end of the spectrum where the differential diagnosis between a difficult manual removal and an abnormally adherent or placenta accreta may be impossible in the absence of histopathological confirmation. These diagnostic difficulties probably explain the current wide variation in reported prevalence of placenta accreta ranging between 1 in 300 and 1 in 2000 pregnancies,[1–5] and highlight the need for a standardised approach to imaging, clinical and histopathological descriptions. In the last decade, even the condition itself has begun to be known by many different names, with 'morbidly adherent placenta' becoming particularly popular. This terminology was originally used in the 19th century to describe the clinical complications associated with a retained placenta. This terminology is misleading as 'morbidly adherent' does not encompass the abnormally invasive end of the accreta spectrum (increta and percreta), which usually have the worst clinical outcomes.[16,17] In order to overcome these difficulties, the terms 'placenta accreta spectrum' or 'abnormally adherent and invasive placenta' should be used to include both the abnormally adherent and invasive forms of accreta placentation.[18] In this guideline, the term placenta accreta spectrum will be used.

In the 1990s, the maternal mortality of placenta percreta was reported to be as high as 7% of cases.[19] More recent large series have reported lower rates of maternal death and this is likely to be further improved by screening for placenta accreta spectrum in women at high risk and in planning the delivery in specialist centres.[20–22]

3. Identification and assessment of evidence

This guideline was developed in accordance with standard methodology for producing Royal College of Obstetricians and Gynaecologists (RCOG) Green-top Guidelines. The Cochrane Library (including the Cochrane Database of Systematic Reviews and the Database of Abstracts of Reviews of Effects [DARE]), EMBASE, Trip, MEDLINE and PubMed (electronic databases) were searched for relevant randomised controlled trials (RCT), systematic reviews and meta-analyses. The search was restricted to articles published between May 2009 and July 2016 (the search for the previous guideline was up to May 2009). A top-up literature search was performed in March 2018. The databases were searched using the relevant Medical Subject Headings (MeSH) terms, including all subheadings, and this was combined with a keyword search. Search words included 'placenta praevia', 'low lying placenta', 'placenta accreta', 'placenta increta' 'placenta percreta', 'abnormally adherent placenta' and 'abnormally invasive placenta'. The search was restricted to humans and the English language. The National Library for Health and the National Guideline Clearinghouse were also searched for relevant guidelines and reviews.

Where possible, recommendations are based on available evidence. In the absence of published evidence, these have been annotated as 'good practice points'. Further information about the assessment of evidence and the grading of recommendations may be found in Appendix 1.

4. Antenatal diagnosis and care of women with placenta praevia or a low-lying placenta

4.1 What are the risk factors for women with placenta praevia or a low-lying placenta?

Caesarean delivery is associated with an increased risk of placenta praevia in subsequent pregnancies. This risk rises as the number of prior caesarean sections increases. [*New 2018*] **B**

ART and maternal smoking increase the risk of placenta praevia. [*New 2018*] **B**

In 1997, a meta-analysis of the association of placenta praevia with history of caesarean delivery found a dose-response pattern for the relative risk (RR) of placenta praevia of 4.5 (95% CI 3.6–5.5) for one, 7.4 (95% CI 7.1–7.7) for two, 6.5 (95% CI 3.6–11.6) for three, and 44.9 (95% CI 13.5–149.5) for four or more prior caesarean deliveries compared with vaginal delivery.[23]

Evidence level 2++

A systematic review and meta-analysis of 22 studies including over 2 million deliveries indicated that the incidence of placenta praevia increases from 10 in 1000 deliveries with one previous caesarean delivery to 28 in 1000 with three or more caesarean deliveries.[24] A 2014 meta-analysis confirmed these findings and reported an overall odds ratio (OR) of 1.47 (95% CI 1.44–1.51) for placenta praevia after caesarean section.[25]

Evidence level 1+

Cohort studies have also reported that a second pregnancy within 1 year of a caesarean section is associated with an increased risk of placenta praevia (RR 1.7, 95% CI 0.9–3.1).[26] Compared with vaginal birth, a previous prelabour caesarean section is associated with an increased risk of placenta praevia in the second delivery (adjusted OR [aOR] 2.62, 95% CI 1.24–5.56).[27]

Evidence level 2++

There have been contradictory reports regarding the incidence of placenta praevia in multiple pregnancies. A retrospective cohort study of 1 172 405 twin live births and stillbirths in the USA between 1989 and 1998 found no increased risk in twins.[28] A retrospective cohort of 67 895 singleton and twin pregnancies found that dichorionic (aOR 1.54, 95% CI 1.15–2.06) and monochorionic (RR 3.29, 95% CI 1.32–8.21) twin pregnancies have an increased risk of placenta praevia compared with singletons.[29]

Evidence level 2+

ART is associated with a higher incidence of placenta praevia independent of the high rate of multiple pregnancies generated by the technique used.[30,31] A 2016 meta-analysis of ART singleton pregnancies reported a RR of 3.71 (95% CI 2.67–5.16) for placenta praevia[32] that was confirmed by a 2017 meta-analysis (OR 2.67, 95% CI 2.01–3.34).[33] Furthermore, a 2017 meta-analysis of the impact of maternal smoking on placental position[34] (OR 1.42, 95% CI 1.30–1.50) has found an increased risk of placenta praevia.

