



Royal College of
Obstetricians &
Gynaecologists

Umbilical Cord Prolapse

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Umbilical Cord Prolapse

This is the second edition of this guideline. It replaces the first edition which was published in 2008 under the same title.

Executive summary of recommendations

Clinical issues

What factors are associated with a higher chance of cord prolapse?

Clinicians need to be aware of several clinical factors associated with umbilical cord prolapse.



Can cord presentation be detected antenatally?

Routine ultrasound examination is not sufficiently sensitive or specific for identification of cord presentation antenatally and should not be performed to predict increased probability of cord prolapse, unless in the context of a research setting.



Selective ultrasound screening can be considered for women with breech presentation at term who are considering vaginal birth.



Can cord prolapse or its effects be avoided?

With transverse, oblique or unstable lie, elective admission to hospital after 37⁺⁰ weeks of gestation should be discussed and women in the community should be advised to present urgently if there are signs of labour or suspicion of membrane rupture.



Women with non-cephalic presentations and preterm prelabour rupture of membranes should be recommended inpatient care.



Artificial membrane rupture should be avoided whenever possible if the presenting part is mobile and/or high.



If it becomes necessary to rupture the membranes with a high presenting part, this should be performed with arrangements in place for immediate caesarean section.



Upward pressure on the presenting part should be kept to a minimum in women during vaginal examination and other obstetric interventions in the context of ruptured membranes because of the risk of upward displacement of the presenting part and cord prolapse.



Rupture of membranes should be avoided if on vaginal examination the cord is felt below the presenting part. When cord presentation is diagnosed in established labour, caesarean section is usually indicated.



When should cord prolapse be suspected?

Cord presentation or prolapse should be excluded at every vaginal examination in labour and after spontaneous rupture of membranes if risk factors are present.



In addition to the national guidance for fetal heart rate monitoring in labour, the fetal heart rate should be auscultated after every vaginal examination in labour and after spontaneous membrane rupture.



Cord prolapse should be suspected when there is an abnormal fetal heart rate pattern, especially if such changes commence soon after membrane rupture, either spontaneous or artificial.



Speculum and/or digital vaginal examination should be performed when cord prolapse is suspected.



When spontaneous rupture of membranes occurs, if there is normal fetal heart rate monitoring and there are no risk factors for cord prolapse, then a routine vaginal examination is not indicated.



What is the optimal initial management of cord prolapse in a fully equipped hospital setting?

When cord prolapse is diagnosed before full dilatation, assistance should be immediately called and preparations made for immediate birth in theatre.



There are insufficient data to evaluate manual replacement of the prolapsed cord above the presenting part to allow continuation of labour. This practice is not recommended.



To prevent vasospasm, there should be minimal handling of loops of cord lying outside the vagina.



To prevent cord compression, it is recommended that the presenting part be elevated either manually or by filling the urinary bladder.



Cord compression can be further reduced by the mother adopting the knee-chest or left lateral (preferably with head down and pillow under the left hip) position.



Tocolysis can be considered while preparing for caesarean section if there are persistent fetal heart rate abnormalities after attempts to prevent compression mechanically, particularly when birth is likely to be delayed.



Although the measures described above are potentially useful during preparation for birth, they must not result in unnecessary delay.



What is the optimal mode of birth with cord prolapse?

Caesarean section is the recommended mode of delivery in cases of cord prolapse when vaginal birth is not imminent in order to prevent hypoxic acidosis.



A category 1 caesarean section should be performed with the aim of achieving birth within 30 minutes or less if the cord prolapse is associated with a suspicious or pathological fetal heart rate pattern but without compromising maternal safety.



Category 2 caesarean birth can be considered for women in whom the fetal heart rate pattern is normal, but continuous assessment of the fetal heart trace is essential. If the cardiotocograph (CTG) becomes abnormal, re-categorisation to category 1 birth should immediately be considered.



Discussion with the anaesthetist should take place to decide on the appropriate form of anaesthesia. Regional anaesthesia can be considered in consultation with an experienced anaesthetist.



Verbal consent is satisfactory for category 1 caesarean section.



Vaginal birth, in most cases operative, can be attempted at full dilatation if it is anticipated that birth would be accomplished quickly and safely, using standard techniques and taking care to avoid impingement of the cord when possible.



Breech extraction is appropriate under some circumstances, for example, after internal podalic version for a second twin.



A practitioner competent in the resuscitation of the newborn should attend all births that follow cord prolapse.



Paired cord blood samples should be taken for pH and base excess measurement.



What is the optimal management in community settings?

Midwives should assess the risk of cord prolapse for women requesting home birth or birth in centres without facilities for immediate caesarean section and at the start of labour in the community.

D

Women with known cord prolapse should be advised by telephone to assume the knee–chest face-down position while waiting for hospital transfer.

✓

During emergency ambulance transfer, the knee–chest position is potentially unsafe and the exaggerated Sims position (left lateral with pillow under hip) should be used.

✓

All women with cord prolapse should be advised to be transferred to the nearest consultant-led unit for birth, unless an immediate vaginal examination by a competent professional reveals that a spontaneous vaginal birth is imminent.

D

The presenting part should be elevated during transfer either manually or by using bladder distension. It is recommended that community midwives carry a Foley catheter for this purpose and equipment for fluid infusion.

D

To prevent vasospasm, there should be minimal handling of loops of cord lying outside the vagina.

D

What is the optimal management of cord prolapse at the threshold of viability?

