

## Delayed Cord Clamping at Delivery of a Newborn- A Position Statement by the College of Paediatrics and the College of Obstetricians and Gynaecologists, Academy of Medicine of Malaysia

CHEAH FC<sup>1,2</sup>, OMAR SZ<sup>3</sup>, LIM PS<sup>2,4</sup>, ISMAIL H<sup>5</sup>, LIM CKK<sup>6</sup>,  
THONG MK<sup>7,8</sup>, YONG SC<sup>9</sup>, CHEE SC<sup>10</sup>

<sup>1</sup>Department of Paediatrics, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, Kuala Lumpur, Malaysia

<sup>2</sup>Placenta and Perinatal Research Group, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia

<sup>3</sup>Department of Obstetrics and Gynaecology, Universiti Malaya Medical Centre, Lembah Pantai, Kuala Lumpur, Malaysia

<sup>4</sup>Department of Obstetrics and Gynaecology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, Kuala Lumpur, Malaysia

<sup>5</sup>Department of Obstetrics and Gynaecology, Kulliyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

<sup>6</sup>Department of Obstetrics and Gynaecology, Hospital Ampang, Jalan Mewah Utara, Selangor, Malaysia

<sup>7</sup>Department of Paediatrics, Universiti Malaya Medical Centre, Lembah Pantai, Kuala Lumpur, Malaysia

<sup>8</sup>M. Kandiah Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Selangor, Malaysia

<sup>9</sup>Department of Paediatrics, Pantai Hospital Kuala Lumpur, Jalan Bukit Pantai, Kuala Lumpur, Malaysia

<sup>10</sup>Faculty of Health and Medical Sciences, Taylor's University, Subang Jaya, Selangor, Malaysia

### ABSTRAK

*Pengapitan tali pusat lewat (PTPL) ialah suatu amalan di mana tali pusat bayi yang baru lahir tidak segera diapit selepas kelahiran, sebaliknya ditangguhkan untuk membolehkan pemindahan darah dan nutrien yang penting dari uri ke bayi. Kenyataan pendirian ini menyokong PTPL dengan menekankan beberapa faktor fisiologi utama bayi dalam menyesuaikan diri dengan kehidupan luar rahim sebagai justifikasi untuk menangguhkan pengapitan tali pusat. Masa yang optimum*

**Address for correspondence and reprint requests:** Professor Dr. Cheah, Fook Choe. Department of Paediatrics, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia. Tel: +603-9174 8510 Email: cheahfc@ppukm.ukm.edu.my

*untuk mengapit tali pusat juga dibincangkan berdasarkan saranan amalan terbaik daripada beberapa badan antarabangsa terkemuka yang terlibat dalam penjagaan ibu, janin dan bayi baru lahir. Dalam menjelaskan manfaat PTPL dari perspektif saintifik, kenyataan pendirian ini juga mengkaji impak signifikan terhadap kesihatan bayi baru lahir, terutamanya dalam mengurangkan pendarahan dalam otak dan ketidakstabilan peredaran darah untuk golongan bayi pramatang, anemia kekurangan zat besi, dan meningkatkan hasil perkembangan otak jangka panjang. Pada umumnya, kebimbangan dan risiko potensi yang sering dikaitkan dengan PTPL seperti pendarahan selepas bersalin dan penyakit kuning bayi baru lahir telah disangkal berdasarkan penyelidikan terkini. Kenyataan pendirian ini bertujuan memberikan saranan kepada kakitangan penjagaan kesihatan dan nasihat kepada ibu bapa di Malaysia, dengan harapan PTPL akan dilaksanakan di seluruh negara sebagai amalan piawai pada masa terdekat.*

*Kata-kunci: Anemia kekurangan zat besi; bayi cukup bulan; bayi pramatang; pemindahan darah dari uri; pengapitan tali pusat awal; pengapitan tali pusat segera; tali pusat bayi*

## ABSTRACT

Delayed cord clamping (DCC) is a practice in which the umbilical cord of a newborn is not immediately clamped and cut after birth, but deferred to allow the transfer of vital blood and nutrients from the placenta to the neonate. This position paper, in advocating DCC, highlights some key physiological factors of the newborn transitioning into extrauterine life in justifying the delay in cord clamping. The optimum timing in clamping the cord is also discussed based on the recommendations on best practice from some of the foremost international bodies involved in maternal, fetal and neonatal care. In explaining the benefits of DCC from a scientific perspective, this paper also reviews the significant impact on neonatal health, especially in decreasing intraventricular haemorrhage and circulatory instability in the preterm infant, iron deficiency anaemia, and improving long-term neurodevelopment outcome. Common concerns and potential risks related to DCC such as postpartum haemorrhage and neonatal hyperbilirubinemia are largely disproved. This position paper provides recommendations for healthcare providers and advice for parents in Malaysia, in the hope that DCC will be implemented nationwide soon as a standard of care.

