Society for Maternal-Fetal Medicine
High-risk pregnancy experts

Society for Maternal-Fetal Medicine (SMFM) Consult Series | #44
smfm.org

Society for Maternal-Fetal Medicine (SMFM) Consult Series #44: Management of bleeding in the late preterm period

Society for Maternal-Fetal Medicine (SMFM); Cynthia Gyamfi-Bannerman, MD, MSc

The American College of Obstetricians and Gynecologists endorses this document.

Third-trimester bleeding is a common complication arising from a variety of etiologies, some of which may initially present in the late preterm period. Previous management recommendations have not been specific to this gestational age window, which carries a potentially lower threshold for delivery. The purpose of this document is to provide guidance on management of late preterm (34 0/7–36 6/7 weeks of gestation) vaginal bleeding. The following are Society for Maternal-Fetal Medicine recommendations: (1) we recommend delivery at 36–37 6/7 weeks of gestation for stable women with placenta previa without bleeding or other obstetric complications (GRADE 1B); (2) we do not recommend routine cervical length screening for women with placenta previa in the late preterm period due to a lack of data on an appropriate management strategy (GRADE 2C); (3) we recommend delivery between 34 and 37 weeks of gestation for stable women with placenta accreta (GRADE 1B); (4) we recommend delivery between 34 and 37 weeks of gestation for stable women with vasa previa (GRADE 1B); (5) we recommend that in women with active hemorrhage in the late preterm period, delivery should not be delayed for the purpose of administering antenatal corticosteroids (GRADE 1B); (6) we recommend that fetal lung maturity testing should not be used to guide management in the late preterm period when an indication for delivery is present (GRADE 1B); and (7) we recommend that antenatal corticosteroids should be administered to women who are eligible and are managed expectantly if delivery is likely within 7 days, the gestational age is between 34 0/7 and 36 6/7 weeks of gestation, and antenatal corticosteroids have not previously been administered (GRADE 1A).

Key words: late preterm bleeding, late preterm delivery, late preterm vaginal bleeding, placenta accreta, placental abruption, placenta previa, vasa previa

Third-trimester bleeding is a common complication arising from a variety of etiologies, some of which may initially present in the late preterm period. Previous management recommendations have not been specific to this gestational age window, which carries a potentially lower threshold for delivery. The purpose of this document is to provide guidance about management of late preterm (34 0/7–36 6/7 weeks of gestation) vaginal bleeding.

What are the etiologies of late preterm antepartum third-trimester bleeding?

The phrase, third-trimester bleeding, defines vaginal blood loss that occurs in the latter part of pregnancy and can range from spotting to obstetric hemorrhage. There is no universally agreed-upon definition of antepartum obstetric hemorrhage; however, the definition most frequently used is bleeding from the genital tract that occurs in the latter half of gestation.

The etiologies of third-trimester bleeding are varied and of differing acuity. The epidemiology of late preterm vaginal bleeding has not previously been described. Although bleeding during this time is usually attributed to placenta previa, placental abruption, or vasa previa, there are other causes of bleeding that occurs late in pregnancy. Lesions of the lower genital tract or early labor are common etiologies of late pregnancy bleeding. Etiologies of late preterm bleeding are listed in Table 1.

Etiologies of late preterm bleeding

Placenta previa

Placenta previa can cause late preterm third-trimester bleeding and is defined as placental implantation that

Corresponding author: Society for Maternal-Fetal Medicine: Publications Committee. pubs@smfm.org

Received Oct. 12, 2017; accepted Oct. 16, 2017.

overlies or abuts the internal cervical os. Classically, a patient presents with painless bleeding. Diagnosis is most accurately made by transvaginal ultrasound.[1,2] The incidence of placenta previa ranges from 5% to 20% with second-trimester transabdominal ultrasonography.[3-5]

Transvaginal ultrasound provides a more accurate diagnosis than transabdominal ultrasound, with estimates of prevalence in the second trimester of 1–4%.[6,7] The prevalence of placenta previa decreases to 0.3–0.5% at term.[3,5] Risk factors for placenta previa include advanced maternal age, multiparity, prior cesarean delivery, multifetal gestation, and smoking.

Recommendations for timing of delivery in a woman who presents with placenta previa vary, based on the amount of bleeding and maternal and fetal status. **We recommend delivery at 36–37 6/7 weeks of gestation for stable women with placenta previa without bleeding or other obstetric complications, (GRADE 1B).**[8,9]

Women with active, ongoing obstetric hemorrhage in the late preterm period, regardless of etiology, require stabilization and preparation for delivery. Similarly, because the likelihood of a subsequent bleeding episode increases with the number of prior bleeding episodes as well as with increasing gestational age,[10] delivery may be considered for women presenting with mild late preterm bleeding who have had 1 or more prior bleeding episodes at less than 34 weeks of gestation.

