1.0 Introduction
There is a body of evidence accumulating which indicates that a delay of 30 seconds, or more, in umbilical cord clamping leads to significant benefits for the newborn infant\(^1,2\). Delayed clamping is recommended by Newborn Life Support, European Resuscitation Council, the World Health Organisation and the International Federation of gynaecology and Obstetrics but, at the present time, not by NICE\(^3,4,5\). The various bodies recommend a delay in cutting of between 1 and 3 minutes.

Benefits for term babies include a better iron status during the first few months of life\(^6\). The benefits for preterm infants are perhaps more important with fewer babies suffering with hypotension, a reduced need for blood transfusions and fewer having intraventricular haemorrhage\(^7,8,9,10\).

Delayed cord clamping does not interfere with the management of the third stage of labour, nor operative delivery. It does not cause significant delays should resuscitation be needed\(^2,11,12,13\). It is associated with a small increased risk of jaundice requiring phototherapy and asymptomatic polycythaemia\(^1,8\).

2.0 Term Infants  (equal to or more than 37 weeks gestation)

Parents need to be told that the cord will not be clamped immediately (unless the health professional leading neonatal resuscitation deems it appropriate).

When the infant is born they are assessed by the midwife or obstetrician (and paediatric staff if they are present) and triaged into one of two categories:

2.1 Baby appears well

► The infant is dried and placed on the maternal abdomen or on or between the mothers legs, and kept warm. Care should be taken not to raise the infant much above the level of the placenta until the cord is clamped. If the baby is born by caesarean section it is important not to hold the baby up, so parents can see them over the ‘screen’.
► The baby can be put to the breast straight away if wished, the mother can be lying down, semi-recumbent at this time.
► The cord is not clamped and cut for at least 2 minutes. There is no evidence of benefit, or harm, for delaying cord clamping beyond two minutes.
2.2. Appears to be in need of resuscitation

► The professional leading resuscitation makes a rapid assessment of the infant and if they appear to be in need of resuscitation they are handed to a midwife or doctor holding a towel (sterile drape at C/S) who lowers the infant as far as possible below the level of the placenta as the cord will allow. This may be no lower than the bed/ operating table that the mother is lying on.
► Stimulate the baby by gentle rubbing/drying with the towel if they are not breathing, it is best if the baby takes her first breath and expands her lungs (drawing blood from the placenta) before the cord is cut.
► The 30 second period of placental transfusion starts when the buttocks are delivered for a cephalic presentation or the head for a breech presentation.
► The thirty second interval should be counted out by paediatric staff, “ten seconds, twenty seconds” etc.
► The cord is clamped and cut after 30 seconds.
► The first minute after birth is mainly occupied by assessment and stimulation of the infant and hence they will not be compromised by a slightly delayed transfer to the resuscitare.
► This may leave a lot of cord attached to the baby. This can be trimmed on the resuscitare after resuscitation.
► Whilst the cord is left unclamped oxygenated blood will flow from placenta to baby and this should aid rather than compromise the baby's recovery.

If at any time the professional leading resuscitation considers that it is in the best interests of the infant to cut the cord before the above times have elapsed then the cord must be clamped and cut immediately.

Details of the timing of cord cutting and the decisions made around this MUST be clearly documented in the birth notes.

Preterm Infants (less than 37 weeks gestation)

The infant should be held at least 10 - 15 inches (25 to 40 cm) below the level of the placenta for at least 30 seconds. The cord is then clamped, cut and the baby moved to the resuscitare. There is no evidence of benefit or harm with a longer period of placental transfusion.

► All staff and parents should be aware that a thirty second period of placental transfusion, following delivery, is being planned.
► The infant should be held in a towel (sterile drape at C/S) and kept warm.
► A midwife who is allocated to assist with resuscitation or a paediatrician will usually hold the baby. The baby will be held at the side of the bed / operating table 25 to 40 cm below the level of the placenta for 30 seconds. If the cord is not of sufficient length the baby will be held as low as possible for the thirty seconds.
► At C/S an alternative approach, especially for the moderately preterm, is to place the infant on the sterile drapes over the mother's legs for 30 seconds.
► The 30 second period starts when the buttocks are delivered for a cephalic presentation or the head for a breech presentation.
► They should be stimulated by gentle rubbing/drying with the towel if they is not breathing, it is best if the baby takes her first breath and expands her lungs (drawing blood from the placenta) before the cord is cut.
► The thirty second interval should be counted out by paediatric staff, “ten seconds, twenty seconds” etc.
► This thirty second period should be viewed as part of the infants resuscitation not a hindrance to it.

