from the vessels to the internal os, and any vessels seen running through the membranes on transvaginal ultrasound should be considered vasa previa.

- I routinely recommend using 3-dimensional ultrasound for vasa previa diagnosis and/or follow-up.

- I suggest routinely performing ultrasound for vascular mapping before delivery to guide the uterine incision during cesarean delivery.

- If you do not routinely admit your patients: in the outpatient management of asymptomatic patients after 32 wk until delivery/admission, I recommend routine weekly biophysical profile examinations.

- In patients with vasa previa, I recommend routinely administering steroids at the time of admission, regardless of the reason for admission and gestational age.

CL, cervical length; *CTG*, cardiotocography; *NST*, nonstress test; *VP*, vasa previa.
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Comment
Principal findings
Expert panelists reached consensus regarding several aspects of the definition, screening, clinical management, and timing of delivery for vasa previa (Table 1). The main findings included the following:

1. Although there is no consensus regarding a definition for vasa previa based on distance from the internal os, this definition should not be limited to vessels within 2 cm of the internal os.

2. Universal screening for vasa previa should be performed at the time of the second-trimester anatomy scan via examination of the placental cord insertion and a color flow Doppler sweep of the area over the cervix in all pregnant patients.

3. Outpatient management of vasa previa in asymptomatic patients without risk factors for spontaneous preterm birth is reasonable with careful counseling and consent.

4. Asymptomatic patients with vasa previa should be delivered between $35^{0/7}$ and $37^{0/7}$ weeks of gestation by scheduled cesarean delivery.

### Results in the context of what is known
Definition
A distance of 2 cm between the unprotected fetal vessels and the internal os has been used by some authors to define vasa previa.[1,19,21,39] This distance, derived from the definition of a low-lying placenta, has never been shown to be a safe distance for vasa previa, and its use for defining vasa previa has previously been challenged.[3,4,9,30,39] This controversy was recently addressed in a commentary that argued that assumptions on which some have used the 2-cm distance to define vasa previa are flawed.[39] The Delphi process in the present study resulted in a consensus that although no clear distance has been agreed on to define vasa previa, it should not be limited to 2 cm. Of the respondents, 34% used a 2-cm definition, 32% used a 5-cm definition, and 21% did not use a
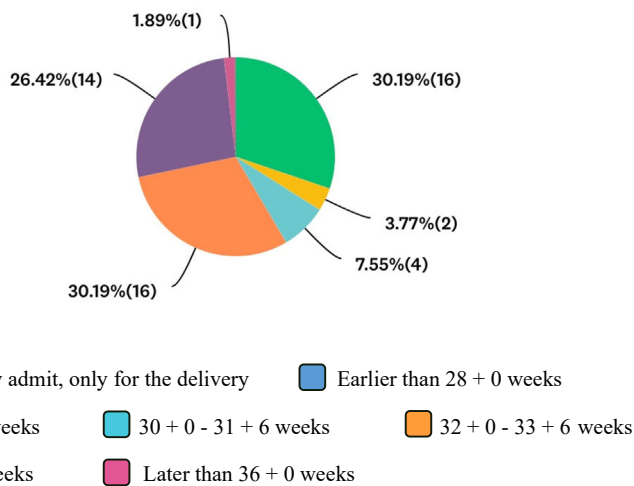

FIGURE 1
Distance between fetal vessels and os to define vasa previa

Distance Criteria

- No distance criteria: 21%
- 2cm: 33.96%
- 2.5cm: 1.89%
- 3cm: 1.89%
- 3-4cm: 1.89%
- 4cm: 7.54%
- 5cm: 32%
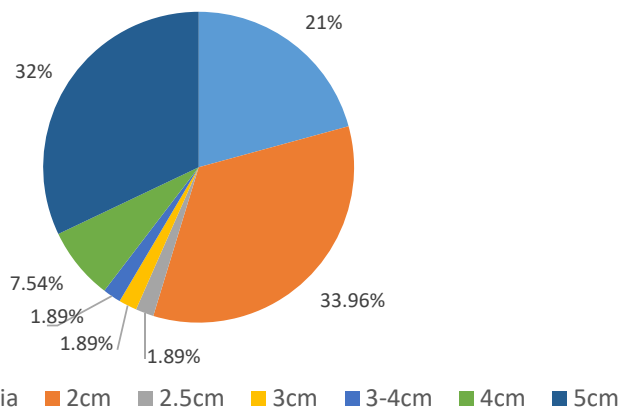
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FIGURE 2
Experts' recommendations regarding routine hospitalization for vasa previa

Legend:
- I do not routinely admit, only for the delivery
- Earlier than 28 + 0 weeks
- 28 + 0 – 29 + 6 weeks
- 30 + 0 - 31 + 6 weeks
- 32 + 0 - 33 + 6 weeks
- 34 + 0 - 35 + 6 weeks
- Later than 36 + 0 weeks

If you recommend routinely admitting asymptomatic* patients with vasa previa and a normal cervical length, at what gestational age do you typically recommend admission.

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definition based on distance. The remaining 13% used distances between 2.5 and 4 cm (Figure 1).

Screening

There has been much controversy regarding who should be screened or if screening for vasa previa should be performed at all.[9,30,31,40–48] The panelists agreed that all pregnancies should be screened for vasa previa and that this should be performed at the time of the second-trimester anatomy scan and through both identification of the placental cord insertion[49] and a routine color flow Doppler sweep of the region overlying the cervix. Although some guidelines recommend identification of the placental cord insertion when feasible,[49,50] none currently recommend a color Doppler flow sweep of the region overlying the cervix. Placental cord insertion alone will identify most cases of type 1 vasa previa but will fail to identify types 2 and 3 vasa previa.[13,15,16,18] Several national guidelines
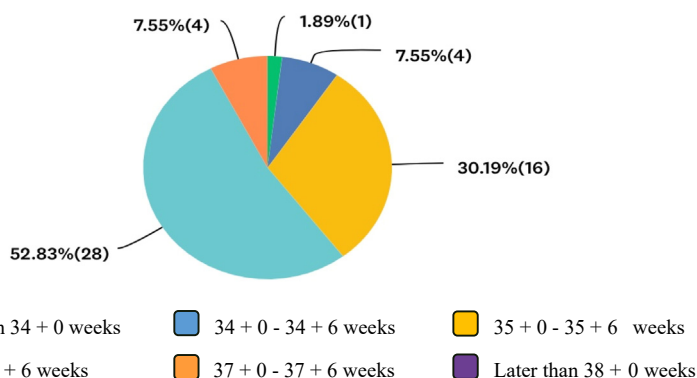
FIGURE 3
Expert recommendations regarding timing of delivery