Expectant management should be discussed for cord prolapse complicating pregnancies with a gestational age at the threshold of viability (23⁺⁰ to 24⁺⁶ weeks).

D

Clinicians should be aware that there is no evidence to support replacement of the cord into the uterus when prolapse occurs at or before the threshold of viability.

D

Women should be counselled on both continuation and termination of pregnancy following cord prolapse at the threshold of viability.

✓

Should delayed cord clamping (DCC) be used after cord prolapse?

Delayed cord clamping can be considered if a baby is uncompromised at birth.

B

Immediate resuscitation should take priority over DCC when the baby is unwell at birth.

D

Clinical governance

Explanation of events

An opportunity to discuss the events should be offered to the woman (possibly with her companions in labour) at a mutually convenient time.

✓

Training

All staff involved in maternity care should receive training in the management of obstetric emergencies including the management of cord prolapse.

B

Training for cord prolapse should be multidisciplinary and include team rehearsals.

D

Clinical incident reporting

Clinical incident forms should be submitted for all cases of cord prolapse.

✓

Documentation

Preformatted sheets should be considered for the recording of clinical events related to cord prolapse.

D

1. Purpose and scope

The purpose of this guideline is to describe the prevention, diagnosis and management of cord prolapse. It addresses those women who are pregnant and at high risk or with a diagnosis of cord prolapse in both hospital and community settings. Pregnancies with cord prolapse before 23⁺⁰ weeks are not covered by this guideline. All later gestations are covered by the guidance, including those pregnancies at the threshold of viability.

2. Introduction and background epidemiology

Cord prolapse has been defined as the descent of the umbilical cord through the cervix alongside (occult) or past (overt) the presenting part in the presence of ruptured membranes.^{1,2} Cord presentation is the presence of the umbilical cord between the fetal presenting part and the cervix, with or without intact membranes. The overall incidence of cord prolapse ranges from 0.1–0.6%.^{1,3–11} In the case of breech presentation, the incidence is higher at 1%.¹² The incidence is influenced by population characteristics and is higher when there is a greater percentage of multiple gestations.¹³

Cases of cord prolapse consistently feature in perinatal mortality enquiries.^{14–16} One large study found a perinatal mortality rate of 91 per 1000.¹ Prematurity and congenital malformation account for the majority of adverse outcomes associated with cord prolapse in hospital settings,¹ but birth asphyxia is also associated with cord prolapse.^{1,9} Perinatal death has been described with normally formed term babies, especially during home births.^{1,15,17} Delay in diagnosis to delivery because transfer to hospital is required appears to be a contributing factor.¹

The principal causes of asphyxia in this context are thought to be cord compression and umbilical arterial vasospasm preventing venous and arterial blood flow to and from the fetus. There is a paucity of long-term follow-up data of babies born alive after cord prolapse in both hospital and community settings.

The management of cord prolapse is currently one of the labour ward Minimum Data Sets for skills and drills training mandated by the Clinical Negligence Scheme for Trusts (CNST) in England [<http://www.nhs.uk/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf>] and is a guideline mandated by the Welsh Risk Pool [<http://www.wales.nhs.uk/sitesplus/955/page/52730>] and Clinical Negligence and Other Risks Indemnity Scheme (CNORIS) [<http://www.clo.scot.nhs.uk/our-services/cnoris.aspx>] maternity risk management standards in Wales and Scotland respectively.

3. Identification and assessment of evidence

This guideline was developed in accordance with standard methodology for producing RCOG Green-top Guidelines. MEDLINE, EMBASE, the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials (CENTRAL), the Database of Abstracts of Reviews of Effects (DARE), the ACP Journal Club and Ovid database were searched. The search was restricted to articles published between June 2005 and October 2012 and limited to humans and the English language. A top-up literature search was performed in July 2014. Search terms included ‘umbilical cord’, ‘cord’, ‘cord prolapse’, ‘delayed cord clamping’ and ‘funic (cord)’. Selection of articles for analysis and review was then made based on relevance to objectives. Further documents were obtained by the use of free text terms and hand searches.

The levels of evidence and the grades of recommendations used in this guideline originate from the guidance by the Scottish Intercollegiate Guidelines Network Grading Review Group¹⁸ that incorporates formal assessment of the methodological quality, quantity, consistency and applicability of the evidence base.

Because of the emergent nature and rare incidence of the condition, there are no randomised controlled trials comparing interventions. There are a large number of case reports, case-control studies and case series. Some studies have simply used the general population as a control group. Other studies have controlled for known confounding variables.

4. Clinical issues

4.1 What factors are associated with a higher chance of cord prolapse?

Clinicians need to be aware of several clinical factors associated with umbilical cord prolapse.



Several clinical features are associated with cord prolapse and they are shown in Table 1 below.^{1,5,7,9,10,19,20}

Table 1: Associations with cord prolapse (and cord presentation)

| General | Procedure-related |
|---|---|
| Multiparity | Artificial rupture of membranes with high presenting part |
| Low birthweight (< 2.5 kg) | Vaginal manipulation of the fetus with ruptured membranes |
| Preterm labour (< 37 ⁺⁰ weeks) | External cephalic version (during procedure) |
| Fetal congenital anomalies | Internal podalic version |
| Breech presentation | Stabilising induction of labour |
| Transverse, oblique and unstable lie* | Insertion of intrauterine pressure transducer |
| Second twin | Large balloon catheter induction of labour |
| Polyhydramnios | |
| Unengaged presenting part | |
| Low-lying placenta | |

*Unstable lie is when the longitudinal axis of the fetus (lie) is changing repeatedly after 37⁺⁰ weeks.