The management of women with initial mild bleeding episodes at 34–35 weeks of gestation that has resolved by the time of evaluation is less clear. Several small studies suggest that cervical length measurement may help distinguish those who are likely to have another bleed from those who are not likely to bleed again.[11-13] **However, we do not recommend routine cervical length screening for women with placenta previa in the late preterm period due to a lack of data on an appropriate management strategy (GRADE 2C).**[14]

Placenta accreta

Placenta accreta is defined as abnormal trophoblast infiltration beyond the fibrinoid Nitabuch layer, resulting in abnormal adherence to the myometrium. If the placenta invades the myometrium, it is termed placenta increta. If it penetrates beyond the myometrium, it is called placenta percreta.

Placenta accreta is most commonly associated with placenta previa and previous cesarean delivery; other risk factors include previous uterine surgery, advanced maternal age, smoking, and multiparity.[15] The incidence of accreta in the absence of placenta previa is <1% unless a woman has had more than 5 prior cesareans.[16]

Antepartum bleeding risk with placenta accreta is primarily related to the common occurrence of coexisting placenta previa. In general, women with placenta accreta are at greatest risk of bleeding at the time of delivery.

Diagnosis is generally made by ultrasonography, and sonographic markers suggestive of placenta accreta have been described.[15] These include multiple vascular lacunae within the placenta, blood vessels traversing the uteroplacental or uterovesicular junctions, loss of the normal hypoechoic retroplacental zone, a retroplacental myometrial thickness of <1 mm, or numerous coherent vessels visualized with 3-dimensional power Doppler in the basal view.[15,17-22]

Delivery timing for stable women with placenta accreta is based on the severe maternal morbidity associated with emergent bleeding.[8,23] Warshak et al[24] describe outcomes for cases of placenta accreta in which the diagnosis was made before delivery. Four of 9 cases of antenatally suspected placenta accreta managed beyond 36 weeks of gestation (44.4%) required emergent delivery for hemorrhage. A decision analysis to identify the most appropriate delivery timing for women with accreta, taking into account maternal and neonatal morbidities, concluded that 34 weeks was the ideal gestational age for delivery.[25]

Risk factors for unscheduled preterm delivery in this population include vaginal bleeding and the presence of uterine contractions, with each episode of bleeding increasing the likelihood of unscheduled delivery.[26] Based on this and other data, **we recommend delivery between 34 and 37 weeks of gestation for stable women with placenta accreta (GRADE 1B).**[8,9,15,23,25,27-31]

Delivery is indicated for women with placenta accreta and late preterm bleeding; however, for women who are clinically stable, delivery can be delayed briefly to coordinate logistics and assemble the care team.

Placental abruption

Placental abruption is defined as placental separation, either partial or complete, prior to delivery. Classically, women with placental abruption present with abdominal pain and bleeding, and approximately 60% will also have a nonreassuring fetal heart rate tracing.[32] Numerous risk factors for placental abruption have been described. These include hypertension, smoking, preterm premature rupture of the membranes, cocaine abuse, uterine myomas, and previous abruption.[33] The incidence of placental abruption is estimated to be between 0.5% and 1%.[34]

TABLE 1
Possible etiologies of late preterm third-trimester bleeding

Obstetric	Nonobstetric
Placenta previa	Internal or external hemorrhoids
Placental accreta, increta, or percreta	Urinary tract infection
Placental abruption	Bladder or kidney stones
Vasa previa	Lower gastrointestinal bleeding
Early labor	Lower genital tract lesions

SMFM. Management of bleeding in the late preterm period. Am J Obstet Gynecol 2018.

The diagnosis of abruption is best made by history and clinical presentation. Ultrasonography fails to detect placental abruption in approximately 20–50% of cases.[35] One series reports a 24% specificity, with a 53% negative predictive value for ultrasonographic diagnosis of abruption.[36] Because a small proportion of women with abruption present without vaginal bleeding, this diagnosis should be considered when in women who present with nonreassuring fetal status and uterine irritability on tocometry. Often, abruption is a diagnosis of exclusion in a woman with vaginal bleeding and no other identified etiology.