**Keywords:** Early cord clamping; immediate cord clamping; iron deficiency anaemia; placental transfusion; preterm infant; term infant; umbilical cord

## INTRODUCTION

Early cord clamping (ECC) or immediate cord clamping (ICC) involves clamping and cutting the umbilical cord within the first 60 seconds (generally within the first 15-30 seconds) after birth. In contrast, delayed cord clamping (DCC) is when the umbilical cord is clamped more than 60 seconds after birth, or after the cord pulsations have ceased (McDonald et al. 2013; Mercer 2001)). Both term and preterm newborns experience benefits from DCC (Li et al. 2021; McDonald et al. 2013). These include increased early haemoglobin concentrations, increased iron stores, and better neurodevelopmental outcomes (Seidler et al. 2021). More specific to preterm infants, are decreased severe intraventricular haemorrhage, requirement for inotropic support, as well as a lower incidence of respiratory distress syndrome (Rabe et al. 2019).

The primary reason for these improved outcomes is due to DCC enabling the continuous flow of blood between the placenta and the newborn during the third stage of labour, facilitating a more stable neonatal hemodynamic transition (Kresch 2017). During this physiological transition, there is a gradual increase in the neonate's heart rate - which is now considered one of the most reliable indicators of stabilisation. Therefore, DCC allows for a safe period of transitioning for the newborn while avoiding hasty and unnecessary interventions by healthcare providers (Te Pas et al. 2019).

In the case of the preterm infant,

a study (Katheria et al. 2016) found that more than 90% of infants born at 32 weeks of gestation were able to breathe spontaneously within the first minute after birth following stimulation, thus avoiding mechanical ventilation. Establishing breathing is crucial for achieving cardiovascular stability, therefore efforts should be made to encourage spontaneous breathing in the newborn during DCC, and stimulation can be used to facilitate this process. This approach again allows for a safe period to assess the initiation of spontaneous breathing and to minimize medical support while avoiding unnecessary and potentially harmful interventions (Bianchi et al. 2021).

The transition of a newborn to extra-uterine life is an intricate physiological process that involves a synchronised interplay of various mechanisms. It encompasses several vital components: the initiation of spontaneous breathing by the newborn, which serves to oxygenate the lungs, leading to a decrease in pulmonary vascular resistance and subsequently facilitating an increase in pulmonary blood flow. This critical transition necessitates an additional supply of blood volume, drawn from the low-resistance placental circulation. This process is often referred to as "placental transfusion" (Farrar et al. 2011).

However, the practice of ICC disrupts this physiological progression. ICC can lead to a significant reduction in venous return to the heart, potentially causing a 30-50% decrease in cardiac output, particularly impacting preterm infants by increasing the risk of circulatory

collapse. When cord clamping occurs before the lungs have a chance to aerate, this reduction in cardiac output could lead to decreased cerebral blood flow, which may result in severe intraventricular haemorrhage (IVH) in the preterm infant consequent to ICC (Mercer et al. 2006).

A previous concern with DCC, especially with the obstetrics community is whether this could impact maternal health. The ICC was introduced as part of the active management of the third stage of labour to mitigate the risk of postpartum haemorrhage (Hersh et al. 2024). The effectiveness of this intervention is dubious for this purpose and on the contrary, the WHO has recommended DCC as one of the steps in the guidelines for the prevention of postpartum haemorrhage (WHO 2012). In both Caesarean and vaginal births, there is no increased risk of maternal blood loss or postpartum haemorrhage when compared to ICC (Purisch et al. 2019; Qian et al. 2019). Instead, DCC allows for immediate skin-to-skin contact between the mother and the neonate, facilitating early initiation of kangaroo mother care while the newborn continues to receive additional blood and nutrients from the placenta.

### History of Cord Clamping

In the early 19<sup>th</sup> century, the English physician, Erasmus Darwin mentioned “Another thing very harmful to the child is the tying and cutting of the navel too soon, which should always be left until the child has not only repeatedly

breathed but until all pulsation in the cord ceases. As otherwise the child is much weaker” (Darwin 1794). This early recognition regarding the harmful effects of ICC should have been a wake-up call alerting us to how important it is to delay clamping of the cord to optimise the newborn’s immediate and later health.

### Physiology of Placental Transfusion

At birth, blood flow to the lungs of the newborn is significantly increased, when air breathing is initiated. If the neonate is stimulated to breathe before the umbilical cord is clamped, the increased blood flow through the umbilical vein can counterbalance the loss of systemic flow that occurs through the patent ductus arteriosus (Kresch 2019). This provides the preload needed for the left ventricle which gradually receives increasing pulmonary venous return coinciding with the fall in pulmonary vascular resistance occurring in the first few minutes after birth (Kresch 2019). Earlier physiological studies in term infants consistently showed that a transfer from the placenta of approximately 80 mL of blood occurs by 1 minute, reaching approximately 100 mL at 3 minutes after birth (Raju & Singal 2012; Yao & Lind 1977). This indicates that most placental transfusion occurs within the first 1 minute of delayed cord clamping. Additionally, initial breaths taken by the newborn appear to facilitate this placental transfusion (Bhatt et al. 2013).

## EFFECTS ON TERM INFANTS

In the short term, DCC increases early haemoglobin concentrations and iron stores in infants (McDonald et al. 2013). In the longer term, a randomised trial conducted in a high-income country among full-term infants from low-risk pregnancies showed better neurodevelopment at 4 years of age in infants that went through delayed rather than early cord clamping (Andersson et al. 2015). This trial also showed DCC was associated with less iron deficiency in these infants when they were at 4–6 months of age, indicating a possible relationship between iron sufficiency and better later neurodevelopment. This study also found that DCC at birth showed favourable outcomes on fine motor and social domains at four years old, particularly among boys. In short, DCC may promote better neurological development.