Legend:
- Earlier than 34 + 0 weeks
- 34 + 0 - 34 + 6 weeks
- 35 + 0 - 35 + 6 weeks
- 36 + 0 - 36 + 6 weeks
- 37 + 0 - 37 + 6 weeks
- Later than 38 + 0 weeks

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state that there is insufficient evidence to recommend routine screening for vasa previa.[1–3] However, there are data supporting universal vasa previa screening because it is feasible without requiring additional personnel, time, and equipment beyond what is used in routine obstetrical ultrasound.[31,51,52] Given the high perinatal mortality associated with vasa previa undiagnosed before birth, the high detection rate of ultrasound for the condition, and the dramatic reduction in perinatal mortality accompanying prenatal diagnosis, several authors have argued for universal screening for the condition.[4,8,23,31,53]

The panel also agreed that transvaginal ultrasound screening should be performed routinely in patients with risk factors for vasa previa (second-trimester low-lying placenta and placenta previa, velamentous cord insertion, multifetal pregnancies, pregnancies with accessory lobes). This is consistent with several guidelines that recommend targeted screening in patients with these risk factors.[3,41,54] In addition, our experts concurred that when vasa previa diagnosis is made in the second trimester, it should be confirmed in the third trimester. Previous studies have indicated that between 15% and 40% of cases of vasa previa diagnosed in the second trimester will resolve by the time of delivery.[21,55]

Clinical management

There is ongoing debate about whether patients with vasa previa should routinely be admitted to the hospital in the third trimester.[1,3,4,56,57] There was consensus that in symptomatic patients or those at high risk for preterm delivery, hospitalization should be recommended (Table 1). The experts in this study did not reach a consensus that patients with prenatally diagnosed vasa previa should be routinely admitted to the hospital, and agreed that asymptomatic patients (without bleeding, regular painful uterine contractions, or loss of fluid) without risk factors for spontaneous preterm delivery (short cervix, history of spontaneous preterm delivery, positive fetal fibronectin) could be managed as outpatients until delivery. Nearly a third of

the experts reported that they admit patients only for delivery without routine steroid administration (Figure 2). Of those who reported routinely admitting asymptomatic patients, 30% reported admitting patients between $32^{0/7}$ and $33^{6/7}$ weeks, and 26% reported admitting patients between $34^{0/7}$ and $35^{6/7}$ weeks (Figure 2).

Cervical surveillance with transvaginal ultrasound and fetal monitoring have been proposed for patients with vasa previa.[58] However, the panel concluded that although these interventions may have a clinical role, practice should be tailored to the individual institutional guidelines.

There was no consensus on avoiding sexual intercourse or recommending pelvic rest, nor on performing monitoring for contractions, routine administration of steroids, routine vascular mapping before surgery, and routinely performing 3-dimensional ultrasound for vasa previa. Fetoscopic laser ablation has been proposed as a potential treatment for selected cases of types 2 and 3 vasa previa.[59,60] The panel's consensus opinion was that this intervention should be considered experimental at this time.

Timing of delivery
Although some authors have recommended delivery as early as 32 weeks, our experts agreed that delivery in asymptomatic patients without risk factors for spontaneous preterm birth should occur between 35 and 37 weeks of gestation. Over half of the experts chose between 36^0 and 36^6 weeks, whereas 30.2% opted for 35^0 to 35^6 weeks (Figure 3). This is consistent with both a recent cohort study and a systematic review and meta-analysis that found that best outcomes were achieved with delivery between 36^0 and 36^6 weeks in asymptomatic patients.[61,62]

Clinical implications
Screening
The consensus that pregnant patients should routinely be screened for vasa previa will help reduce the preventable perinatal mortality arising from this condition.[30,31] It has been proposed that

if vasa previa were to not be diagnosed, it would likely result in >1000 perinatal deaths in the United States each year. It is therefore important that all involved in obstetrical imaging be aware of this condition and how to screen for and recognize it, and know which patients are at increased risk for vasa previa.[4,6,9,26,53] However, despite screening, even with experienced examiners, it is possible to miss some cases of vasa previa.[3,4,12,63,64]

Clinical management
The panelists agreed that outpatient management is reasonable for asymptomatic patients without risk factors for preterm birth. Thus, practitioners should not assume that hospitalization is mandatory for all patients with vasa previa, but rather that there should be individualization of care with careful consideration of risk and logistics (such as access to the hospital). Furthermore, shared decision-making should determine whether patients are hospitalized. Although no consensus was reached on steroid administration, we recommend that rather than routine administration of steroids, this should be based on an individual risk assessment of high likelihood of delivery within 7 days before 36^6 weeks.

Timing of delivery
The expert panel also provides guidance on timing of delivery. Previous studies have indicated substantial morbidity related to preterm delivery in patients with prenatally diagnosed vasa previa. The recommendation to deliver asymptomatic patients without risk factors at 35^0 to 37^0 weeks will reduce the risks of preterm delivery to the newborn and will hopefully lead to improved neonatal outcomes. Timing of delivery should take into consideration individual patient circumstances, and detailed counseling and shared decision-making are recommended.

Research implications
Definition
Although the panel reached a consensus on many aspects of the diagnosis and management of vasa previa, several

knowledge gaps still exist that could not be addressed adequately in our study. For example, consensus was not reached regarding a specific distance from the internal os for making the diagnosis of vasa previa. In addition, the distance from the fetal vessels to the internal os at which patients may safely deliver vaginally remains unknown.

Screening
There is a need for more data on the true incidence of vasa previa in most countries, and the national impact of screening on reducing perinatal mortality rates. The cost-effectiveness of routine screening for vasa previa also needs to be examined more closely. There are ongoing studies examining routine transvaginal ultrasound cervical length assessment at the time of the anatomy scan for preterm birth prevention. This would be an ideal population to evaluate the cost-effectiveness of adding screening for vasa previa in these patients.