There are no clinical trials to guide timing of delivery for women with preterm abruption. Expert opinion suggests that delivery timing of stable women with a high clinical index of suspicion for a placental abruption should be in the late preterm or early term period.[37] If the diagnosis is unclear, bleeding is minimal, and the maternal and fetal status remain stable, delivery may be delayed with close surveillance and ongoing fetal testing. However, as with other women presenting with active hemorrhage from any etiology in the late preterm period, delivery is indicated in the setting of abruption with significant vaginal bleeding, abnormal laboratory results including acute anemia or coagulopathy, abnormality of the fetal heart tracing, or maternal instability.

Vasa previa

Vasa previa, an uncommon but potentially devastating condition that complicates approximately 1 in 2500 pregnancies, occurs when fetal vessels course through the membranes and traverse the internal os. Vasa previa should be suspected in cases of velamentous cord insertion, after resolved placenta previa or with a known succenturiate lobe.[38] Other risk factors for vasa previa include in vitro fertilization and multiple gestation.[39,40]

Perinatal morbidity and mortality associated with vasa previa are related to fetal vessel disruption at the time of membrane rupture. Older literature reports up to a 60% perinatal mortality with this diagnosis.[41] However, these rates vary with prenatal diagnosis. In 1 case series, antenatal diagnosis of vasa previa was associated with a 97% survival rate compared with a 44% survival rate without prenatal diagnosis.[41] As a result of recommendations to evaluate the placenta and placental cord insertion at the time of second-trimester ultrasound, antenatal diagnosis is now more common.[38,42]

Recommendations about timing of delivery for vasa previa are primarily directed at care for women with antenatal diagnoses who are stable. Because of the potential devastating effects of fetal vessel rupture, as well as the increasing likelihood of spontaneous labor, **we recommend delivery between 34 and 37 weeks of gestation for stable women with vasa previa (GRADE 1B).**[38,43-46] Emergent delivery is indicated for any woman with late preterm bleeding because of known vasa previa.

What is the evaluation of women who present with late preterm bleeding?

A detailed history and physical examination are important in the evaluation of bleeding in the late preterm period. Pertinent elements in the history include the amount and duration of bleeding as well as a review of the woman's obstetric course, including any prior bleeding.

A history of cesarean delivery, myomectomy, or dilation and curettage is important because these are thought to increase the risk of placenta accreta.[2,47] Imaging results should be reviewed to evaluate reported placentation. A review of the chart may also reveal previously noted cervicovaginal pathology that may contribute to bleeding, such as ectropion or cervical polyps. However, because the woman's diagnosis can evolve over time, chart review should not be a substitute for the bedside patient evaluation, including ultrasound evaluation.

The physical examination should include an assessment of both maternal and fetal status. Fetal status should be evaluated by electronic fetal monitoring. A speculum examination may be helpful to evaluate the extent and location of current bleeding. Ultrasound evaluation of placental location to rule out vasa or placenta previa should be performed prior to attempting a digital examination, particularly if placental location has not been documented or is unknown. In such cases, if ultrasound is not available, a digital vaginal examination should be avoided and other clinical findings, including the fetal heart tracing, should be used to guide further management until an ultrasound examination can be performed.

Ultrasonography

Ultrasonography is the most appropriate imaging modality to recognize or exclude placenta previa or vasa previa as the cause of late preterm vaginal bleeding. Specifically, transvaginal ultrasound should be performed to evaluate for placenta previa because the safety and reliability of this approach have been shown.[1-3]

To confirm the diagnosis of vasa previa, pulsed-wave Doppler can be used to identify an arterial vessel with a fetal heart rate,[2,38,43] although the presence of fetal vessels with venous blood flow identified with color Doppler may be equally ominous.[48]

As described above, ultrasound evaluation is also useful in the diagnosis of placenta accreta, but the sensitivity (89–92%) and specificity (92–97%) for diagnosis are lower than for placenta previa or vasa previa.[15] Placental abruption is easily missed by ultrasound; therefore, a high clinical suspicion for abruption should dictate management.[35,49]

Because the role of magnetic resonance imaging in the assessment of placenta accreta remains unclear,[15] this modality is not routinely recommended for the evaluation of a woman presenting with acute bleeding at 34–36 weeks of gestation.

TABLE 2
Late preterm delivery timing by etiology of bleeding

Etiology of hemorrhage	Amount of bleeding	Delivery	Expectant management
Placenta previa	Heavy	+	
	Light		+
Vasa previa	Any	+	
Placenta accreta	Any	+	
Placental abruption	Depends on index of suspicion and amount of bleeding	+ (if high index of suspicion and/or heavy bleeding)	+ (if low index of suspicion and light bleeding)
Cervicovaginal lesions (ectropion, cervical polyp, etc)	Any		+

SMFM. Management of bleeding in the late preterm period. Am J Obstet Gynecol 2018.