Interventions can result in cord prolapse, with approximately half of the cases reported being preceded by obstetric intervention.²¹ The manipulation of the fetus during external cephalic version, internal podalic version of the second twin, manual rotation, placement of intrauterine pressure catheters (with or without prior membrane rupture)^{21,22} and artificial rupture of membranes,^{11,21} particularly in the presence of an unengaged presenting part, are the interventions that most frequently precede cord prolapse. In general, these factors predispose to cord prolapse by preventing close application of the presenting part to the lower part of the uterus and/or pelvic brim.

Evidence level 3

One study of induction of labour using transcervical balloon catheters showed a significant increase in the rate of cord presentation after inflation with saline above 180 ml.²⁰

Evidence level 2+

Amnioinfusion is used for suspected umbilical cord compression in labour. Large studies would be required to detect an increased risk of cord prolapse associated with this intervention,²³ but this is not practised widely in the UK.²⁴

Artificial membrane rupture can precede cord prolapse.^{11,21} However, in a recent Cochrane systematic review of amniotomy for augmenting spontaneous labour there was no difference between the two groups (artificial rupture of the membranes [ARM] versus no ARM) in the incidence of cord prolapse (RR 1.00, 95% CI 0.14–7.10). This would suggest that artificial membrane rupture in this context carries a low risk of cord prolapse provided clinical judgement is made as to its safety in individual women.²⁴

Evidence level 1++

Some authorities have speculated that cord abnormalities, such as true knots, low content of Wharton's jelly or a single umbilical artery, are associated with a higher chance of cord prolapse.^{25–28}

Evidence level 2+

Induction of labour with prostaglandins is not associated with a higher chance of cord prolapse.^{1,29}

4.2 Can cord presentation be detected antenatally?

Routine ultrasound examination is not sufficiently sensitive or specific for identification of cord presentation antenatally and should not be performed to predict increased probability of cord prolapse, unless in the context of a research setting.



Selective ultrasound screening can be considered for women with breech presentation at term who are considering vaginal birth.

C

In a Canadian study, cord prolapse was preceded by the identification of cord presentation at routine ultrasound (real time with colour mapping) in only 12.5% of cases. Just one of 13 cases of suspected cord presentation developed cord prolapse.³⁰

Evidence level 3

A cohort study with historical controls looked at the effect of weekly transvaginal ultrasound screening for cord presentation in women with a breech presentation beyond 36⁺⁰ weeks of gestation. Elective caesarean section was recommended for persistent cord presentation. There was a 4% cord presentation rate. In the women who underwent the screening there were no cases of cord prolapse in a 10-year period. In the women who had not undergone screening, there were ten cases of cord prolapse in an 11-year period with one perinatal death.³¹ This intervention has the potential to help give women more information to make an informed choice if their baby is of breech presentation and they want to consider a vaginal breech birth.

Evidence level 2+

4.3 *Can cord prolapse or its effects be avoided?*

With transverse, oblique or unstable lie, elective admission to hospital after 37⁺⁰ weeks of gestation should be discussed and women in the community should be advised to present urgently if there are signs of labour or suspicion of membrane rupture.

D

Women with non-cephalic presentations and preterm prelabour rupture of membranes should be recommended inpatient care.

C

Artificial membrane rupture should be avoided whenever possible if the presenting part is mobile and/or high.

D

If it becomes necessary to rupture the membranes with a high presenting part, this should be performed with arrangements in place for immediate caesarean section.

✓

Upward pressure on the presenting part should be kept to a minimum in women during vaginal examination and other obstetric interventions in the context of ruptured membranes because of the risk of upward displacement of the presenting part and cord prolapse.

✓

Rupture of membranes should be avoided if on vaginal examination the cord is felt below the presenting part. When cord presentation is diagnosed in established labour, caesarean section is usually indicated.

✓

One study that evaluated outcomes in 29 women with transverse or unstable lie after 37⁺⁰ weeks of gestation found that, when managed expectantly as outpatients, five (17%) eventually presented in labour with a persistent transverse lie. Major complications included two cord prolapses and one neonatal death.³²

Evidence level 3

Labour in the context of an abnormal lie is usually an indication for immediate caesarean section. Similarly, ruptured membranes with an abnormal lie may be an indication to expedite delivery by caesarean section, although this will depend on gestational age.³²

Women with preterm prelabour rupture of membranes with non-cephalic presentations appear to have a significantly higher risk of cord prolapse when compared with their cephalic counterparts.³³

Evidence level 2+

To reduce the likelihood of cord prolapse, which may occur at the time of amniotomy, the National Institute for Health and Care Excellence (NICE)³⁴ recommends that before induction of labour, engagement of the presenting part should be assessed. Obstetricians and midwives should palpate for umbilical cord presentation during the preliminary vaginal examination and avoid dislodging the baby's head. NICE also recommended that amniotomy should be avoided if the baby's head is high.

Evidence level 4

4.4 *When should cord prolapse be suspected?*

Cord presentation or prolapse should be excluded at every vaginal examination in labour and after spontaneous rupture of membranes if risk factors are present.



In addition to the national guidance for fetal heart rate monitoring in labour, the fetal heart rate should be auscultated after every vaginal examination in labour and after spontaneous membrane rupture.