Clinical management
Further studies are necessary to examine the role of hospitalization for patients with vasa previa, and to determine which patients may be safely managed as inpatients or outpatients. There is a need to better determine optimal timing of steroid administration and the roles of cervical length surveillance and antenatal fetal monitoring. There is ongoing research into the potential role of fetoscopic laser ablation as a treatment for selected cases of vasa previa.[59,60] Further studies would be important to close these knowledge gaps.

Strengths and limitations
Our study has several strengths. First, we were able to assemble an international group of experts, with representation from 13 countries in 5 continents. Furthermore, our expert panel represents individuals who have considerable experience in diagnosing and managing patients with vasa previa and have contributed to >80% of the published cohort studies on vasa previa listed on PubMed. Our experts report managing an average of >10 patients with vasa previa annually. Furthermore, included

among our experts are those who have authored national society guidelines on vasa previa. Second, we were able to achieve consensus on several controversial issues surrounding vasa previa. Third, we achieved a high response rate of >80% to each of the rounds, which substantially increases the validity of our methodology. Fourth, because of our extensive systematic review and FGDs before the Delphi study, we were able to identify the issues regarding vasa previa that needed to be addressed and the areas of debate in clinical practice. Fifth, according to the principles of the Delphi technique, all experts were blinded to responses of other experts, allowing their true opinions to be made known without influence from others.

A limitation is our exclusion of twin pregnancies because those have a different risk profile and may be at higher risk for adverse outcomes.[65,66] Another limitation was that the panel could not reach consensus on best practice regarding steroid administration and the role of cervical surveillance and fetal monitoring.

Conclusions
Using a robust FGD and Delphi technique, international expert consensus opinion was achieved regarding the diagnosis and clinical management of vasa previa. This will be helpful for both health care providers and patients, and support the development of new clinical guidelines.

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SUPPLEMENTAL TABLE 1
Survey Questions and Responses for the Delphi Round 1.

Response Rate: 57/68 = 83.82%

A. Definitions

Phrase	Median
I define vasa previa (VP) as unprotected fetal vessels (artery or vein) running through the membranes within 2 cm from the internal cervical os.	4
I define VP as unprotected fetal vessels (artery or vein) running through the membranes within 5 cm from the internal cervical os.	3
I consider unprotected vessels within 5 cm from internal cervical os at risk of rupture.	4
I use the term "vasa previa" only if the unprotected fetal vessels are still present after 26 + 0 weeks.	2
In my routine practice, I make the diagnosis of VP at any gestational age but it should be confirmed later in the pregnancy.	5
I do not consider the gestational age in the VP definition.	3

Screening and Diagnosis

Phrase	Median
I recommend screening for VP in all pregnant persons.	5
I only recommend screening for VP in pregnant persons with risk factors (placenta previa, low-lying placenta, IVF pregnancies, bilobed or succenturiate lobe placenta, marginal/velamentous cord insertion).	2
I recommend routinely screening pregnant persons for VP by transvaginal sonography (TVS) and color Doppler imaging (CDI).	3
I recommend routinely screening for VP by identifying the umbilical cord insertion into the placenta by trans-abdominal US at the time of the mid-trimester anatomy scan.	4
I recommend routinely performing a trans-abdominal US with color Doppler sweep of the lower uterine segment and then transvaginal sonography/color Doppler imaging for confirmation in cases of suspected VP.	4
I recommend screening at the time of the anatomy scan.	5
I recommend a follow-up transvaginal sonography/color Doppler imaging at about 32 weeks in patients with a previous diagnosis of placenta previa, low-lying placenta, or VP at the time of anomaly scan.	5
In the evaluation of suspected VP by transvaginal sonography/color Doppler imaging, I recommend examining the region over the cervix in multiple planes (i.e., sagittal, coronal, etc.)	5
In evaluation for suspected VP, I believe that the fetal presenting part should not be applied to the cervix and compressing the vessels.	4
I recommend manual displacement of the presenting part from the cervix. If the presenting part cannot be displaced, vasa previa cannot be ruled out with certainty.	4
I do not routinely suggest three-dimensional (3D) ultrasound for VP diagnosis.	4
I suggest ultrasound for vascular mapping before the delivery.	4

Management

Phrase	Median
I believe that outpatient management of asymptomatic patients (without bleeding, regular painful contractions, or loss of fluid) without risk factors for preterm birth or rupture of the membranes (history of preterm birth, short cervix, positive fetal fibronectin) is reasonable.	4
I routinely recommend an NST/CTG to detect contractions.	3
I only recommend NST/CTG in patients with short CL to check for any asymptomatic contractions.	2
I recommend 1-2 scans to check CL, BPP, and fetal growth from 32 weeks until delivery.	3
I routinely recommend admission to all patients with VP.	3
I routinely offer admission for all patients with VP.	4

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.   *(continued)*

Management

Phrase	Median
I do not routinely recommend admission to VP patients.	3
I recommend admission to VP patients with shortened CL (less than 25mm).	4
I recommend admission to VP patients with premature contractions (symptomatic or detected by tocography).	4
I recommend admission to VP patients with variable decelerations on the outpatient NST/CTG.	5
I recommend admission to VP patients with limited access to medical centers.	4
I recommend admission to VP patients with bleeding or rupture of the membranes.	5
I offer admission according to the special social circumstances of the pregnant person (including their willingness to become admitted, their anxiety, difficult access to the medical center, etc.).	5
I routinely give steroids just before the delivery or within one week of delivery.	4
I do not routinely give steroids to VP patients.	2
I recommend that all patients with VP avoid vaginal penetration during the entire pregnancy.	4
I do not suggest pelvic rest during pregnancy for asymptomatic patients with VP with normal CL.	3
I do not recommend complete bed rest for patients with VP.	5
I recommend not to change the level of activity in patients with VP.	4
I recommend avoiding high-impact/intensity activity for patients with VP.	4
I believe that fetoscopic laser ablation for VP should be considered experimental and is not routinely recommended.	5
I offer fetoscopic laser ablation as an optional treatment for patients with type II VP with a normal placental cord insertion to the dominant lobe and otherwise normal pregnancy after 32 weeks.	2