Laboratory evaluation

The laboratory evaluation for late preterm bleeding depends on the degree of bleeding and the woman's clinical status and can include a complete blood count with platelets, a type and crossmatch, prothrombin time/ and partial prothrombin time-International Normalized Ratio (INR) to evaluate coagulation factors, and fibrinogen. Blood urea nitrogen, creatinine, and electrolytes may also be assessed if the likelihood for transfusion is high.

A wall clot is a useful test to assess coagulopathy with acute bleeding. To perform this test, blood is placed into a plain (red-top) tube and put aside. The blood should clot within 6 minutes, and delayed clotting beyond this time is suggestive of coagulopathy.[50]

In women who are Rh negative, a quantitative rosette test, a qualitative Kleihauer-Betke stain, or flow cytometry may be useful to determine the degree of fetal-maternal hemorrhage.[51] A standard Rh immunoglobulin dose of 300 μg should be administered to patients with bleeding who are Rh negative, unless the Kleihauer-Betke stain suggests that additional doses of Rh immunoglobulin are needed.[52] Kleihauer-Betke testing is not indicated for women with late preterm bleeding unless they are Rh negative.[53]

What is the management for women with late preterm bleeding?

Timing of delivery

The management of women presenting with late preterm bleeding depends on the amount and duration of bleeding, maternal and fetal status, presence of preterm labor or ruptured membranes, and the patient's proximity to the hospital. The decision for delivery is highly dependent on the degree and etiology of bleeding.

Stabilization and preparation for delivery is indicated in women with an active, ongoing hemorrhage in the late preterm period, regardless of etiology. Stabilization includes the placement of 2 large-bore intravenous lines, determination of blood type and cross-matching for an initial 2–4 U of blood, and laboratory evaluation as described previously.

Fetal heart rate monitoring is also indicated. Many labor units utilize obstetric hemorrhage bundles or massive transfusion protocols; these tools should be used in women with acute hemorrhage as appropriate.[54,55] Many successful management strategies involve a multidisciplinary approach that includes the obstetric, nursing, and anesthesia teams. Assembling this team will allow for simultaneous efforts including initial resuscitation by fluid, blood, and blood products; alerting the blood bank to the possibility of massive hemorrhage; identifying and prepping O-negative blood while the woman is cross-matched; and preparing the operating room.

Mode of delivery will vary by clinical circumstances; women with an accreta or placenta previa will be delivered by cesarean, while women without a contraindication for vaginal delivery and reassuring fetal status are candidates for vaginal delivery. **We recommend that in women with active hemorrhage in the late preterm period, delivery should not be delayed for the purpose of administering antenatal corticosteroids (ACS) (GRADE 1B).**[56] **We also recommend that fetal lung maturity testing should not be used to guide management in the late preterm period when an indication for delivery is present (GRADE 1B).**[8] Maturation of the fetal lungs does not confirm maturation of other organ systems. A summary of indications for delivery is listed in Table 2.

Indications for expectant management

There are no current evidence-based recommendations for women who have a small amount of late preterm bleeding that has resolved by presentation to care. The conditions suggesting expectant management include maternal hemodynamic stability, reassuring fetal status, absence of active bleeding or contractions, and proximity of the patient to the hospital. Bleeding from ectropion, cervical polyps, or early labor is generally minor and self-limited. In the

presence of reassuring results of fetal testing, these women can be managed expectantly.

Similarly, women with placenta previa and a subjectively small bleed that has resolved by presentation may be observed and managed expectantly if this represents the first bleed in the pregnancy. Consideration may be given to an initial period of observation in the hospital for 24–48 hours after a subjectively heavy bleeding episode that has resolved, particularly if the etiology of the bleed is unclear.

We recommend that ACS should be administered to women who are eligible and are planned to be managed expectantly if delivery is likely within 7 days, the gestational age is between 34 0/7 and 36 6/7 weeks of gestation, and if ACS have not previously been administered (GRADE 1A).[56,57]

What are the neonatal sequelae of late preterm delivery?