Cord prolapse should be suspected when there is an abnormal fetal heart rate pattern, especially if such changes commence soon after membrane rupture, either spontaneous or artificial.



Speculum and/or digital vaginal examination should be performed when cord prolapse is suspected.



When spontaneous rupture of membranes occurs, if there is normal fetal heart rate monitoring and there are no risk factors for cord prolapse, then a routine vaginal examination is not indicated.



Vaginal examination and membrane rupture can provoke cord prolapse (see Table 1).⁵

Evidence level 2+

Mismanagement of abnormal fetal heart rate patterns is a feature identified in perinatal death associated with cord prolapse. Bradycardia or variable fetal heart rate decelerations have been associated with cord prolapse and their presence should prompt vaginal examination.³⁵ In one series of 89 cases of cord prolapse in women being monitored electronically, each case had abnormalities of the fetal heart rate; 66% had variable decelerations and 34% had a prolonged deceleration of more than 1 minute or persistent bradycardia.³⁶

Evidence level 3

Prompt vaginal examination is the most important aspect of diagnosis and should be performed if there is a particularly high risk of cord prolapse: for example, rupture of membranes with high presenting part or rupture of membranes with polyhydramnios.

Cord presentation and prolapse may occur without outward physical signs and with a normal fetal heart rate pattern and might first be diagnosed at routine vaginal examination in labour.¹

Evidence level 2+

4.5 *What is the optimal initial management of cord prolapse in a fully equipped hospital setting?*

When cord prolapse is diagnosed before full dilatation, assistance should be immediately called and preparations made for immediate birth in theatre.



There are insufficient data to evaluate manual replacement of the prolapsed cord above the presenting part to allow continuation of labour. This practice is not recommended.



To prevent vasospasm, there should be minimal handling of loops of cord lying outside the vagina.



To prevent cord compression, it is recommended that the presenting part be elevated either manually or by filling the urinary bladder.



Cord compression can be further reduced by the mother adopting the knee–chest or left lateral (preferably with head down and pillow under the left hip) position.



Tocolysis can be considered while preparing for caesarean section if there are persistent fetal heart rate abnormalities after attempts to prevent compression mechanically, particularly when birth is likely to be delayed.



Although the measures described above are potentially useful during preparation for birth, they must not result in unnecessary delay.



Umbilical cord replacement by digital elevation has been advocated for managing cord prolapse in order to allow labour to continue. In a series of eight cases of cord prolapse, the procedure was not

Evidence level 3

possible in one woman and vaginal birth was imminent in another two. The prolapsed cord was successfully replaced in the five other women. The prolapsed segment was described as short in all five. Continuous fetal heart rate monitoring was used before, during and after the replacement. Typically there was a prolonged deceleration of 4 minutes during the replacement. Two fetuses (40%) had persistent cardiotocographic abnormalities after the reduction and in both the umbilical artery blood gas pH was less than 7.25 after birth. There were no neonatal deaths or Apgar scores of less than 7 at 5 minutes, but other short- or long-term outcome measures of neonatal morbidity were not reported.³⁷ In this study all five women where replacement was successful had a vaginal birth. These data are insufficient to support cord replacement and this should not be used outside a clinical trial. There have been no studies in which cord replacement has been used as a temporary measure while preparing for caesarean section.

Evidence level 3

There are concerns that manipulation of the cord or exposure to air may cause reactive vasoconstriction and fetal hypoxic acidosis.^{2,38,39} Some authorities advise that swabs soaked in warm saline are wrapped around the cord but this is of unproven benefit.^{37,38}

Evidence level 4

Elevation of the presenting part is thought to reduce pressure on the umbilical cord and prevent vascular occlusion. There have been no randomised controlled trials but its use has been associated with a high chance of good outcome. Displacement of the presenting part was assessed in 132 cases in a large Oxford study.¹ After excluding death due to extreme prematurity and lethal anomaly, there was only one death from asphyxia in the remaining 121 cases. This death was associated with the delay incurred by having to transfer into hospital from home.

Evidence level 2++

Manual elevation is achieved by inserting two fingers of a gloved hand into the vagina and pushing the presenting part upwards. A variation is to remove the hand from the vagina once the presenting part is above the pelvic brim and apply continuous suprapubic pressure upwards.⁴⁰ Excessive displacement may encourage more cord to prolapse. If the diagnosis-to-birth interval is likely to be prolonged, elevation through bladder filling may be more practical. Bladder filling can be achieved quickly by inserting the end of a blood giving set into a Foley catheter. The catheter should be clamped once 500–750 ml have been instilled. It is essential to empty the bladder again just before any attempt to assist birth, be it vaginal or caesarean section.

Evidence level 4

In the original description of bladder filling by Vago,⁴¹ the procedure was performed in moderate Trendelenburg position (head-down tilt). There was one neonatal death in 28 cases, with a decision-to-delivery interval of 25 to 115 minutes. In a second study,⁴² 88 cases of cord prolapse in the first stage were treated with bladder instillation before caesarean section. There were no fetal deaths despite a diagnosis-to-delivery interval of more than 30 minutes for 48 women. Chetty et al.⁴³ recorded no perinatal deaths in 24 cases similarly managed with an average diagnosis-to-delivery interval of 65 minutes.

Evidence level 3

Bladder filling to further displace the presenting part if manual displacement is already taking place does not improve neonatal outcomes any further.⁴⁴

The knee-chest and head-down positions have not been evaluated for the management of cord prolapse independently of other interventions.