Outpatient management in asymptomatic patients with VP from the time of diagnosis to 32 weeks:

Phrase
Please select one regarding your recommendation for transvaginal (TV) cervical length (CL) examination:

10.53%(6)
26.32%(15)
33.33%(19)
29.82%(17)

⬛ Weekly   ⬛ Every 2 weeks   ⬛ Every 4 weeks   ⬛ I do not recommend at all

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.   *(continued)*

SUPPLEMENTAL TABLE 1
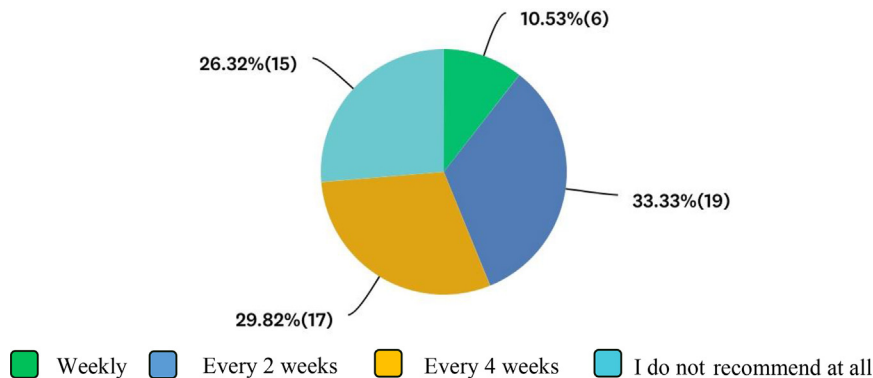**Survey Questions and Responses for the Delphi Round 1.** *(continued)*

Outpatient management in asymptomatic patients with VP from the time of diagnosis to 32 weeks:

Phrase

Please select one regarding your recommendation for routine growth scans:

21.05%(12)   17.54%(10)

61.40%(35)

■ Every 2 Weeks   ■ Every 4 Weeks   ■ I do not recommend at all

Outpatient management in asymptomatic patients with VP after 32 weeks until delivery/admission:

Phrase

Please select one regarding your recommendation for transvaginal (TV) cervical length (CL) examination:

33.33%(19)   28.07%(16)

5.26%(3)   33.33%(19)

■ Weekly ■ Every 2 weeks ■ Every 4 weeks ■ I do not recommend at all

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.   *(continued)*
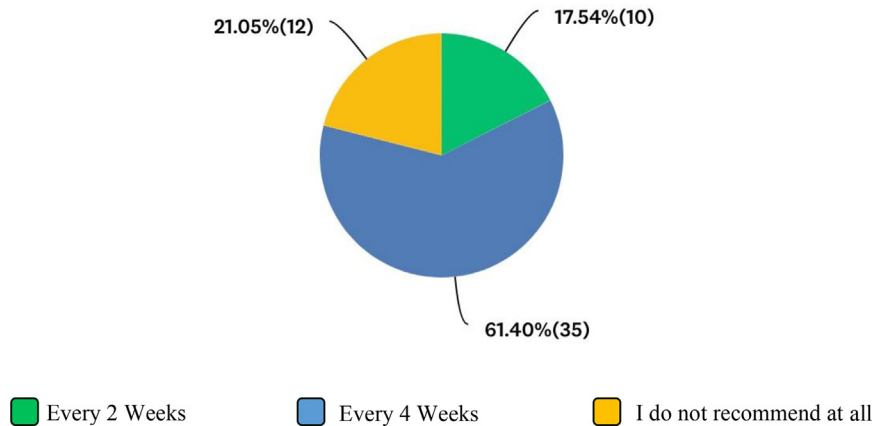

SUPPLEMENTAL TABLE 1
Survey Questions and Responses for the Delphi Round 1. *(continued)*

Outpatient management in asymptomatic patients with VP after 32 weeks until delivery/admission:

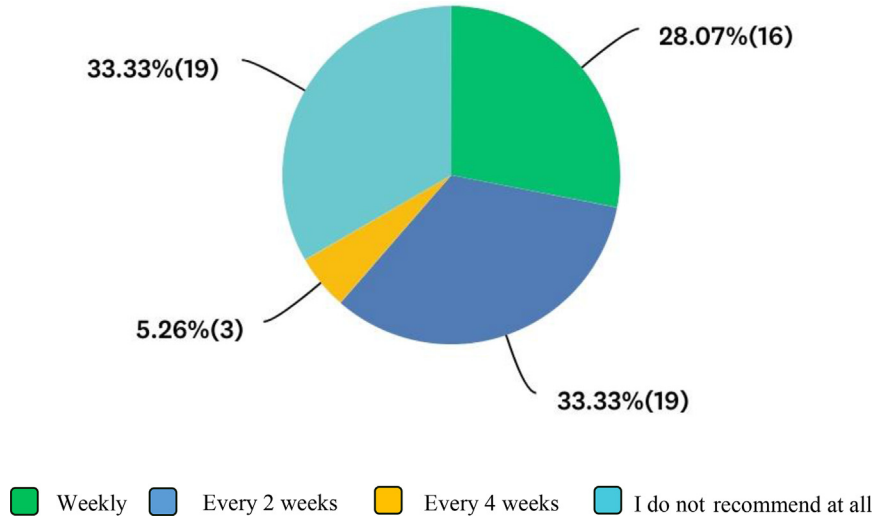**Phrase**

Please select one regarding your recommendation for NST/CTG evaluation:

22.81%(13) 17.54%(10) 12.28%(7) 47.37%(27)

■ Weekly   ■ 2 Time per Week   ■ I do not recommend   ■ Comment/Modification
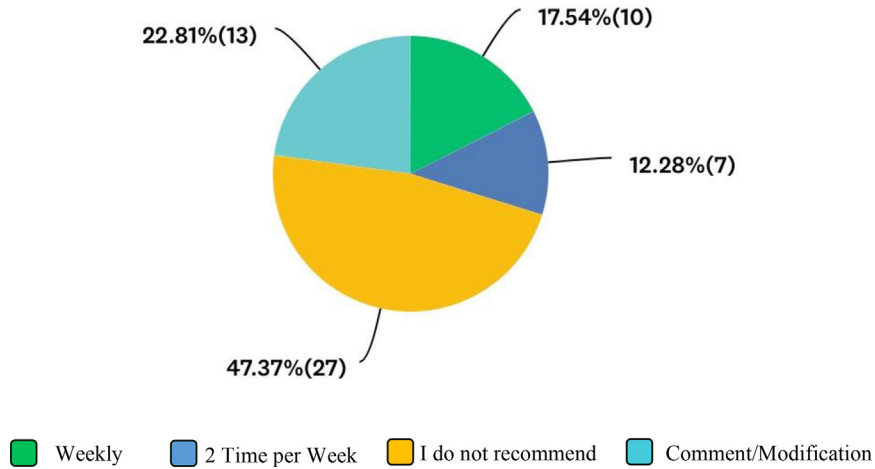
Phrase