Furthermore, the timing of cord clamping on the early developing brain at 12 months in a healthy population showed that infants who received DCC exhibited greater myelin content in their brain regions related to motor function, visual processing, spatial awareness, and sensory processing (Mercer et al. 2022). The greater myelination may be the result of a longer placental transfusion allowing for the transfer of more growth factors and stem cells that are beneficial for the maturation of organs in the neonate. Overall, these findings indicate that DCC may have positive effects on brain growth, and as such, better neurodevelopmental outcomes.

## EFFECTS ON PRETERM INFANTS

Delayed cord clamping facilitates a gentler physiological transition of newborns to extrauterine life especially among preterm infants with impeded maturation. When compared to ICC, meta-analyses reveal a substantial 28% decrease in the risk of mortality amongst newborns delivered before 37 weeks of gestation, including extremely preterm neonates (28 weeks or less), without increasing the rate of low Apgar scores and the need for cardiorespiratory support or neonatal resuscitation at delivery (Fogarty et al. 2018). Furthermore, a systematic review (Rabe et al. 2019) found moderate quality evidence that DCC (specified to be more than 30 seconds after birth) in preterm infants may reduce neonatal mortality prior to discharge. This review also found that the number of preterm infants with any grade of IVH is slightly reduced with DCC, although the rate of severe IVH (grade 3 or 4) showed no significant difference between neonates with DCC and ICC.

Delaying clamping of the cord reduced the need for blood transfusion, decreased the risk of IVH and necrotising enterocolitis in the preterm population (Rabe et al. 2012). Of note, DCC offers additional advantages in stabilising the preterm infant in the initial period after birth with a ten percent reduction in the necessity for blood transfusions, as well as improving mean blood pressure, leading to a reduced requirement for inotropic support (Seidler et al. 2021). Moreover, DCC has been linked

to a lower incidence of respiratory distress syndrome in preterm infants, a critical benefit that can have a lasting impact on their long-term health (Chiruvolu et al. 2015). Reassuringly, DCC was actually associated with, in contradiction to those who worry about hesitation in cutting the cord, a reduced incidence of low Apgar score at 1 minute and showed no significant effect on the incidence of low Apgar score at 5 minutes. Overall, DCC was not negatively associated with other outcomes such as the frequency of intubation for resuscitation, admission temperature, mechanical ventilation, brain injury, chronic lung disease, patent ductus arteriosus, necrotising enterocolitis, late-onset sepsis, or retinopathy of prematurity (Fogarty et al. 2018).

### CONCERNS AND SPECIAL CONSIDERATIONS WITH DELAYED CORD CLAMPING

In terms of the potential risks of DCC, a previous comprehensive analysis of 15 randomised trials involving 3911 mothers and their infants comparing ICC/ECC versus DCC showed that there was a 40% increase in the need for phototherapy for jaundice among newborns subjected to DCC (McDonald et al. 2013). Specifically, in infants of diabetic mothers, hyperbilirubinemia risk may be greater (Shao et al. 2022) and in growth-restricted newborns, there may also be an increased risk of polycythaemia (British Association of Perinatal Medicine 2020). However, there is emerging evidence from newer studies showing no increase in the rates

of hyperbilirubinemia or phototherapy requirements for newborns who had undergone DCC. Of note, a recent study (Malik et al. 2024) showed that DCC of more than 120 seconds in infants had the highest haemoglobin levels and haematocrit without an increase in the risk of hyperbilirubinemia. Interestingly, the risk of adverse effects like polycythaemia or neonatal hyperbilirubinemia did not increase even after extending the timing of cord clamping to more than 180 seconds. Another study showed that there was no increase in the rates of phototherapy among infants subjected to DCC compared to ECC (Rana et al. 2020). The ACOG is of the view that there may be the risk of a small increase in the incidence of jaundice that requires phototherapy in term infants undergoing DCC (American College of Obstetricians and Gynecologists' Committee on Obstetric Practice 2020). Consequently, they recommend that care providers adopting DCC in term infants should ensure that mechanisms are in place to monitor and treat neonatal jaundice.

ICC should be considered or tailored to individual circumstances in specific clinical situations. For maternal cases, these include instances of haemorrhage, hemodynamic instability, or a combination of both, as well as abnormal placentation (such as previa or abruption). Even so, in placenta abruption, DCC can be considered when the placenta is delivered concurrently with the baby, it can be strategically positioned above the baby, followed by gentle pressure on the placenta. Clamping the cord at

around 60 seconds before lowering the placenta is advisable. Additionally, the option of gentle umbilical cord milking can be evaluated in this scenario (Ashford and St. Peter's Hospital 2021). A short cord length may present challenges in maternal and neonatal care. However, these challenges can typically be mitigated by ensuring optimal positioning. It's crucial not to automatically resort to ECC or cord milking due to this factor (Ashford and St. Peter's Hospitals 2021).

For fetal/neonatal considerations, immediate clamping may be necessary when there is an immediate need for resuscitation, when the placental circulation is compromised (e.g., abruption, previa, cord avulsion), or when there is fetal growth restriction with abnormal cord Doppler evaluation (American College of Obstetricians and Gynecologists' Committee on Obstetric Practice 2020).