The rate of late preterm delivery, defined as delivery between 34 0/7 weeks through 36 6/7 weeks of gestation, has declined consistently in the United States over the past several years.[58,59] Nevertheless, many indications for late preterm birth exist.[8,9] Guidance about appropriate indications for late preterm delivery is available but is based mainly on expert opinion. Furthermore, this guidance does not address management decisions in the face of the expected changes in clinical status that occur in many obstetric complications.[8]

Neonatal consequences of late preterm delivery are now well described. Infants born between 34 0/7 weeks and 36 6/7 weeks of gestation are at increased risk for neonatal respiratory morbidity compared with birth at term (≥37 weeks 0 days).[60-63] The most notable respiratory morbidities for this group include respiratory distress syndrome and transient tachypnea of the newborn because pulmonary maturation continues through the late preterm period into early childhood.[61,64]

Late preterm infants also have increased risks for hypoglycemia, jaundice, hyperbilirubinemia, and feeding difficulties.[65] A recent study by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network found that administration of ACS to this group decreases some short- and long-term respiratory morbidities, such as

Summary of Recommendations

	Recommendations	GRADE
1	We recommend delivery at 36–37 6/7 weeks of gestation for stable women with placenta previa without bleeding or other obstetric complications.	1B Strong recommendation, moderate-quality evidence
2	We do not recommend routine cervical length screening for women with placenta previa in the late preterm period due to a lack of data on an appropriate management strategy.	2C Weak recommendation, low-quality evidence
3	We recommend delivery between 34 and 37 weeks of gestation for stable women with placenta accreta.	1B Strong recommendation, low-quality evidence
4	We recommend delivery between 34 and 37 weeks of gestation for stable women with vasa previa.	1B Strong recommendation, low-quality evidence
5	We recommend that in women with active hemorrhage in the late preterm period, delivery should not be delayed for the purpose of administering ACS.	1B Strong recommendation, moderate-quality evidence
6	We recommend that fetal lung maturity testing should not be used to guide management in the late preterm period when an indication for delivery is present.	1B Strong recommendation, moderate-quality evidence
7	We recommend that ACS should be administered to women who are eligible and are managed expectantly if delivery is likely within 7 days, the gestational age is between 34 0/7 and 36 6/7 weeks of gestation, and if ACS have not previously been administered.	1A Strong recommendation, high-quality evidence

Guidelines

The content of this document reflects the national and international guidelines related to the management of late preterm third-trimester bleeding.

Organization	Title	Year of publication
SMFM[3]	MFM Consult: Evaluation, and management of low-lying placenta or placenta previa on second-trimester ultrasound	2010
SMFM[15]	Clinical Guideline #1: Placenta accreta	2010
American College of Obstetricians and Gynecologists and SMFM[9]	Committee Opinion #560: Medically indicated late-preterm and early-term deliveries	2013
American College of Obstetricians and Gynecologists and SMF[37]	Committee Opinion #561: Nonmedically indicated early-term deliveries	2013
SMFM[38]	Consult Series #37: Diagnosis and management of vasa previa	2015
SMFM[14]	Consult Series #40: The role of routine cervical length screening in selected high- and low-risk women for preterm birth prevention	2016
SMF[56]	SMFM Statement: Implementation of the use of antenatal corticosteroids in the late preterm birth period in women at risk for preterm delivery	2016

bronchopulmonary dysplasia, and decreases the likelihood of a prolonged special care nursery stay.[57] Nonetheless, in the setting of late preterm obstetric bleeding, the risks of late preterm delivery should be reviewed in the context of the potential maternal and fetal risks of continued pregnancy and possible further hemorrhage.

What are the gaps in knowledge regarding late preterm bleeding?

The likelihood of the recurrence of bleeding that first presents in the late preterm period is ill defined. Rather, data on recurrence of bleeding are extrapolated from the likelihood to enter spontaneous labor, which would precipitate further bleeding from many of the conditions described. Diagnostic criteria that reliably predict placental abruption are needed. Placental abruption is often a diagnosis of exclusion when other known sources of vaginal bleeding, such as placenta previa and placenta accreta, are ruled out. Finally, further epidemiological, observational, and clinical trials would be helpful to describe the incidence, interventions, and outcomes related to late preterm bleeding.

REFERENCES

1. Timor-Tritsch IE, Yunis RA. Confirming the safety of transvaginal sonography in patients suspected of placenta previa. Obstet Gynecol 1993;81(5 Pt 1):742-4.

2. Reddy UM, Abuhamad AZ, Levine D, Saade GR; Fetal Imaging Workshop. Fetal imaging: Executive summary of a joint *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, American Institute of Ultrasound in Medicine, American College of Obstetricians and Gynecologists, American College of Radiology, Society for Pediatric Radiology, and Society of Radiologists in Ultrasound Fetal Imaging workshop. Obstet Gynecol 2014;123:1070-82.

3. Oyelese Y, Society for Maternal-Fetal Medicine. MFM consult: Evaluation and management of low-lying placenta or placenta previa on second-trimester ultrasound. Contemp Ob/Gyn December 2010:30-3.