Please select one regarding your recommendation for BPP evaluation:
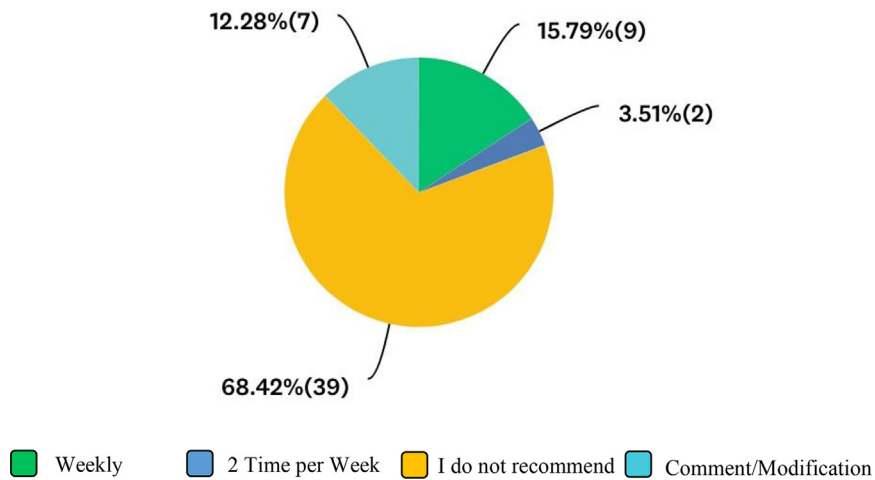
12.28%(7) 15.79%(9) 3.51%(2) 68.42%(39)

■ Weekly   ■ 2 Time per Week   ■ I do not recommend   ■ Comment/Modification

Comments:

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024. *(continued)*

SUPPLEMENTAL TABLE 1
Survey Questions and Responses for the Delphi Round 1. *(continued)*

Phrase
Please select **at least** one regarding your routine recommendation for admission:

Percentage of Responses
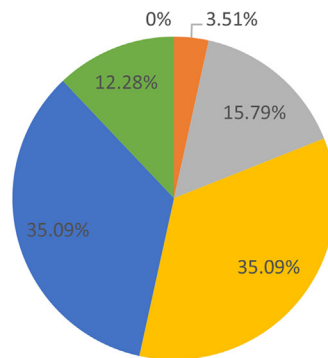
- Earlier than 28 + 0 weeks.
- At 28 + 0 - 29 + 6 weeks
- At 30 + 0 - 31 + 6 weeks
- At 32 + 0 - 33 + 6 weeks
- At 34 + 0 - 35 + 6 weeks
- After 36 + 0 weeks

Phrase
If you routinely give steroids, please select **at least** one:

Percentage of Responses

- At 28 + 0 − 29 + 6 weeks
- At 30 + 0 − 31 + 6 weeks
- At 32 + 0 − 33 + 6 weeks
- At 34 + 0 − 35 + 6 weeks

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.   *(continued)*

SUPPLEMENTAL TABLE 1
Survey Questions and Responses for the Delphi Round 1. *(continued)*

Phrase	
Timing of Delivery (asymptomatic patients)	
Phrase	**Median**
I believe that the caliber and type (main umbilical cord vs. peripheral vessels) of VP could affect our general recommendation for the time of delivery.	3
I do not recommend routine delivery earlier than 34 + 0 weeks.	5
I recommend routine delivery at 34+0 − 36+6.	4
I do not recommend delivery later than 38 + 0 weeks.	5

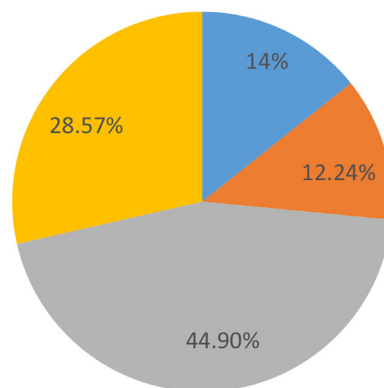| Phrase |
| --- |
| Please select **at least** one regarding your recommendation for routine delivery: |

Percentage of Responses
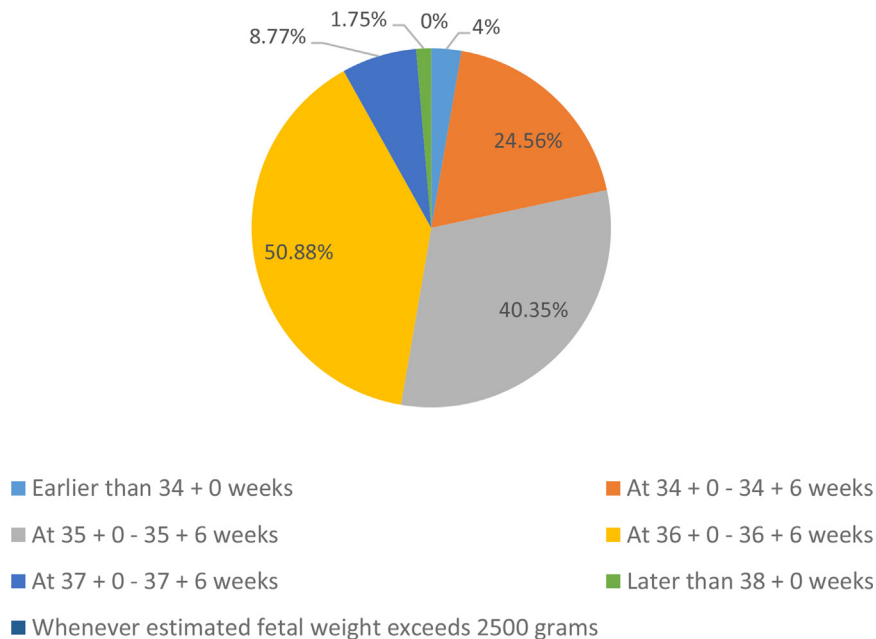
- Earlier than 34 + 0 weeks
- At 34 + 0 - 34 + 6 weeks
- At 35 + 0 - 35 + 6 weeks
- At 36 + 0 - 36 + 6 weeks
- At 37 + 0 - 37 + 6 weeks
- Later than 38 + 0 weeks
- Whenever estimated fetal weight exceeds 2500 grams

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.