Studies on multiple births have confirmed the feasibility of implementing DCC for twins and triplets (Jegatheesan et al. 2019). At this time, there is not sufficient evidence to recommend for or against DCC in multiple gestations. In saying so, multiple births should not be routinely excluded from the practice of DCC. The delivery plan should be individually tailored, with a collaborative decision made between the obstetrics and neonatal team well in advance of the birth.

In special situations when families are considering banking of umbilical cord blood, they should be counselled that DCC may significantly decrease the volume and total number of cells in the

umbilical cord blood to be collected for donation (Allan et al. 2016). Unless there is a directed donation already planned, advice should be given about the exceeding benefit to the newborn infant than banking for possible future use (American College of Obstetricians and Gynecologists' Committee on Obstetric Practice 2020).

### ALTERNATIVES TO DELAYED CORD CLAMPING

There may be some situations when DCC may not be an option, for example when an infant requires immediate resuscitation. An alternative to DCC to enhance placental transfusion is in the form of umbilical cord milking (UCM). This can be done with or without prior clamping of a long segment of the cord. UCM involves squeezing the segment of the umbilical cord from the end closer to the placenta towards the infant, encouraging the blood left in the umbilical cord to enter the infant's circulation. However, a systematic review and meta-analysis on the safety and efficacy of UCM amongst preterm infants was conducted. Nineteen studies (2014 preterm infants) were included, with five studies (n=922) comparing UCM with DCC, whereas 14 studies (n=1092) compared UCM with ICC. UCM significantly increased the risk of severe IVH (grade 3 or higher) as compared to DCC [risk ratio: 1.95 (95% CI, 1.01 to 3.76);  $p=0.05$ ] (Balasubramanian et al. 2020). Another trial comparing UCM to DCC in preterm infants found that although there was no statistically significant difference in death for both groups,

rates of severe IVH was significantly higher in the UCM group than in the DCC group [8% (20/236) vs 3% (8/238), respectively; risk difference, 5% (95% CI, 1% to 9%);  $P = 0.02$ ] (Katheria et al. 2019). Emerging studies show that UCM is not associated with IVH especially in the more mature preterm infant, greater than 28 weeks gestation (Katheria et al. 2023; Murali et al. 2023). More studies are needed before recommendations are made to support UCM in infants born preterm or term requiring immediate resuscitation after birth. As an alternative to not doing UCM when immediate resuscitation is required, there are innovative neonatal resuscitation platforms configured in proximity to the maternal bedside, allowing resuscitation of the infant with an intact cord until clamping is done later as desired (Katheria et al. 2021).

### **OPTIMUM TIMING FOR DELAYED CORD CLAMPING**

In recent years, many international bodies have recommended DCC as a standard of practice based on consistent evidence demonstrating its benefits. This includes the WHO, which recommends delaying cord clamping by 30-120 seconds after birth. The recommended duration to delay cord clamping is, however, quite variable, as the ideal timing is yet to be established (Rabe et al. 2019). Different guidelines recommended different durations. Even so, around 75% of the blood available for transfer from the placenta to the fetus is typically transfused within 60 seconds after birth (Lainez et al. 2005). Although a

longer time for placental transfusion, especially to the preterm infant for transitioning into extrauterine life, the more advantageous it may be for positive outcomes, this timing needs to be balanced with other aspects, such as respiratory support requirement and temperature stabilisation. The International Liaison Committee on Resuscitation advocate for a 60-second wait for babies born preterm (Perlman et al. 2010). Recommendations from the Society of Obstetricians and Gynecologists of Canada (Mcdonald et al. 2022) suggest ideally at least 60 seconds after birth for preterm births, while the European Panel of Expert Neonatologists' Consensus Guidelines (Sweet et al. 2023) recommend deferring clamping the cord if possible, for at least 60 seconds in preterm newborns. The latest updated guidelines for neonatal resuscitation involving umbilical cord clamping (UCC) endorsed by the American Heart Association and American Academy of Pediatrics suggest at least 30 seconds for term and late-term infants of 34 weeks gestation and above (Yamada et al. 2024).

### **EXISTING BEST PRACTICE RECOMMENDATIONS AND GUIDELINES**

#### **WHO Guidelines (WHO 2014)**

- (i) In newly born term or preterm babies who do not require positive-pressure ventilation, the cord should not be clamped earlier than 1 min after birth (strong recommendation).
- (ii) When newly born term or preterm



babies require positive-pressure ventilation, the cord should be clamped and cut to allow effective ventilation to be performed (conditional recommendation).

(iii) Newly born babies who do not breathe spontaneously after thorough drying should be stimulated by rubbing the back 2–3 times before clamping the cord and initiating positive-pressure ventilation (conditional recommendation).

(iv) Late cord clamping (performed approximately 1–3 min after birth) is recommended for all births, while initiating simultaneous essential neonatal care (strong recommendation).

(v) Early UCC (less than 1 min after birth) is not recommended unless the neonate is asphyxiated and needs to be moved immediately for resuscitation (strong recommendation).

#### **National Institute for Clinical Excellence guideline (NICE 2014)**

Do not clamp the cord earlier than 1 minute from the birth of the baby unless there is concern about the integrity of the cord or the baby has a heartbeat below 60 beats/minute that is not getting faster.