Tocolysis has been used to reduce contractions and limit bradycardia, including in women with cord prolapse.^{45–47} The suggested tocolytic regimen is terbutaline 0.25 mg subcutaneously.^{38,39,48,49}

Evidence level 3

4.6 What is the optimal mode of birth with cord prolapse?

Caesarean section is the recommended mode of delivery in cases of cord prolapse when vaginal birth is not imminent in order to prevent hypoxic acidosis.

B

A category 1 caesarean section should be performed with the aim of achieving birth within 30 minutes or less if the cord prolapse is associated with a suspicious or pathological fetal heart rate pattern but without compromising maternal safety.

B

Category 2 caesarean birth can be considered for women in whom the fetal heart rate pattern is normal, but continuous assessment of the fetal heart trace is essential. If the cardiotocograph (CTG) becomes abnormal, re-categorisation to category 1 birth should immediately be considered.



Discussion with the anaesthetist should take place to decide on the appropriate form of anaesthesia. Regional anaesthesia can be considered in consultation with an experienced anaesthetist.



Verbal consent is satisfactory for category 1 caesarean section.



Vaginal birth, in most cases operative, can be attempted at full dilatation if it is anticipated that birth would be accomplished quickly and safely, using standard techniques and taking care to avoid impingement of the cord when possible.



Breech extraction is appropriate under some circumstances, for example, after internal podalic version for a second twin.



A practitioner competent in the resuscitation of the newborn should attend all births that follow cord prolapse.



Paired cord blood samples should be taken for pH and base excess measurement.



Caesarean section is associated with a lower perinatal mortality and reduced risk of Apgar score less than 3 at 5 minutes compared to spontaneous vaginal birth in cases of cord prolapse when vaginal birth is not imminent.⁹ However, when vaginal birth is imminent, outcomes are similar or better compared with caesarean section.^{1,8}

There is poor correlation between the decision-to-delivery interval (DDI) and umbilical cord pH.⁵⁰⁻⁵³ The 30-minute DDI is the acknowledged target for category 1 caesarean section [<http://www.nhs.uk/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf>].⁵⁴ The unit average interval between decision and childbirth for fetal concern in maternity departments in the UK ranges between 30 and 40 minutes,⁴⁹ but in the National Sentinel Caesarean Section Audit,⁵⁵ for cases with cord prolapse the median interval was 17 minutes and 75% of births were performed within less than 26 minutes (interquartile range 12-26). It has been acknowledged that maternal safety and attention to the individual woman is more important than fixation on time targets.⁵⁶

Evidence level 2++

For women at and beyond 26⁺⁰ weeks with a pathological fetal heart rate pattern on transfer from home, emergency birth should be advised as dictated by national guidelines.⁵⁷ For women with a pathological pattern at less than 26⁺⁰ weeks, a discussion of the chance of (healthy) survival should take place.

Evidence level 4

With modern techniques, the complications of general anaesthesia are rare but still higher than for regional anaesthesia.⁵⁸ The use of temporary measures, as described above, can reduce cord compression, making regional anaesthesia the technique of choice.⁵¹ Repeated attempts at regional anaesthesia should be avoided.

Evidence level 1+

One case report described a spinal anaesthetic sited while the pregnant woman was in the knee-chest position because of an anticipated difficult intubation.⁵⁹ This case was successful, but it has been criticised by others.⁶⁰ At present this is not recommended.

Evidence level 3

In a study in which 39 women with cord prolapse in the second stage of labour were supported to give birth vaginally, the percentage of babies with 5-minute Apgar scores of less than 7 was 5% for DDI less than 10 minutes, 30% for 10-20 minutes, and 71% for 20-30 minutes. There were no cases with a DDI of 30 minutes or more.⁴²

One large retrospective study demonstrated that a mean DDI of 15 minutes (SD 9.5 minutes) is achievable in operative vaginal births in a labour room (and an interval of 30 minutes for

Evidence level 2+

assisted births in an operating theatre) for urgent indications ('fetal distress').⁶¹ However, another study showed that assisted vaginal birth for urgent indications took 27 minutes on average (SD 14 minutes). Further analysis showed that 41/91 (45%) gave birth within 20 minutes and the majority within 30 minutes.⁶²

Evidence
level 2+

It is important that clinicians only attempt vaginal birth for those women with very favourable characteristics. It should also be remembered that any delays could be compounded by the possible need to then undertake a caesarean section.

In the Oxford study,¹ the only case of birth asphyxia was associated with an emergency caesarean section after unplanned home birth had initially started. There were 21 forceps births for viable fetuses with cord prolapse, all of which were successful. Of surviving fetuses that were born vaginally, none had a 5-minute Apgar score of less than 7 or an arterial cord pH of less than 7.1. The DDI was 20 minutes or less in 31 of 32 vaginal births and 30 minutes or less in the remaining case.

Evidence
level 2++

The operator should choose the instrument most appropriate to the clinical circumstances and their level of skill. Forceps- and vacuum-assisted births have different benefit and risk profiles.^{63,64} A recent study showed no difference in neonatal outcomes for fetal distress⁶¹ but the two instruments have not been compared directly in the context of cord prolapse.