4. Zelop CC, Bromley B, Frigoletto FD Jr, Benacerraf BR. Second trimester sonographically diagnosed placenta previa: Prediction of persistent previa at birth. Int J Gynaecol Obstet 1994;44:207-10.

5. Gallagher P, Fagan CJ, Bedi DG, Winsett MZ, Reyes RN. Potential placenta previa: Definition, frequency, and significance. AJR Am J Roentgenol 1987;149:1013-5.

6. Becker RH, Vonk R, Mende BC, Ragosch V, Entezami M. The relevance of placental location at 20–23 gestational weeks for prediction of placenta previa at delivery: Evaluation of 8650 cases. Ultrasound Obstet Gynecol 2001;17:496-501.

7. Lauria MR, Smith RS, Treadwell MC, et al. The use of second-trimester transvaginal sonography to predict placenta previa. Ultrasound Obstet Gynecol 1996;8:337-40.

8. Spong CY, Mercer BM, D'Alton M, Kilpatrick S, Blackwell S, Saade G. Timing of indicated late-preterm and early-term birth. Obstet Gynecol 2011;118(2 Part 1):323-33.

9. American College of Obstetricians and Gynecologists. Medically indicated late-preterm and early-term deliveries. ACOG Committee opinion no. 560. Obstet Gynecol 2013;121:908-10.

10. Oyelese Y, Smulian JC. Placenta previa, placenta accreta, and vasa previa. Obstet Gynecol 2006;107:927-41.

11. Stafford IA, Dashe JS, Shivvers SA, Alexander JM, McIntire DD, Leveno KJ. Ultrasonographic cervical length and risk of hemorrhage in pregnancies with placenta previa. Obstet Gynecol 2010;116:595-600.

12. Ghi T, Contro E, Martina T, et al. Cervical length and risk of antepartum bleeding in women with complete placenta previa. Ultrasound Obstet Gynecol 2009;33:209-12.

13. Shin JE, Shin JC, Lee Y, Kim SJ. Serial change in cervical length for the prediction of emergency cesarean section in placenta previa. PLoS One 2016;11:e0149036.

14. Society for Maternal-Fetal Medicine, McIntosh J, Feltovich H, Berghella V, Manuck T. The role of routine cervical length screening in selected high- and low-risk women for preterm birth prevention. Am J Obstet Gynecol 2016;215:B2-7.

15. Society for Maternal-Fetal Medicine Publications Committee. Placenta accreta. Clinical guideline no. 1. Am J Obstet Gynecol 2010;203:430-9.

16. Silver RM, Landon MB, Rouse DJ, et al. *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol 2006;107:1226-32.

17. Wong HS, Cheung YK, Zuccollo J, Tait J, Pringle KC. Evaluation of sonographic diagnostic criteria for placenta accreta. J Clin Ultrasound 2008;36:551-9.

18. Gielchinsky Y, Mankuta D, Rojansky N, Laufer N, Gielchinsky I, Ezra Y. Perinatal outcome of pregnancies complicated by placenta accreta. Obstet Gynecol 2004;104:527-30.

19. Levine D, Hulka CA, Ludmir J, Li W, Edelman RR. Placenta accreta: evaluation with color Doppler US, power Doppler US, and MR imaging. Radiology 1997;205:773-6.

20. Hull AD, Salerno CC, Saenz CC, Pretorius DH. Three-dimensional ultrasonography and diagnosis of placenta percreta with bladder involvement. J Ultrasound Med 1999;18:853-6.

21. Comstock CH, Love JJ Jr, Bronsteen RA, et al. Sonographic detection of placenta accreta in the second and third trimesters of pregnancy. Am J Obstet Gynecol 2004;190:1135-40.

22. Shih JC, Palacios Jaraquemada JM, Su YN, et al. Role of three-dimensional power Doppler in the antenatal diagnosis of placenta accreta: comparison with gray-scale and color Doppler techniques. Ultrasound Obstet Gynecol 2009;33:193-203.

23. Belfort MA. Indicated preterm birth for placenta accreta. Semin Perinatol 2011;35:252-6.

24. Warshak CR, Ramos GA, Eskander R, et al. Effect of predelivery diagnosis in 99 consecutive cases of placenta accreta. Obstet Gynecol 2010;115:65-9.

25. Robinson BK, Grobman WA. Effectiveness of timing strategies for delivery of individuals with placenta previa and accreta. Obstet Gynecol 2010;116:835-42.