#### **Recommendation by FIGO (Bianchi et al. 2021)**

There is insufficient evidence to show what duration of delay is best. The current evidence supports not clamping the cord before 30 seconds for preterm births. Future trials could compare different lengths of delay.

Until then, at term a period of 30 seconds to 3 minutes seems justified or until the cord is collapsed and white.

For both preterm and term-born babies, during the cord clamping delay, attempts should be made to get them to breathe spontaneously.

#### **American College of Obstetricians and Gynaecologists Guidelines (ACOG Committee on Obstetric Practice 2020)**

Given the benefits to most newborns and concordant with other professional organisations, the ACOG now recommends a delay in UCC in vigorous term and preterm infants for at least 30-60 seconds after birth.

#### **American Heart Association and American Academy of Pediatrics (Yamada et al. 2024)**

(i) For term and late preterm newborn infants 34 weeks' gestation who do not require resuscitation, delayed cord clamping ( $\geq 30$  seconds) can be beneficial compared with early cord clamping ( $< 30$  seconds).

(ii) For preterm newborn infants  $< 34$  weeks' gestation who do not require resuscitation, delaying cord clamping ( $\geq 30$  seconds) can be beneficial compared with early cord clamping ( $< 30$  seconds).

### **CURRENT STATE OF PRACTICE IN MALAYSIA**

A cross-sectional survey assessed the state of practice of UCC in Malaysia and the level of knowledge regarding

DCC amongst obstetric and paediatric doctors, as well as midwives (Pong et al. 2022). Most respondents (71%) were not aware of any formal guidelines on UCC in their place of practice. Despite published evidence on the benefits of DCC, only 29% of respondents reported that their institution had a UCC guideline. This contrasts markedly against developed countries where DCC is considered a standard of care.

The authors proposed the incorporation of DCC guidelines into training programmes and highlighted the importance of educating healthcare professionals on the benefits of DCC, especially among midwives and non-specialists (Pong et al. 2022).

The lack of awareness and formal guidelines on UCC in Malaysia's healthcare setting requires an urgent need for increased education and awareness of DCC among healthcare professionals as to the benefits of DCC to newborn health and put into practice this intervention as the standard of care, which is evidence-based and in line with recommendations from international professional organisations, especially the WHO.

In advancing DCC to be implemented nationwide, a committee of representatives from the College of Paediatrics and College of Obstetricians and Gynaecologists of the Academy of Medicine of Malaysia have approached the Ministry of Health stakeholders to propose a work process for DCC in consultation with lead doctors, midwives, as well as public health specialists. As a result, a workflow process in both English and

Bahasa Malaysia (Table 1) has been developed and will be implemented in due time.

## CONCLUSION

DCC is a practice that holds immense promise in improving neonatal outcomes and should be embraced in Malaysia's routine obstetric care. This is backed by enough strong evidence on the benefits of DCC for both term and preterm infants. Many countries around the world have already adopted this practice in accordance with the WHO recommendations. It is time that we implement DCC as the standard of care in Malaysia. It is hoped that this position statement with a summary of the science, clinical benefits and best practices on DCC forms a practical guide tailored to the local setting not only will ensure that all healthcare professionals are well-informed but also encourages a sustainable implementation of DCC. The colleges also hope there will be more efforts in creating regular training programmes and audit in evaluating DCC as a routine clinical procedure. Further research is encouraged to determine the optimum positioning of the infant, duration of delay in cord clamping and resuscitation of infants with an intact cord.

Lastly, it is emphasised here that DCC is a safe and straightforward procedure requiring minimal additional resources, making it highly feasible to implement in most Malaysian healthcare facilities. This practice aligns with the principles of evidence-based care and ensures that newborn

TABLE 1: Recommended workflow process for delayed cord clamping after birth in Malaysia

Six Steps on Delayed Cord Clamping (DCC) (English language version)	Enam Langkah Pengapitan Tali Pusat Lewat (PTPL) (Malay language version)
Step 1: Delayed cord clamping is recommended for all births, while initiating simultaneous essential neonatal care. Delayed cord clamping of at least 1 minute for term births, and at least 30 seconds for preterm births.	Langkah 1: Pengapitan tali pusat lewat adalah disyorkan untuk semua kelahiran, serentak dengan memulakan perawatan awal neonatal. Pengapitan tali pusat lewat adalah tidak kurang 1 minit untuk bayi kelahiran matang dan tidak kurang 30 saat untuk bayi kelahiran pramatang.
Step 2: Early umbilical cord clamping (less than 30 seconds after birth) is not recommended unless immediate resuscitation of the mother or newborn infant is required.	Langkah 2: Pengapitan tali pusat awal (kurang daripada 30 saat selepas kelahiran) tidak digalakkan melainkan ibu atau bayi yang baru lahir memerlukan resusitasi segera.
Step 3: During the delayed cord clamping period, attempts should be made to stimulate the newborn infant to breathe spontaneously.	Langkah 3: Ketika dalam tempoh pengapitan tali pusat lewat, cubaan merangsang bayi yang baru lahir untuk bernafas secara spontan perlu dilakukan.
Step 4: Delayed cord clamping for term infants born vaginally should be done with the infant placed on the maternal abdomen for immediate skin-to-skin care.	Langkah 4: Pengapitan tali pusat lewat untuk bayi kelahiran matang yang dilahirkan secara biasa perlu dilakukan secara bayi diletakkan di perut ibu untuk sentuhan segera kulit ke kulit.
Step 5: For caesarean delivery, the newborn infant is placed between the mother’s legs, on a piece of dry sterile drape while being held close to the level of the placenta before the umbilical cord is clamped.	Langkah 5: Untuk kelahiran Caesarean, bayi yang baru lahir diletakkan di celah kedua kaki ibu, di atas sehelai kain alas kering yang steril sambil dipegang separas mungkin dengan uri sebelum tali pusat diapit.
Step 6: Umbilical cord milking is not recommended for all deliveries.	Langkah 6: Melurut tali pusat tidak digalakkan untuk semua jenis kelahiran.