SUPPLEMENTAL TABLE 2
Survey Questions and Responses for the Delphi Round 2.

Response Rate: 53/57 = 92.98%

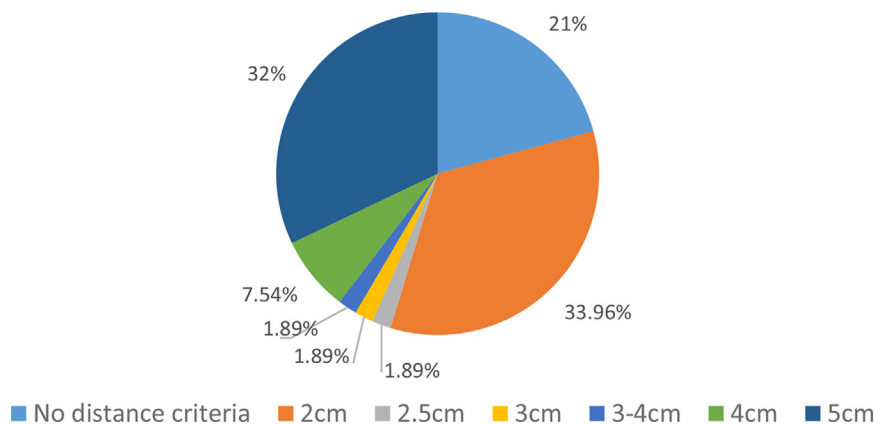| Definitions	
Phrase	**Median**
I define vasa previa as unprotected fetal vessels (artery or vein) running through the membranes only when the vessels are within 2 cm of the internal cervical os. While the diagnosis may be made in the second trimester, it should be confirmed in the third trimester.	4
The diagnosis of vasa previa made in the second trimester should be confirmed during the third trimester or before delivery.	5
There is no safe distance from the vessels to the internal os, and any vessels seen running through the membranes on transvaginal ultrasound should be considered vasa previa.	2

Phrase

I consider vasa previa to include unprotected fetal vessels (artery or vein) running through the membranes within what distance of the internal cervical os? (please specify in centimeters or put an "x" for no distance criteria)

Distance Criteria

21%
32%
33.96%
7.54%
1.89%
1.89%
1.89%

■ No distance criteria ■ 2cm ■ 2.5cm ■ 3cm ■ 3-4cm ■ 4cm ■ 5cm

Screening and Diagnosis	
Phrase	**Median**
I recommend routine identification of the umbilical cord insertion into the placenta by transabdominal ultrasound at the time of the mid-trimester anatomy scan in all pregnant individuals.	5
In all pregnant individuals, including those without risk factors, I recommend routine transabdominal ultrasound with color Doppler sweep of the lower uterine segment.	5
I recommend that when vasa previa is suspected on transabdominal ultrasound, the diagnosis should be confirmed with transvaginal ultrasound with Doppler.	5
In pregnant persons with any risk factors*, I recommend routine screening with transvaginal sonography and color Doppler imaging for vasa previa.	5
During the evaluation for suspected vasa previa, whenever possible, the fetal presenting part should not be applied on the cervix to avoid compressing the vessels. Techniques such as manual displacement or positioning the patient in a Trendelenburg position may be used to achieve this.	5
If in a patient with suspected vasa previa, the fetal head cannot be displaced away from the cervix, vasa previa cannot be excluded with certainty.	4

Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.   *(continued)*

SUPPLEMENTAL TABLE 2
Survey Questions and Responses for the Delphi Round 2. *(continued)*

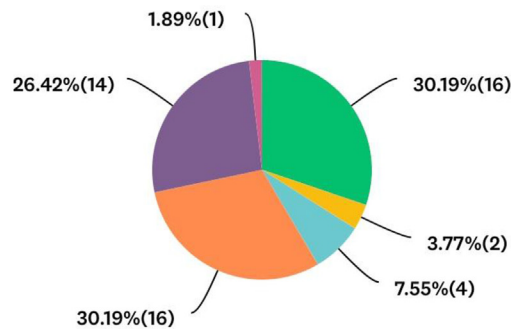| Screening and Diagnosis	Median
Phrase	
I routinely recommend using three-dimensional ultrasound for vasa previa diagnosis and/or follow-up.	2
I suggest routinely performing ultrasound for vascular mapping before delivery to guide the uterine incision during cesarean delivery.	3
Management	
Phrase	**Median**
In the outpatient management of asymptomatic patients from the time of diagnosis to 32 weeks, I recommend routine transvaginal cervical length examination every two to four weeks.	4
In the outpatient management of asymptomatic patients from the time of diagnosis to 32 weeks, I recommend routine growth scans every four weeks.	4
In asymptomatic patients without risk factors for preterm birth or rupture of the membranes*, outpatient management is reasonable after appropriate counseling, if the patient desires this, and has easy access to the hospital.	5
If you do not routinely admit your patients: in the outpatient management of asymptomatic patients after 32 weeks until delivery/admission, I recommend routine transvaginal cervical length examinations at least every two weeks.	4
If you do not routinely admit your patients: in the outpatient management of asymptomatic patients after 32 weeks until delivery/admission, I recommend routine weekly biophysical profile examinations.	3
I recommend admission to patients with progressive cervical shortening in the third trimester.	5
I recommend admission to patients with premature symptomatic uterine contractions.	5
I offer/recommend admission to patients with limited access to medical centers in the third trimester.	5
In patients with vasa previa, I recommend routinely giving steroids only within one week of planned delivery or just before delivery if delivery occurs before 37 weeks.	4
In patients with vasa previa, I recommend routinely giving steroids at the time of admission, regardless of the reason for admission and gestational age.	2
I recommend abstinence from vaginal penetration after confirming the diagnosis of vasa previa.	4
I recommend avoiding high-impact/intensity activity for patients with vasa previa in the third trimester.	4
Phrase	
If you recommend routinely admitting asymptomatic* patients with vasa previa and a normal cervical length, at what gestational age do you typically recommend admission:	