Evidence level 1+

Advanced maternal age has been also associated with a slight increase in the risk of placenta praevia (OR 1.08, 95% CI 1.07–1.09) but this effect may be due to parity.[35]

Evidence level 2–

4.2 *Should we screen women for placenta praevia or a low-lying placenta, if so, at what gestation and with what follow-up?*

The midpregnancy routine fetal anomaly scan should include placental localisation thereby identifying women at risk of persisting placenta praevia or a low-lying placenta. [*New 2018*]

✓

The term placenta praevia should be used when the placenta lies directly over the internal os. For pregnancies at more than 16 weeks of gestation the term low-lying placenta should be used when the placental edge is less than 20 mm from the internal os on TAS or TVS. [*New 2018*]

D

If the placenta is thought to be low lying (less than 20 mm from the internal os) or praevia (covering the os) at the routine fetal anomaly scan, a follow-up ultrasound examination including a TVS is recommended at 32 weeks of gestation to diagnose persistent low-lying placenta and/or placenta praevia. D

Placenta praevia is a well-established complication of pregnancy associated with high maternal and perinatal complication rates.[4–9] The UK National Screening Committee (UK NSC) does not recommend a national screening program for placenta praevia, but it has supported current local practices of identifying it at the routine midpregnancy (18^{+6} to 21^{+6} weeks of gestation) antenatal screening ultrasound examination in women whose placenta extends onto the internal cervical os (www.screening.nhs.uk/policies).[36] An update published in 2014 that included a literature search covering the period between January 2008 and November 2012 concluded that this practice is not supported by new evidence, but that the placental site is routinely reported at the time of the routine fetal anomaly scan. In turn, this routine study has become the main screening test for placenta praevia.[37] Evidence level 4

Apparent placental 'migration' following the development of the lower uterine segment during the third trimester of pregnancy results in the resolution of the low-lying placenta in 90% of the cases before term.[38–46] This is less likely to occur in women with a previous caesarean delivery.[39]

In twin pregnancies, the likelihood of persistence of placenta praevia is also dependent on the gestational age at sonographic detection. Among those with placenta praevia diagnosed in the second trimester the majority of cases resolve by 32 weeks of gestation.[29,47] After 32 weeks of gestation around 50% of the remaining placenta praevia will resolve, with no further changes after 36 weeks of gestation.[29] Evidence level 3

The timing of a confirmatory ultrasound examination in the third trimester has varied between 32 and 36 weeks of gestation depending on the extent of the placenta praevia over the internal cervical os. It is based on the perceived risk of antenatal haemorrhage, but there is no strong evidence that it makes a difference in the care of asymptomatic women.[37] The timing of the follow-up ultrasound examination should also be tailored according to a previous history of caesarean delivery to exclude an associated placenta accreta spectrum. Evidence level 4

4.3 What is the role and what are the risks of TVS?

Clinicians should be aware that TVS for the diagnosis of placenta praevia or a low-lying placenta is superior to transabdominal and transperineal approaches, and is safe. [*New 2018*] ✓

In women with a persistent low-lying placenta or placenta praevia at 32 weeks of gestation who remain asymptomatic, an additional TVS is recommended at around 36 weeks of gestation to inform discussion about mode of delivery. [*New 2018*] D

Cervical length measurement may help facilitate management decisions in asymptomatic women with placenta praevia. A short cervical length on TVS before 34 weeks of gestation increases the risk of preterm emergency delivery and massive haemorrhage at caesarean section. [*New 2018*] **D**

TVS improves the accuracy of placental localisation particularly when the placenta is posterior or if the TAS is unclear, for example, due to maternal obesity or the presence of large uterine fibroids.[5] Evidence level 4

There is only one small (n = 38) RCT comparing TAS and TVS for placenta praevia, which supports this safety profile and reports superior views, especially for posterior placentas.[48] Evidence level 1+

If the distance between the internal os and the placental edge is 20 mm or more on TVS, the placental location should be recorded as normal and managed as per routine. Studies have not demonstrated an increased risk for caesarean section due to haemorrhage in these cases.[4,5] By contrast, if the placenta extends beyond the internal os on TVS during the second trimester, it is likely to be confirmed as placenta praevia at 32 weeks of gestation.[48–50] However, 'migration' is still possible after 32 weeks of gestation.[50,51]