26. Bowman ZS, Manuck TA, Eller AG, Simons M, Silver RM. Risk factors for unscheduled delivery in patients with placenta accreta. Am J Obstet Gynecol 2014;210:241.e241-6.

27. Pettit KE, Stephenson ML, Truong YN, Henry D, Murphy A, Kim L, et al. University of California Fetal Consortium. Maternal and neonatal outcomes among scheduled versus unscheduled deliveries in women with prenatally diagnosed, pathologically proven placenta accreta. J Matern Fetal Neonatal Med 2017;5:1-5.

28. Perlman NC, Little SE, Thomas A, Cantonwine DE, Carusi DA. Patient selection for later delivery timing with suspected previa-accreta. Acta Obstet Gynecol Scand 2017;96:1021-8.

29. Riveros-Perez E, Wood C. Retrospective analysis of obstetric and anesthetic management of patients with placenta accreta spectrum disorders. Int J Gynaecol Obstet 2017 Oct 28. [Epub ahead of print].

30. Farquhar CM, Li Z, Lensen S, McLintock C, Pollock W, Peek MJ, et al. Incidence, risk factors and perinatal outcomes for placenta accreta in Australia and New Zealand: a case-control study. BMJ Open 2017;7(10): e017713.

31. Baldwin HJ, Patterson JA, Nippita TA, Torvaldsen S, Ibiebele I, Simpson JM, et al. Maternal and neonatal outcomes following abnormally invasive placenta: a population-based record linkage study. Acta Obstet Gynecol Scand 2017;96:1373-81.

32. Hurd WW, Miodovnik M, Hertzberg V, Lavin JP. Selective management of abruptio placentae: A prospective study. Obstet Gynecol 1983;61:467-73.