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SUPPLEMENTAL TABLE 2
**Survey Questions and Responses for the Delphi Round 2.** *(continued)*

Phrase

Legend:
- I do not routinely admit, only for the delivery
- Earlier than 28 + 0 weeks
- 28 + 0 − 29 + 6 weeks
- 30 + 0 - 31 + 6 weeks
- 32 + 0 - 33 + 6 weeks
- 34 + 0 - 35 + 6 weeks
- Later than 36 + 0 weeks

Pie values: 1.89%(1), 26.42%(14), 30.19%(16), 3.77%(2), 7.55%(4), 30.19%(16)

Phrase

If you routinely recommend steroids to asymptomatic* patients with normal cervical length, at what gestational age do you typically administer?
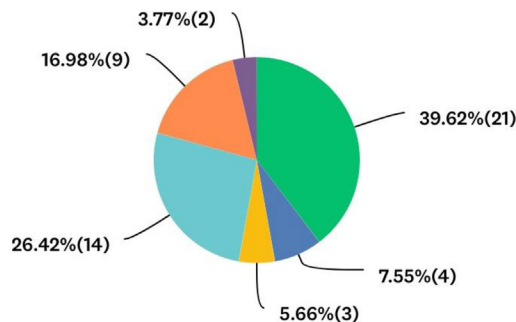
Legend:
- I do not routinely recommend steroids to these patients
- 28 + 0 − 29 + 6 weeks
- 30 + 0 - 31 + 6 weeks
- 32 + 0 - 33 + 6 weeks
- 34 + 0 - 35 + 6 weeks
- 36 + 0 - 36 + 6 week

Pie values: 3.77%(2), 16.98%(9), 39.62%(21), 7.55%(4), 5.66%(3), 26.42%(14)

Timing of Delivery (asymptomatic patients)

Phrase	Median
In asymptomatic* patients with vasa previa and a normal cervical length, I recommend routine delivery between 35 + 0 and 36 + 6.	5

Phrase

Based on your expertise, at what gestational age do you recommend delivering asymptomatic* patients with a normal cervical length?

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(continued)

SUPPLEMENTAL TABLE 2
Survey Questions and Responses for the Delphi Round 2. *(continued)*

Phrase

Pie chart segments:
- 1.89%(1) — Earlier than 34 + 0 weeks (green)
- 7.55%(4) — 34 + 0 - 34 + 6 weeks (blue)
- 30.19%(16) — 35 + 0 - 35 + 6 weeks (yellow)
- 52.83%(28) — 36 + 0 - 36 + 6 weeks (teal)
- 7.55%(4) — 37 + 0 - 37 + 6 weeks (orange)
- Later than 38 + 0 weeks (purple)

Legend:
- Earlier than 34 + 0 weeks
- 34 + 0 - 34 + 6 weeks
- 35 + 0 - 35 + 6 weeks
- 36 + 0 - 36 + 6 weeks
- 37 + 0 - 37 + 6 weeks
- Later than 38 + 0 weeks

Comments:

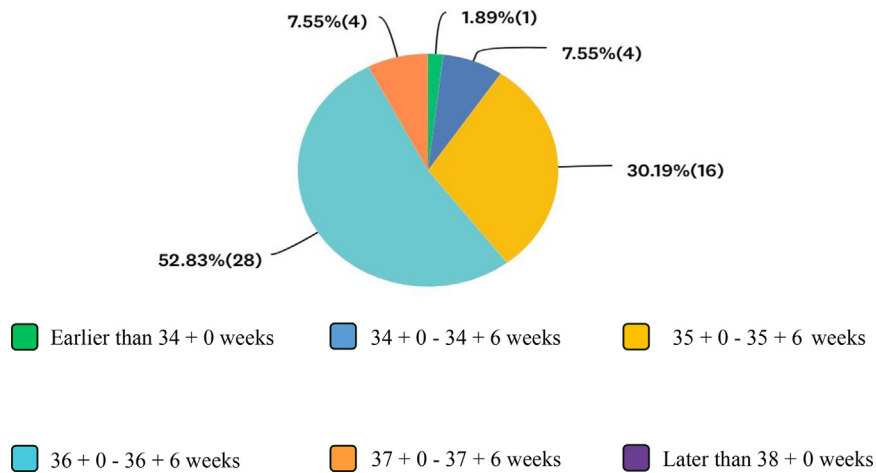*Oyelese. Vasa previa Delphi consensus. Am J Obstet Gynecol 2024.*

SUPPLEMENTAL TABLE 3
Survey Questions and Responses for the Delphi Round 3.