If at any time the professional leading resuscitation considers that it is in the best interests of the infant to cut the cord before the above times have elapsed then the cord must be clamped and cut immediately.

Details of the timing of cord cutting and the decisions made around this MUST be clearly documented in the birth notes.
Alternative approach – cord stripping

There is less evidence to support this practice but it is still superior to immediate clamping. Delayed cord clamping as described above is to be preferred in most situations but there will be occasions on which the paediatric and obstetric staff do not feel able to wait the full 30 seconds, for example if the baby is very pale, appears lifeless and does not respond to tactile stimulation. The cord can be quickly stripped and then cut.

The infant is held 10 -15 inches (25 to 40 cm) below the level of the introitus or incision. A 20cm section of the cord is milked (stripped) by the midwife/obstetrician using a gloved hand in the direction of the baby. The milking speed should be approximately 10cm per second. The cord should be milked 2 or 3 times and then clamped and cut 8.

Summary

Term and well – two minutes minimum on maternal abdomen or legs and then cut cord
Preterm or unwell – thirty seconds below placenta and then cut cord
All cases – Document time of cord clamping

Note on cord blood gas analysis

For medico legal purposes it is important to document the time at which the cord was clamped as delayed clamping can result in significantly different measured values of cord blood acid-base parameters. Delayed clamping reduces pH and increases base deficit values in umbilical artery blood samples. The changes at thirty to sixty seconds after birth are small – see below 14,15.

Note on the administration of uterotonics

The timing of administration of uterotonics has varied from study to study. Some investigators gave them with delivery of the anterior shoulder others only after the cord was clamped, even in the delayed clamping group.

4.0 Related patient information

5.0 Audit

All babies should have the timing of cord clamping documented. If the cord is clamped before the recommended times the reason must be recorded in the medical notes.

Regular audit of clamping times is advised and easy to undertake. Audit of rates of outcomes known to be influenced by timing of cord clamping can be compared to historical data. For instance at the authors unit we were unable to show any increase in rates of phototherapy or dilutional exchange transfusion following the introduction of delayed clamping. Other measures such as rates of blood transfusion, use of inotropes and incidence of IVH would also be of interest and hopefully encourage colleagues to implement delayed clamping as often as possible.
6.0 Summary of Evidence and References

1) **Cochrane review of delayed cord clamping in term infants** (click for link)
“A more liberal approach to delayed cord clamping in healthy term infants appears to be warranted, particularly in light of growing evidence that delayed cord clamping may be of benefit in the longer term in promoting better iron stores in infants”
Studies showed an increased risk of jaundice requiring phototherapy (indications for phototherapy not given) of 2%. With immediate clamping 3% of term babies required phototherapy. Infants had significantly higher ferritin levels at 3 & 6 months of age in the delayed clamping group.

2) **Cochrane review of early versus delayed umbilical cord clamping in preterm infants**
“Delayed cord clamping by 30 to 120 seconds rather than early clamping seems to be associated with less need for transfusion and less intraventricular haemorrhage.” Clearly these are worthwhile benefits. (click for link)

3) **Why do obstetricians and midwives still rush to clamp the cord?** (click for link)
Hutchon D. BMJ 2010;341:c5447
“In the three years since this editorial (Weeks Ref4) there has been no significant change in practice and no change in the guidelines of the UK National Institute for Health and Clinical Excellence (NICE).”

4) **NICE Intrapartum care for healthy women and babies guidance** (click for link)
“women at low risk of intrapartum haemorrhage who request physiological management of the third stage of labour should be supported in their choice”
“There is limited medium level evidence from trials in high income countries that showed delayed cord clamping reduced the incidence of anaemia and increases hyperbilirubinaemia in the baby”
NICE have failed to separate cord clamping time from other procedures that constitute the active management of the third stage of labour, namely use of uterotonics and controlled cord traction. For this reason they have concluded that active management of the third stage is to be recommended to reduce the incidence of post partum haemorrhage. There is no evidence that delayed clamping would increase the risk of PPH. – see BMJ Letters 2007; 334:p651 “NICE is encouraging artificial intervention”

5) **European Resuscitation Council Guidelines for resuscitation 2010.** (click for link)
Wyllie J and Richmond S. Resuscitation 81; 1389 - 1399
“Recommendation: Delay in umbilical cord clamping for at least 1min is recommended for newborn infants not requiring resuscitation. A similar delay should be applied to premature babies being stabilised.”