33. Ananth CV, Savitz DA, Williams MA. Placental abruption and its association with hypertension and prolonged rupture of membranes: A methodologic review and meta-analysis. Obstet Gynecol 1996;88:309-18.
34. Ananth CV, Oyelese Y, Yeo L, Pradhan A, Vintzileos AM. Placental abruption in the United States, 1979 through 2001: Temporal trends and potential determinants. Am J Obstet Gynecol 2005;192:191-8.
35. Jaffe MH, Schoen WC, Silver TM, Bowerman RA, Stuck KJ. Sonography of abruptio placentae. AJR American J Roentgenol 1981;137:1049-54.
36. Glantz C, Purnell L. Clinical utility of sonography in the diagnosis and treatment of placental abruption. J Ultrasound Med 2002;21:837-40.
37. American College of Obstetricians and Gynecologists. Nonmedically indicated early-term deliveries. Committee opinion no. 561. Obstet Gynecol 2013;121:911-5.
38. Society of Maternal-Fetal Publications, Sinkey RG, Odibo AO, Dashe JS. Diagnosis and management of vasa previa. Consult series no. 37: Am J Obstet Gynecol 2015;213:615-9.
39. Baulies S, Maiz N, Munoz A, Torrents M, Echevarria M, Serra B. Prenatal ultrasound diagnosis of vasa praevia and analysis of risk factors. Prenat Diagn 2007;27:595-9.
40. Bronsteen R, Whitten A, Balasubramanian M, et al. Vasa previa: Clinical presentations, outcomes, and implications for management. Obstet Gynecol 2013;122(2 Pt 1):352-7.
41. Oyelese Y, Catanzarite V, Prefumo F, et al. Vasa previa: The impact of prenatal diagnosis on outcomes. Obstet Gynecol 2004;103(5 Pt 1):937-42.
42. Swank ML, Garite TJ, Maurel K, et al. Vasa previa: Diagnosis and management. Am J Obstet Gynecol 2016;215:223.e1-6.
43. Silver RM. Abnormal placentation: Placenta previa, vasa previa, and placenta accreta. Obstet Gynecol 2015;126:654-68.
44. Robinson BK, Grobman WA. Effectiveness of timing strategies for delivery of individuals with vasa previa. Obstet Gynecol 2011;117:542-9.
45. Catanzarite V, Cousins L, Daneshmand S, Schwendemann W, Casele H, Adamczak J, et al. Prenatally Diagnosed Vasa Previa: A Single-Institution Series of 96 Cases. Obstet Gynecol 2016;128:1153-61.
46. Sullivan EA, Javid N, Duncombe G, Li Z, Safi N, Cincotta R, et al. Vasa Previa diagnosis, clinical practice, and outcomes in Australia. Obstet Gynecol 2017;130:591-8.
47. Thurn L, Lindqvist PG, Jakobsson M, et al. Abnormally invasive placenta-prevalence, risk factors and antenatal suspicion: Results from a large population-based pregnancy cohort study in the Nordic countries. BJOG 2016;123:1348-55.
48. Catanzarite V, Oyelese Y. Diagnosis and management of vasa previa. Am J Obstet Gynecol 2016;214:764.
49. Jouppila P, Kirkinen P. Problems associated with the ultrasonic diagnosis of abruptio placentae. Int J Gynaecol Obstet 1982;20:5-11.
50. Hull AD. In: Creasy RKRR, Iams JD, Lockwood CJ, Moore TR, Greene MF, eds. Creasy and Resnik's Maternal-Fetal Medicine. Philadelphia: Elsevier; 2014.
51. Dahmus MA, Sibai BM. Blunt abdominal trauma: Are there any predictive factors for abruptio placentae or maternal-fetal distress? Am J Obstet Gynecol 1993;169:1054-9.
52. Jain V, Chari R, Maslovitz S, et al. Guidelines for the management of a pregnant trauma patient. J Obstet Gynaecol Can 2015;37:553-74.
53. Atkinson AL, Santolaya-Forgas J, Matta P, Canterino J, Oyelese Y. The sensitivity of the Kleihauer-Betke test for placental abruption. J Obstet Gynaecol 2015;35:139-41.
54. Main EK, Goffman D, Scavone BM, et al. National Partnership for Maternal Safety: Consensus bundle on obstetric hemorrhage. Obstet Gynecol 2015;126:155-62.
55. Fleischer A, Meirowitz N. Care bundles for management of obstetrical hemorrhage. Semin Perinatol 2016;40:99-108.
56. Society for Maternal-Fetal Medicine Publications Committee. Implementation of the use of antenatal corticosteroids in the late preterm birth period in women at risk for preterm delivery. Am J Obstet Gynecol 2016;215(2):B13-5.
57. Gyamfi-Bannerman C, Thom EA, Blackwell SC, et al. Antenatal betamethasone for women at risk for late preterm delivery. N Engl J Med 2016;374:1311-20.
58. Gyamfi-Bannerman C, Ananth CV. Trends in spontaneous and indicated preterm delivery among singleton gestations in the United States, 2005—2012. Obstet Gynecol 2014;124:1069-74.
59. Hamilton BE, Martin JA, Ventura SJ. Births: preliminary data for 2012. Natl Vital Stat Rep 2013;62:1-33.
60. Rubaltelli FF, Dani C, Reali MF, et al. Acute neonatal respiratory distress in Italy: A one-year prospective study. Italian Group of Neonatal Pneumology. Acta Paediatr 1998;87:1261-8.
61. McIntire DD, Leveno KJ. Neonatal mortality and morbidity rates in late preterm births compared with births at term. Obstet Gynecol 2008;111:35-41.
62. Yoder BA, Gordon MC, Barth WH Jr. Late-preterm birth: Does the changing obstetric paradigm alter the epidemiology of respiratory complications? Obstet Gynecol 2008;111:814-22.
63. Consortium on Safe L, Hibbard JU, Wilkins I, et al. Respiratory morbidity in late preterm births. JAMA 2010;304:419-25.
64. Escobar GJ, Clark RH, Greene JD. Short-term outcomes of infants born at 35 and 36 weeks gestation: we need to ask more questions. Semin Perinatol 2006;30:28-33.
65. McLaurin KK, Hall CB, Jackson EA, Owens OV, Mahadevia PJ. Persistence of morbidity and cost differences between late-preterm and term infants during the first year of life. Pediatrics 2009;123:653-9.

The authors report no conflict of interest.

All authors and committee members have filed a conflict of interest disclosure delineating personal, professional, and/or business interests that might be perceived as a real or potential conflict of interest in relation to this publication. Any conflicts have been resolved through a process approved by the Executive Board.

The Society for Maternal-Fetal Medicine has neither solicited nor accepted any commercial involvement in the development of the content of this publication.

This document has undergone an internal peer review through a multilevel committee process within the Society for Maternal-Fetal Medicine (SMFM). This review involves critique and feedback from the SMFM Publications and Document Review Committees and final approval by the SMFM Executive Committee. SMFM accepts sole responsibility for document content. SMFM publications do not undergo editorial and peer review by the American Journal of Obstetrics & Gynecology. The SMFM Publications Committee reviews publications every 18-24 months and issues updates as needed. Further details regarding SMFM Publications can be found at www.smfm.org/publications.

All questions or comments regarding the document should be referred to the SMFM Publications Committee at pubs@smfm.org.

  https://doi.org/10.1016/j.ajog.2017.10.019