Evidence
level 3

Neonates born alive after cord prolapse are highly likely to require resuscitation, as evidenced by a high rate of low Apgar scores: 21% at 1 minute and 7% at 5 minutes.¹

Evidence
level 2++

The strong predictive value of a normal paired cord blood gas for the exclusion of intrapartum-related hypoxic ischaemic brain damage justifies the use of paired cord gas analysis in cord prolapse.⁴⁹

Evidence
level 4

4.7 What is the optimal management in community settings?

Midwives should assess the risk of cord prolapse for women requesting home birth or birth in centres without facilities for immediate caesarean section and at the start of labour in the community.

D

Women with known cord prolapse should be advised by telephone to assume the knee–chest face-down position while waiting for hospital transfer.

✓

During emergency ambulance transfer, the knee–chest position is potentially unsafe and the exaggerated Sims position (left lateral with pillow under hip) should be used.

✓

All women with cord prolapse should be advised to be transferred to the nearest consultant-led unit for birth, unless an immediate vaginal examination by a competent professional reveals that a spontaneous vaginal birth is imminent.

D

The presenting part should be elevated during transfer either manually or by using bladder distension. It is recommended that community midwives carry a Foley catheter for this purpose and equipment for fluid infusion.

D

To prevent vasospasm, there should be minimal handling of loops of cord lying outside the vagina.

D

It has been advised that it is essential for a careful risk assessment by the midwifery team to take place before a home birth or births in centres without facilities for caesarean section are advised and supported.⁶⁵

Perinatal mortality is increased by more than ten-fold when cord prolapse occurs outside hospital compared to inside the hospital³⁶ and neonatal morbidity is also increased in this circumstance. A small case series noted that of five cases of cord prolapse, there were three perinatal deaths, all after transfer in from neighbourhood clinics. The other two cases that were diagnosed and gave birth in hospital had infants with normal neurological assessment at 2 years of age.⁶⁶

Evidence
level 3

Elevation of the presenting part during transfer may prevent cord compression.^{67,68}

Evidence
level 3

There are concerns that manipulation of the cord or exposure to air may cause reactive vasoconstriction and fetal hypoxic acidosis.^{2,38,39} Some authorities advise that swabs soaked in warm saline are wrapped around the cord but this is of unproven benefit.^{37,38}

Evidence
level 4

4.8 What is the optimal management of cord prolapse at the threshold of viability?

Expectant management should be discussed for cord prolapse complicating pregnancies with a gestational age at the threshold of viability (23⁺⁰ to 24⁺⁶ weeks).

D

Clinicians should be aware that there is no evidence to support replacement of the cord into the uterus when prolapse occurs at or before the threshold of viability.

D

Women should be counselled on both continuation and termination of pregnancy following cord prolapse at the threshold of viability.

✓

At the threshold of viability (23⁺⁰ to 24⁺⁶ weeks), temporary measures have been recorded for periods up to 3 weeks.^{2,69-71}

Evidence
level 3

Some women might prefer to choose termination of pregnancy, perhaps after a short period of observation to see if labour commences spontaneously. Late termination of pregnancy requires specialist expertise and should only be performed in context of recommendations of the RCOG.⁷² There should be a clear distinction between augmentation of labour with the intention of delivering a live baby and termination of the pregnancy where the intention is that the baby is not born alive, since if over 21⁺⁶ weeks, feticide must be considered.

Evidence
level 4

There is one reported case of cord replacement at 23⁺⁰ weeks of gestation. The woman was in labour and vaginal birth occurred after 8 hours.³⁷ There have been no reports of cases in which uterine replacement of the cord was used to assist expectant management of cord prolapse at extreme preterm gestation.

Evidence
level 3

There are no data to guide decisions about the timing of birth. It should be considered if there are signs of severe fetal compromise once viability has been reached or a gestational age associated with a reasonable neonatal outcome is achieved. Some women might prefer to run a high risk of fetal death in order to achieve a gestational age associated with a better chance of intact neonatal survival.

4.9 Should delayed cord clamping (DCC) be used after cord prolapse?

Delayed cord clamping can be considered if a baby is uncompromised at birth.

B

Immediate resuscitation should take priority over DCC when the baby is unwell at birth.

D

A Cochrane Review concluded that, in term infants, delayed cord clamping (DCC) should be assessed at each birth, especially in infants where access to good nutrition is poor, and this simple intervention may be advantageous.⁷³

In a systematic review of preterm infants (less than 37⁺⁰ weeks of gestation), DCC for up to 180 seconds was associated with fewer blood transfusions for anaemia, better circulatory stability, fewer intraventricular haemorrhages (all grades) and a lower risk of necrotising enterocolitis. The risk of death or high-grade intraventricular haemorrhage was not found to be significantly different.⁷⁴ The UK newborn resuscitation guideline 2010 states 'For uncompromised babies, a delay in cord clamping of at least one minute from the complete delivery of the infant, is now recommended.'⁷⁵ The recommendation also states that most preterm babies are uncompromised and in need of stabilisation rather than resuscitation and therefore the recommendation might be equally applied to them as it is to uncompromised babies at term.

Evidence
level 1+

Most studies have excluded babies who require resuscitation at birth. There is, therefore, insufficient evidence to make a recommendation for babies requiring resuscitation.⁷⁶

Evidence
level 4

5. Clinical governance

5.1 Explanation of events

An opportunity to discuss the events should be offered to the woman (possibly with her companions in labour) at a mutually convenient time.



After obstetric emergencies, women can be psychologically affected by postnatal depression, post-traumatic stress disorder or fear of further childbirth. Women with cord prolapse and those who undergo urgent transfer to hospital might be particularly vulnerable to emotional problems.⁶⁷

Evidence
level 4

5.2 Training

All staff involved in maternity care should receive training in the management of obstetric emergencies including the management of cord prolapse.