6) **Late vs early clamping of the cord in full term neonates: Systemic review and meta-analysis of controlled trials** (click for link)
Hutton E and Hassan E. JAMA 2007;297:1241 – 1252
“DCC in full term neonates for a minimum of two minutes is beneficial to the newborn, extending into infancy. Although there was an increase in polycythaemia ..... this condition appeared to be benign”

7) **Seven month developmental outcomes of VLBW infants enrolled in a randomized controlled trial of delayed vs immediate cord clamping** (click for link)
Mercer JS et al. J Perinatol 2010. 30; 11-16
“DCC at birth seems to be protective of VLBW male infants against motor disability at 7 months corrected age”

8) **Umbilical cord milking reduces the need for red cell transfusions and improves neonatal adaptation in infants born at less than 29 weeks gestation: a randomised controlled trial.** (Click for abstract)
The milked group was more likely not to have needed red cell transfusion and had a decreased number of RBC transfusions (milked group 1.7 vs controls 4.0). Mean blood pressure at admission was significantly higher in the milked group (34 vs 28mmHg). There was a significant decrease in major IVH in the milked group and a significant decrease in the incidence of CLD at 36 weeks.
9) **Delayed cord clamping in very preterm infants reduces the incidence of intraventricular haemorrhage and late onset sepsis: a randomised, controlled trial**

Pediatrics 2006; 117(4) p 1235 – 1242 (click for link)

Delayed cord clamping (< 32 weeks by 30-45 seconds, baby held 10-15 inches below placenta) showed a significant benefit on rates of IVH and late onset sepsis.

10) **Umbilical cord clamping and preterm infants: a randomised trial**

BMJ 1993; 306:172 – 175 (click for abstract)

Babies 27-33 weeks were held 20cm below placenta for 30 seconds. Significant reduction in RBC transfusions and duration of supplemental oxygen. “This intervention produces clinical and economic benefits”

11) **Delayed cord clamping should be more widely practised**

Gallagher AL and Hutchon LD. Arch Dis Child letter Feb 2010 95; F59 – F63

“delayed cord clamping should not be seen as an intervention but rather as the allowance of a physiologically normal transition from intra to extra uterine life. On the other hand immediate cord clamping is clearly a medical intervention and one for which there is no evidence of benefit to either the mother or the newborn infant”

12) **Umbilical cord clamping after birth – better not to rush**

Weeks A. BMJ editorial 2007; 335:312-3

“So long as the cord is unclamped the average transfusion to the newborn is 19ml/kg birth weight, equivalent to 21% of the neonate’s final blood volume. The final amount is unaffected by the use of oxytocics or the position of the baby relative to the placenta. Three quarters of the transfusion occurs in the first minute after birth. The rate of transfer can be increased by the use of intravenous uterotonics or by holding the newborn 40cm below the level of the placenta”

13) **Delayed cord clamping with full neonatal resuscitation at caesarean section**

British international congress of obstetrics and gynaecology 2007; Oral abstract FC4.15

The authors describe practice in their hospital (Darlington Memorial) where delayed clamping is practised by bringing the resuscitaire to the side of the operating table.

14) **Acid base equilibrium in umbilical cord blood and time of cord clamping.**

Obstet Gynaecol 1984; 63(1) p 44 – 47 (click for abstract)

At thirty seconds after birth arterial blood from the unclamped cord showed a distinct decrease in pH and an increase in PCO2 and base deficit. These changes were not observed in the venous cord blood.

pH change in one minute in arterial blood ranged from 0.008 to 0.076U, median of 0.038U. Base deficit increase at one minute after birth was between 0.2 and 3.0 mMol, median 1.0mMol.

15) **Delayed umbilical clamping at birth has effects on arterial and venous blood gases and lactate concentrations.**

Wiberg N, Kallen K and Olofsson P. BJOG 2008;115:697 – 703 (click for abstract)

“In arterial blood there were significant decreases of pH (7.24 – 7.21), HCO3 (18.9 – 18.1mmol/l) and BE (-4.85 to -6.14mmol/l), and significant increases of PaCO2 (7.64 – 8.07kPa), PO2 (2.30 – 2.74 kPa) and lactate (5.3 – 5.9 mmol/l) from T0 to T90 seconds with the most pronounced changes at T0 – T45. Similar changes occurred in venous bloodpH (7.32 – 7.31), HCO3 (19.54 – 19.33mmol/l), BE (-4.93 to -5.19 mmol/l), PaCO2 (5.69 – 5.81kPa) and lactate (5.0 – 5.3 mmol/l)although the changes were smaller and most pronounced at T45 – T90. No significant changes were observed in venous PO2.”