infants receive the best possible start in life. As such, the College of Paediatrics and the College of Obstetricians and Gynaecologists from the Academy of Medicine of Malaysia propose the following recommendations for DCC in Malaysia:

- (i) Delayed cord clamping is recommended for all births, while initiating simultaneous essential neonatal care. Delayed cord clamping of at least 1 minute for term births, and at least 30 seconds for preterm births.
- (ii) Early UCC (less than 30 seconds after birth) is not recommended unless immediate resuscitation of the mother or newborn infant is required.
- (iii) Delayed cord clamping for

longer durations may be feasible in centres with the appropriate facilities, equipment, and experienced staff.

(iv) If delayed cord clamping for neonates that require immediate resuscitation (such as in cases of fetal distress or high-risk pregnancies) is to be considered, it should be performed in consultation with the paediatric-skilled personnel standing by at delivery.

(v) During the delayed cord clamping period, attempts should be made to stimulate the newborn infant to breathe spontaneously.

(vi) Delayed cord clamping for term infants born vaginally should be done with the infant placed on the

maternal abdomen for immediate skin-to-skin care.

(vii) For caesarean delivery, the newborn infant is placed between the mother's legs, on a piece of dry sterile drape while being held close to the level of the placenta before the umbilical cord is clamped.

(viii) Umbilical cord milking is inferior to delayed cord clamping in terms of placental transfusion. Umbilical cord milking is not recommended especially for extremely preterm deliveries (below 28 weeks) due to the possible increased risk of intraventricular haemorrhage.

(x) Delayed cord clamping is to be performed on a case-to-case basis in special situations such as maternal haemorrhage, placenta abruptio or previa, short cord length, and multiple gestations.

### ACKNOWLEDGEMENT

The authors thank Dr. Choong Zhi Chien and Dr. Natalie Ling Sze Jane for their technical assistance in the preparation of this position paper.

### DISCLAIMER

The authors declare no conflicts of interest in the preparation of this manuscript. The recommendations in this position paper are based on the expert opinion of the authors, after seeking the best available and current evidence on delayed cord clamping after birth. These may change when more studies are conducted in the future and new evidence emerges.

### REFERENCES

- Allan, D.S., Scrivens, N., Lawless, T., Mostert, K., Oppenheimer, L., Walker, M., Petraszko, T., Elmoazzen, H. 2016. Delayed clamping of the umbilical cord after delivery and implications for public cord blood banking. *Transfusion* 56(3): 662-5.
- American College of Obstetricians and Gynecologists' Committee on Obstetric Practice. 2020. Delayed Umbilical Cord Clamping After Birth: ACOG Committee Opinion, Number 814. *Obstet Gynecol* 136(6): e100-e106.
- Andersson, O., Lindquist, B., Lindgren, M., Stjernqvist, K., Domellöf, M., Hellström-Westas, L. 2015. Effect of delayed cord clamping on neurodevelopment at 4 years of age: A randomized clinical trial. *JAMA Pediatr* 169(7): 631-8.
- Ashford and St. Peter's Hospitals. 2021. Delayed Cord Clamping. [https://ashfordstpeters.net/Guidelines\\_Neonatal/Delayed%20Cord%20Clamping%20Apr%202021.pdf](https://ashfordstpeters.net/Guidelines_Neonatal/Delayed%20Cord%20Clamping%20Apr%202021.pdf) [29 May 2024].
- Balasubramanian, H., Ananthan, A., Jain, V., Rao, S. C., Kabra, N. 2020. Umbilical cord milking in preterm infants: a systematic review and meta-analysis. *Arch Dis Child Fetal Neonatal Ed* 105(6): 572-80.
- Bhatt, S., Alison, B.J., Wallace, E.M., Crossley, K. J., Gill, A.W., Kluckow, M., te Pas, A.B., Morley, C.J., Polglase, G.R., Hooper, S.B. 2013. Delaying cord clamping until ventilation onset improves cardiovascular function at birth in preterm lambs. *J Physiol* 591(8): 2113-26.
- Bianchi, A., Jacobsson, B., Mol, B. W., Jacobsson, B., Simpson, J.L., Norman, J., Grobman, W., Bianchi, A., Munjanja, S., González, C.M.V., Mol, B.W., Shennan, A. 2021. FIGO good practice recommendations on delayed umbilical cord clamping. *Int J of Gynecol Obstet* 155(1): 34-6.
- British Association of Perinatal Medicine. 2020. Optimal cord management in preterm babies: A quality improvement toolkit. <https://www.bapm.org/pages/197-optimal-cord-management-toolkit> [29 May 2024].
- Chiruvolu, A., Tolia, V.N., Qin, H., Stone, G.L., Rich, D., Conant, R.J., Inzer, R.W. 2015. Effect of delayed cord clamping on very preterm infants. *Am J Obstet Gynecol* 213(5): 676.e1-676.e676.
- Darwin, E. 1794. *Zoonomia; or the Laws of Organic Life*. Volume 1. <https://www.gutenberg.org/files/15707/15707-h/15707-h.htm> [29 May 2024].
- Farrar, D., Airey, R., Law, G. R., Tuffnell, D., Cattle, B., Duley, L. 2011. Measuring placental transfusion for term births: weighing babies with cord intact. *BJOG* 118(1): 70-5.
- Fogarty, M., Osborn, D. A., Askie, L., Seidler, A. L.,