Training for cord prolapse should be multidisciplinary and include team rehearsals.



Updates on the management of obstetric emergencies (including the interpretation of fetal heart rate patterns) are a proactive approach to risk management. CNST [<http://www.nhs.uk/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf>], CNORIS [<http://www.clo.scot.nhs.uk/our-services/cnoris.aspx>] and Welsh Risk Pool [<http://www.wales.nhs.uk/sitesplus/955/page/52730>] standards currently mandate that all staff involved in maternity care should attend regular multidisciplinary rehearsals (skill drills) including the management of cord prolapse according to a local training needs analysis (see Appendix 1).

Evidence
level 4

The Simulation and Fire-drill Evaluation (SaFE) Study showed that practical, multidisciplinary, obstetric emergency training increased midwives' and doctors' knowledge of emergency management⁷⁷ and improved the management of simulated obstetric emergencies in general.^{78,79}

Evidence
level 1+

One study of training did not demonstrate any benefit for the management of cord prolapse;⁸⁰ in contrast, a SaFE follow-up study looking at the effect of multidisciplinary training on the management of cord prolapse, using a retrospective cohort design with historical controls, found a reduction in median diagnosis-to-birth times from 25 minutes to 14.5 minutes, without any increase in the use of general anaesthesia and a slight increase in the use of regional anaesthesia. There was also a significant increase in the conduct of recommended actions to alleviate cord compression post training, which was associated with improved neonatal outcomes.⁸¹

Evidence
level 2-

5.3 Clinical incident reporting

Clinical incident forms should be submitted for all cases of cord prolapse.



Currently the CNST [<http://www.nhs.uk/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf>] encourages that all cases of cord prolapse are investigated.

5.4 Documentation

Preformatted sheets should be considered for the recording of clinical events related to cord prolapse.



Preformatted sheets improved the documentation of a simulated obstetric emergency⁸² and should be considered for the recording of clinical events (see Appendix 2).

Evidence
level 2+

6. Recommendations for future research

- Prospective study of diagnosis–birth interval for spontaneous and assisted vaginal births and category 1 caesarean sections in cases of cord prolapse, combined with outcomes at appropriate long-term follow-up.
- Should cord replacement be used in cases at the threshold of viability?

7. Auditable topics

- Audit of the management of cord prolapse in hospital settings (100%).
- Audit of the management of cord prolapse in community settings (100%).
- Synthesis of critical analyses of adverse outcomes related to cord prolapse (100%).
- Proportion of cases of cord prolapse that were incident reported (100%).

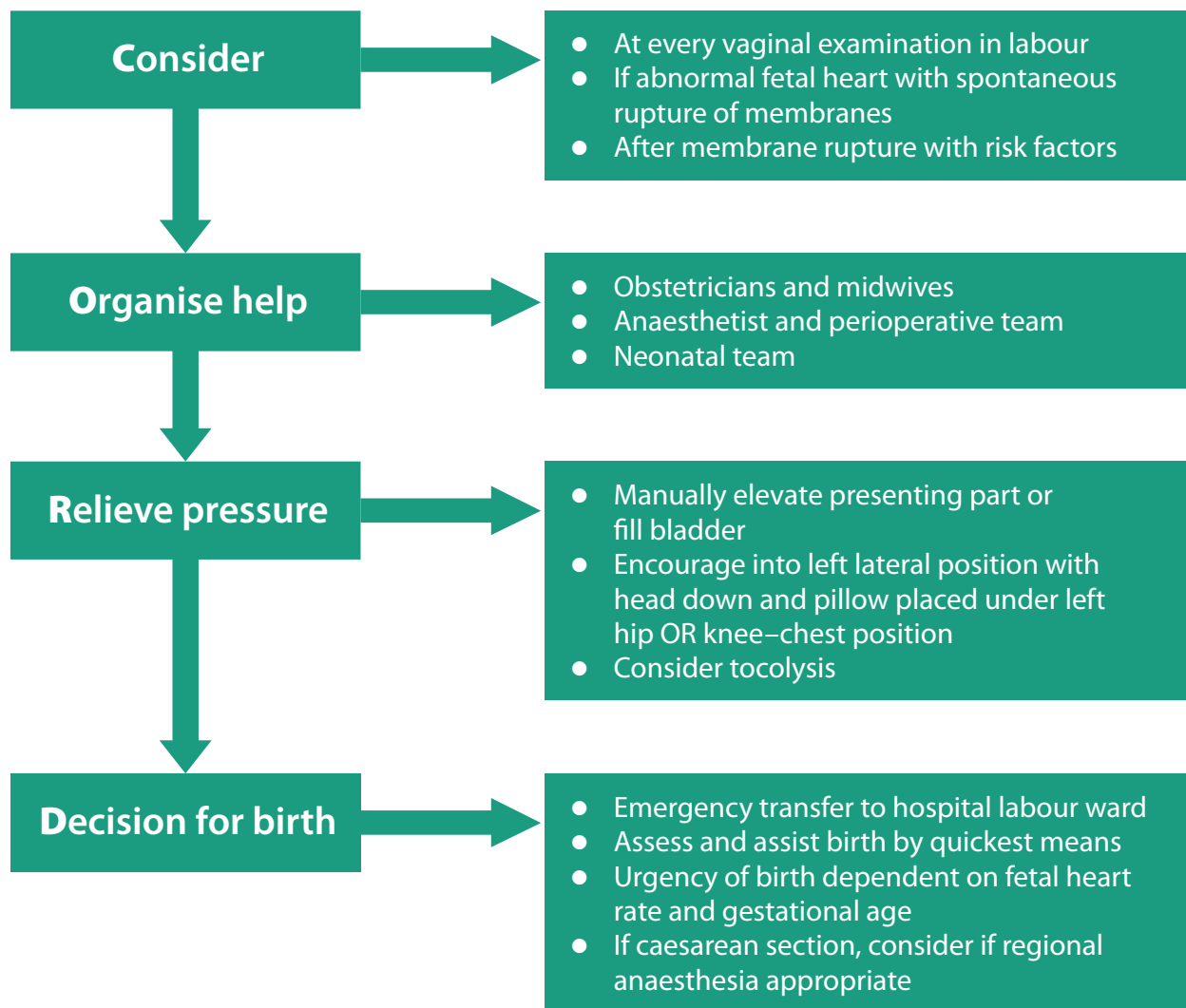
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Appendix I: Suggested actions for management of cord prolapse