Response Rate: 48/53 = 90.57%

B. Final Statements

Phrase	Agreement
In the previous round, we asked the following question: "I consider vasa previa to include unprotected fetal vessels (artery or vein) running through the membranes within what distance of the internal cervical os? (Please specify in centimeters or put an "x" for no distance criteria)." Here are the answers: -No distance criteria: 11/53 = 20.75% -2cm: 18/53 = 33.96% -2.5cm: 1/53 = 1.89% -3cm: 1/53 = 1.89% -3-4cm: 1/53 = 1.89% -4cm: 4/53 = 7.54% -5cm: 17/53 = 32.07% Based on the results of our previous round, please indicate whether you agree or disagree with the following statement: While there is no consensus regarding a distance definition for vasa previa, I feel the definition of vasa previa should not be limited to vessels within 2 cm of the internal os.	79.17%
In the previous round, the following two statements received a median score of four: "In the outpatient management of asymptomatic patients from the time of diagnosis to 32 weeks, I recommend routine transvaginal cervical length examination every two to four weeks." "If you do not routinely admit your patients: in the outpatient management of asymptomatic patients after 32 weeks until delivery/ admission, I recommend routine transvaginal cervical length examinations at least every two weeks." In the majority of the comments we received, there was a discrepancy between the gestational age and frequency of examination used during the examination. Based on this observation, we would like to propose the following statement. Kindly indicate whether you agree or disagree with it: Transvaginal ultrasound measurements of cervical length have a role in the management of vasa previa. This may be individualized according to institutional protocols and resources.	89.58%
In the previous round, the following statements did not reach a consensus: "In the outpatient management of asymptomatic patients from the time of diagnosis to 32 weeks, I recommend routine growth scans every four weeks. (median score of 4)" "If you do not routinely admit your patients: in the outpatient management of asymptomatic patients after 32 weeks until delivery/ admission, I recommend routine weekly biophysical profile examinations. (median score 3)" In all the comments we received, it was noted that the growth scan/BPP is conducted at a frequency different from what was initially mentioned. Additionally, some participants mentioned that they routinely admit their patients at or before 32 weeks, and the scans are performed according to the inpatient policies. In light of this feedback, we propose the following statement. Please indicate whether you agree or disagree with it: In patients with vasa previa, fetal surveillance, including biophysical profile examinations and growth scans, plays a role in management and should be conducted in accordance with institutional protocols and available resources.	85.42%

C. Consensus Statements

Phrase	Agreement
Please confirm that you have reviewed all of the consensus results.	95.83%

D. Non-Consensus Statements

Phrase	Agreement
Please confirm that you have reviewed the non-consensus results.	95.83%

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SUPPLEMENTAL TABLE 4
International expert participants in the Delphi Survey

1. AKOLEKAR, Ranjit, MD, Chatham, England, UK

2. BARTAL, Michal Fishel, MD, Houston, TX, USA

3. BLUMENFELD, Yair, MD, Palo Alto, CA, USA

4. BRONSTEEN, Richard, MD, Beverly Hills, MI, USA

5. CATANZARITE, Val, MD, PhD, San Diego, CA, USA

6. CHAVEZ, Martin R., MD, New York, NY, USA

7. CHMAIT, Ramen, MD, Los Angeles, CA, USA

8. CHUEH, Jane, MD, Palo Alto, CA, USA

9. CINCOTTA, Robert, MBBS, FRANZCOG, DDU, CMFM, South Brisbane, Australia

10. D'SOUZA, Rohan, MD, PhD, FRCOG, MSc, Hamilton, Ontario, Canada

11. DALY-JONES, Elizabeth, MSc, London, England, UK

12. DEGIRMENCI, Yaman, MBBS, Mainz, Germany

13. DELABAERE, Amelia, MD, Clermont-Ferrand, France

14. DUNCOMBE, Gregory, MBBS CSCT(FMP) FRANZCOG, DDU, CMFM, Grad Cert App Law, GAICD, Brisbane, Australia

15. FRANCOIS, Karrie, MD, Phoenix, AZ USA

16. FURUYA, Natsumi, MD, Kanagawa, Japan

17. GAROFALO, Anna, MD, Arezzo, Italy

18. GROBMAN, William, MD, MBA, Columbus, OH, USA

19. GUDANOWSKI, Brittany, BS, Boston, MA, USA

20. HASEGAWA, Junichi, MD, PhD, Tokyo, Japan

21. HENRICH, Wolfgang, MD, Berlin, Germany

22. HERNANDEZ-ANDRADE, Edgar, MD, PhD, Houston, TX, USA

23. JAUNIAUX, Eric, MD, PhD, FRCOG, DHSc, London, England, UK

24. JAVINANI, Ali, MD, Boston, MA, USA

25. KRISPIN, Eyal, MD Boston, MA, USA

26. LEES, Christoph, MD, London, England, UK

27. LOCKWOOD, Charles, MD, Tampa, FL, USA

28. MATSUZAKI, Shinya, MD, Osaka, Japan

29. MAYMON, Ron, MD, Petah Tikva, Israel

30. MELCER, Yaakov, MD, Tel Aviv, Israel

31. ODIBO, Anthony, MD, MSCE, St. Louis, MO, USA

32. OYELESE, Yinka, MD, Boston, MA, USA

33. PAJKRT, Eva, MD, PhD, Amsterdam, Netherlands

34. PAPANNA, Ramesha, MD, MPH, Houston, TX, USA

35. POOH, Ritsuko, MD, PhD, LLB, MSc, Osaka, Japan

36. PREFUMO, Federico, MD, PhD, Genova, Italy

37. RANZINI, Angela C., MD, Cleveland, OH, USA

38. REBARBER, Andrei, MD, New York, NY, USA

39. ROLNIK, Daniel L., MD, PhD, MPH, Melbourne, Australia

40. ROMAN, Ashley S., MD, MPH, New York, NY, USA

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SUPPLEMENTAL TABLE 4
International expert participants in the Delphi Survey *(continued)*

41.	SCHEIER, Matthias, A., MD, MSc, Feldkirch, Austria
42.	SEPULVEDA, Waldo, MD, Santiago, Chile
43.	SERRA, Bernat, MD, Barcelona, Spain
44.	SHAINKER, Scott A., DO, MS, Boston, MA, USA
45.	SHAMSHIRSAZ, Alireza A., MD, Boston, MA, USA
46.	SHEINER, Eyal, MD, PhD, Beersheba, Israel
47.	SILVER, Robert, MD, Salt Lake City, UT, USA
48.	SINKEY, Rebecca, MD, Birmingham, AL, USA
49.	SMULIAN, John C., MD, MPH, Gainesville, FL, USA
50.	SRINIVASAN, Deepa, MBBS, DGO, MD, MRCOG, London, England, UK
51.	STONE, Joanne, MD, MS, New York, NY, USA
52.	SWANK, Morgan, MD, Denver, CO, USA
53.	TACHIBANA, Daisuke, MD, PhD, Osaka, Japan
54.	USHAKOV, Fred, MD, London, England, UK
55.	VILLE, Yves, MD, Paris, France
56.	VINTZILEOS, Anthony M., MD, New York, NY, USA
57.	VIORA, Elsa, MD, Turin, Italy
58.	WESTCOTT, Jill, MD, MS, Kansas City, MO, USA
59.	ZACONETA, Alberto, MD, PhD, MSc, Brasilia, Brazil

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