- Hunter, K., Lui, K., Simes, J., Tarnow-Mordi, W. 2018. Delayed vs early umbilical cord clamping for preterm infants: a systematic review and meta-analysis. *Am J Obstet Gynecol* **218**(1): 1-18.
- Hersh, A.R., Carroli, G., Hofmeyr, G.J., Garg, B., Gülmezoglu, M., Lumbiganon, P., De Mucio, B., Saleem, S., Festin, M.P.R., Mittal, S., Rubio-Romero, J.A., Chipato, T., Valencia, C., Tolosa, J.E. 2023. Third stage of labor: Evidence-based practice for prevention of adverse maternal and neonatal outcomes. *Am J Obstet Gynecol* **230**(3): S1046-S1060.e1
- Jegatheesan, P., Belogolovsky, E., Nudelman, M., Song, D., Govindaswami, B. 2019. Neonatal outcomes in preterm multiples receiving delayed cord clamping. *Arch Dis Child Fetal Neonatal Ed* **104**(6): F575-81
- Katheria, A., Lee, H. C., Knol, R., Irvine, L., Thomas, S. 2021. A review of different resuscitation platforms during delayed cord clamping. *J Perinatol* **41**(7): 1540-8.
- Katheria, A., Poeltler, D., Durham, J., Steen, J., Rich, W., Arnell, K., Maldonado, M., Cousins, L., & Finer, N. 2016. Neonatal resuscitation with an intact cord: A randomized clinical trial. *J Pediatr* **178**: 75-80.e3.
- Katheria, A., Reister, F., Essers, J., Mendler, M., Hummler, H., Subramaniam, A., Carlo, W., Tita, A., Truong, G., Davis-Nelson, S., et al. 2019. Association of umbilical cord milking vs delayed umbilical cord clamping with death or severe intraventricular hemorrhage among preterm infants. *JAMA* **322**(19): 1877-86.
- Katheria, A., Szychowski, J., Carlo, W.A., Subramaniam, A., Reister, F., Essers, J., Vora, F., Martin, C., Schmölzer, G.M., Law, B., et al. 2023. Umbilical cord milking versus delayed cord clamping in infants 28 to 32 weeks: A randomized trial. *Pediatrics* **152**(6): e2023063113.
- Kresch, M. 2017. Management of the third stage of labor: How delayed umbilical cord clamping can affect neonatal outcome. *Am J Perinatol* **34**(14): 1375-81.
- Lainez, V.B., Bergel, A.E., Cafferata, T.M.L., Belizán, C.J.M. 2005. 'Pinzamiento precoz o tardío del cordón umbilical? Una revisión sistemática de la literatura médica [Early or late umbilical cord clamping? A systematic review of the literature]. *An Pediatr (Barc)* **63**(1): 14-21.
- Li, J., Yang, S., Yang, F., Wu, J., Xiong, F. 2021. Immediate vs delayed cord clamping in preterm infants: A systematic review and meta-analysis. *Int J Clin Pract* **75**(11): e14709.
- Malik, S., Kapu, M., Jain, M. K., Patel, B., Kabra, N. 2024. Effects of timing of cord clamping on neonatal hemoglobin and bilirubin levels in preterm and term infants-A prospective observational cohort study. *PLoS One* **19**(1): e0295929.
- McDonald, S.D., Narvey, M., Ehman, W., Jain, V., Cassell, K. 2022. Guideline No. 424: Umbilical cord management in preterm and term infants. *J Obstet Gynaecol Can* **44**(3): 313-322.e1.
- McDonald, S.J., Middleton, P., Dowswell, T., Morris, P.S. 2013. Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. *Cochrane Database Syst Rev* **2013**(7): CD004074.
- Mercer, J. 2001. Current best evidence: a review of the literature on umbilical cord clamping. *J Midwifery Womens Health* **46**(6): 402-14.
- Mercer, J.S., Vohr, B.R., McGrath, M.M., Padbury, J.F., Wallach, M., Oh, W. 2006. Delayed cord clamping in very preterm infants reduces the incidence of intraventricular hemorrhage and late-onset sepsis: a randomized, controlled trial. *Pediatrics* **117**(4): 1235-42.
- Mercer, J.S., Erickson-Owens, D.A., Deoni, S.C.L., Dean Iii, D.C., Tucker, R., Parker, A.B., Joelson, S., Mercer, E.N., Collins, J., Padbury, J.F. 2022. The effects of delayed cord clamping on 12-month brain myelin content and neurodevelopment: A randomized controlled trial. *Am J Perinatol* **39**(1): 37-44.
- Murali, M., Sethuraman, G., Vasudevan, J., Umadevi, L., Devi, U. 2023. Delayed cord clamping versus cord milking in vigorous neonates 35 weeks gestation born via cesarean: A Randomized clinical trial. *J Neonatal Perinatal Med* **16**(4): 597-603.
- National Institute for Health and Care Excellence. 2023. NICE guideline, NG235: Intrapartum Care. <https://www.nice.org.uk/guidance/ng235> [29 May 2024].
- Perlman, J.M., Wyllie, J., Kattwinkel, J., Atkins, D. L., Chameides, L., Goldsmith, J.P., Guinsburg, R., Hazinski, M.F., Morley, C., Richmond, S., Simon, W.M., Singhal, N., Szyld, E., Tamura, M., Velaphi, S., Neonatal Resuscitation Chapter Collaborators. 2010. Part 11: Neonatal resuscitation: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* **122**(16 Suppl 2): S516-S538.
- Pong, K.M., Puasa, N., Mahdy, Z.A. 2022. A survey on current practices of umbilical cord clamping in Malaysia. *Front Med (Lausanne)* **9**: 917129.
- Purisch, S.E., Ananth, C.V., Arditi, B., Mauney, L., Ajemian, B., Heiderich, A., Leone, T., Gyamfi-Bannerman, C. 2019. Effect of delayed vs immediate umbilical cord clamping on maternal blood loss in term cesarean delivery: A randomized clinical trial. *JAMA* **322**(19): 1869-76.
- Qian, Y., Ying, X., Wang, P., Lu, Z., Hua, Y. 2019.