TVS will reclassify 26–60% of placentas diagnosed as low lying at the routine fetal anomaly scan.[52–54] Overall, TVS has a high accuracy (positive predictive value of 93.3%, negative predictive value of 97.6% and false-negative rate of 2.33%) in predicting placenta praevia in women suspected of having a low-lying placenta on TAS in the second and early third trimester, with a sensitivity of 87.5% and a specificity of 98.8%.[55]

Evidence level 2+

TVS has also been used to measure the cervical length to predict preterm birth[56] and cohort studies with low risks of confounding bias have shown that cervical length is a predictor of antepartum bleeding and emergency preterm caesarean section in placenta praevia.[57–60] A prospective cohort study of 59 women presenting with placenta praevia covering the internal os has shown that the best cut-off point for the identification of women at risk of haemorrhage requiring a caesarean delivery before 34 weeks of gestation is a cervical length of 31 mm or less (sensitivity of 83.3% and specificity of 76.6%). Women with a cervical length of less than 31 mm have a 16 times (OR 16.4, 95% CI 3.4–75.9) higher risk of emergency caesarean section due to massive haemorrhage.[57] Similarly, a prospective cohort study of 54 women with placenta praevia covering the internal os has shown that combining a cervical length of less than 30 mm and measurement of the lower placental edge thickness of more than 10 mm has a sensitivity of 83.3% and a specificity of 78.4%.[58] More prospective studies using a standardised ultrasound definition of placental edge thickness are required before this sign can be used in clinical practice.

Compared with women with a long cervical length, women with a short cervical length (less than 25 mm) have a RR of 7.2 (95% CI 2.3–22.3) for massive haemorrhage during caesarean section for placenta praevia.[59]

Serial TVS cervical length measurements from 26 weeks of gestation have indicated that when the length of the cervix decreases rapidly to 35 mm or less there is an increased risk of preterm caesarean section due to massive haemorrhage.[60]

Evidence level 2–

4.4 *Where should women with a low-lying placenta or placenta praevia be cared for in the third trimester?*

4.4.1 Women with recurrent bleeding (low-lying placenta or placenta praevia)

Tailor antenatal care, including hospitalisation, to individual woman's needs and social circumstances, e.g. distance between home and hospital and availability of transportation, previous bleeding episodes, haematology laboratory results, and acceptance of receiving donor blood or blood products. [*New 2018*]

✓

Where hospital admission has been decided, an assessment of risk factors for venous thromboembolism in pregnancy should be performed as outlined in RCOG Green-top Guideline No. 37a. This will need to balance the risk of developing a venous thromboembolism against the risk of bleeding from a placenta praevia or low lying placenta.

D

It should be made clear to any woman being treated at home in the third trimester that she should attend the hospital immediately if she experiences any bleeding, including spotting, contractions or pain (including vague suprapubic period-like aches).

✓

The Cochrane systematic review by Nielson on the impact of an intervention in women diagnosed as having, or being likely to have a placenta praevia, which has not been updated since October 2002, includes only one small RCT (n = 53) comparing hospital versus home care for symptomatic placenta praevia.[61] This trial found little evidence of any clear advantage or disadvantage to a policy of home versus hospital care, and the only significant difference was a reduction in length of hospital stay.[62]

Evidence level 1–

Two large retrospective studies of women presenting with placenta praevia at the routine fetal anomaly scan have proposed scores to predict the risk of emergency caesarean section. The first study (n = 250) found that the risk is increased if the first (sentinel) vaginal bleeding episode occurs before 29 weeks of gestation (OR 2.64, 95% CI 1.17–5.98), and with the occurrence of three or more episodes of antepartum haemorrhage (OR 2.53, 95% CI 1.1–5.86).[63] The second (n = 214) found that independent predictors for emergency delivery are a history of caesarean section (OR 4.7, 95 CI 1.2–12); antepartum haemorrhage on one (OR 7.5, 95% CI 2.5–23), two (OR 14, 95% CI 4.3–47), and three or more occasions (OR 27, 95% CI 8.3–90); and need for antenatal blood transfusion (OR 6.4, 95% CI 1.7–23).[10] A retrospective study of 214 women with singleton pregnancies found that the risk of preterm emergency caesarean delivery increases with the number of antepartum bleeding episodes with one (OR 7.5, 95% C, 2.5–23), two (OR 14, 95% CI 4.3–47), and three or more (OR 27, 95% CI 8.3–90), as well as need for blood transfusion (OR 6.4, 95% C, 1.7–23).[10] The results of these studies suggest that predictors for emergency delivery in women with placenta praevia can be used for individualised antenatal care regarding need for hospital admission, corticosteroid administration and timing of delivery.

Evidence level 2–