CORD⁴⁸



Name
 Date of Birth
 Hospital No

Appendix II: Cord prolapse documentation pro forma

Please tick the relevant boxes:

Senior midwife called: Yes No
 Time called:..... Time called:..... Name:.....
 Obstetrician called: Yes No
 Time called:..... Time called:..... Name:.....
 Grade of obstetrician:.....
 Anaesthetist called: Yes No
 Time called:..... Time called:..... Name:.....
 Neonatologist called: Yes No
 Time called:..... Time called:..... Name:.....
 Diagnosed at home or hospital: Home Hospital
 Time of diagnosis:.....
 Cervical dilation at diagnosis:.....cm

| Procedures used in managing cord prolapse | | |
|--|------------------------------|--|
| Elevating the presenting part manually | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Filling the bladder | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Left lateral, head tilted down / knee-chest position (please circle) | | |
| Tocolysis with subcutaneous terbutaline | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Mode of birth | | Mode of anaesthesia |
| Normal <input type="checkbox"/> | | General anaesthetic <input type="checkbox"/> |
| Forceps <input type="checkbox"/> | | Spinal <input type="checkbox"/> |
| Ventouse <input type="checkbox"/> | | Epidural <input type="checkbox"/> |
| Caesarean section <input type="checkbox"/> | | None <input type="checkbox"/> |
| Other <input type="checkbox"/> | | |
| Diagnosis-to-birth interval:.....minutes | | |
| Neonatal outcome | | |
| Apgar scores: | Weight:.....kg | |
| 1 min: | Cord pH | Base excess |
| 5 mins: | Venous: | |
| 10 mins | Arterial: | |
| Admission to neonatal intensive care unit (NICU)/special care baby unit (SCBU): Yes <input type="checkbox"/> No <input type="checkbox"/> Reason:..... | | |
| Risk incident reporting form completed: Yes <input type="checkbox"/> | | |
| Known risk factors? Please state:..... | | |
| Mother debriefed Yes <input type="checkbox"/> No <input type="checkbox"/> | | |


Signature:..... Print:.....

Designation:..... Date:.....

Appendix III: Explanation of guidelines and evidence levels

Clinical guidelines are: 'systematically developed statements which assist clinicians and patients in making decisions about appropriate treatment for specific conditions'. Each guideline is systematically developed using a standardised methodology. Exact details of this process can be found in Clinical Governance Advice No.1 *Development of RCOG Green-top Guidelines* (available on the RCOG website at <http://www.rcog.org.uk/green-top-development>). These recommendations are not intended to dictate an exclusive course of management or treatment. They must be evaluated with reference to individual patient needs, resources and limitations unique to the institution and variations in local populations. It is hoped that this process of local ownership will help to incorporate these guidelines into routine practice. Attention is drawn to areas of clinical uncertainty where further research may be indicated.

The evidence used in this guideline was graded using the scheme below and the recommendations formulated in a similar fashion with a standardised grading scheme.

| Classification of evidence levels | Grades of recommendations |
|---|--|
| 1++ High-quality meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a very low risk of bias | A At least one meta-analysis, systematic review or randomised controlled trial rated as 1++ and directly applicable to the target population; or A systematic review of randomised controlled trials or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results |
| 1+ Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias | B A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+ |
| 1- Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias | C A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++ |
| 2++ High-quality systematic reviews of case-control or cohort studies or high-quality case-control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal | D Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+ |
| 2+ Well-conducted case-control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal | Good practice point  Recommended best practice based on the clinical experience of the guideline development group |
| 2- Case-control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal | |
| 3 Non-analytical studies, e.g. case reports, case series | |
| 4 Expert opinion | |

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The final version is the responsibility of the Guidelines Committee of the RCOG.

The review process will commence in 2017, unless otherwise indicated.

DISCLAIMER

The Royal College of Obstetricians and Gynaecologists produces guidelines as an educational aid to good clinical practice. They present recognised methods and techniques of clinical practice, based on published evidence, for consideration by obstetricians and gynaecologists and other relevant health professionals. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made by the doctor or other attendant in the light of clinical data presented by the patient and the diagnostic and treatment options available.

This means that RCOG Guidelines are unlike protocols or guidelines issued by employers, as they are not intended to be prescriptive directions defining a single course of management. Departure from the local prescriptive protocols or guidelines should be fully documented in the patient's case notes at the time the relevant decision is taken.