- Early versus delayed umbilical cord clamping on maternal and neonatal outcomes. *Arch Gynecol Obstet* **300**(3): 531-43.
- Rabe, H., Gyte, G.M., Díaz-Rossello, J.L., Duley, L. 2019. Effect of timing of umbilical cord clamping and other strategies to influence placental transfusion at preterm birth on maternal and infant outcomes. *Cochrane Database Syst Rev* **9**(9): CD003248.
- Raju, T.N.K., Singhal, N. 2012. Optimal timing for clamping the umbilical cord after birth. *Clin Perinatol* **39**(4): 889-900.
- Rana, N., Ranneberg, L.J., Mållqvist, M., Kc, A., Andersson, O. 2020. Delayed cord clamping was not associated with an increased risk of hyperbilirubinaemia on the day of birth or jaundice in the first 4 weeks. *Acta Paediatr* **109**(1): 71-7.
- Seidler, A.L., Gyte, G.M.L., Rabe, H., Díaz-Rossello, J.L., Duley, L., Aziz, K., Testoni Costa-Nobre, D., Davis, P.G., Schmölzer, G.M., Ovelman, C., Askie, L.M., Soll, R., International Liaison Committee on Resuscitation Neonatal Life Support Task Force. 2021. Umbilical Cord Management for Newborns <34 Weeks' Gestation: A Meta-analysis. *Pediatrics* **147**(3): e20200576.
- Shao, H., Qian, Y., Gao, S., Dai, D., Hua, Y. 2022. Effect of delayed cord clamping on jaundice and hypoglycemia in the neonates of mothers with gestational diabetes mellitus. *Int J Gynecol Obstet* **156**: 77-81.
- Sweet, D.G., Carnielli, V.P., Greisen, G., Hallman, M., Klebermass-Schrehof, K., Ozek, E., Te Pas, A., Plavka, R., Roehr, C.C., Saugstad, O.D., Simeoni, U., Speer, C.P., Vento, M., Visser, G.H.A., Halliday, H.L. 2023. European Consensus Guidelines on the management of respiratory distress syndrome: 2022 Update. *Neonatology* **120**(1): 3-23.
- Te Pas, A.B., Hooper, S.B., Dekker, J. 2019. The changing landscape in supporting preterm infants at birth. *Neonatology* **115**(4): 392-7.
- WHO Guidelines Review Committee. 2014. Guideline: Delayed umbilical cord clamping for improved maternal and infant health and nutrition outcomes. <https://www.who.int/publications/i/item/9789241508209> [29 May 2024].
- World Health Organization. 2012. WHO recommendations for the prevention and treatment of postpartum haemorrhage. [https://iris.who.int/bitstream/handle/10665/75411/9789241548502\\_eng.pdf?sequence=1#:~:text=Oxytocin%20is%20the%20recommended%20uterotonic,placental%20delivery%20in%20caesarean%20sections.&text=The%20use%20of%20uterotonics%20\(oxytocin,in%20the%20treatment%20of%20PPH](https://iris.who.int/bitstream/handle/10665/75411/9789241548502_eng.pdf?sequence=1#:~:text=Oxytocin%20is%20the%20recommended%20uterotonic,placental%20delivery%20in%20caesarean%20sections.&text=The%20use%20of%20uterotonics%20(oxytocin,in%20the%20treatment%20of%20PPH) [29 May 2024].
- Yamada, N.K., Szyld, E., Strand, M.L., Finan, E., Illuzzi, J.L., Kamath-Rayne, B.D., Kapadia, V. S., Niermeyer, S., Schmölzer, G.M., Williams, A., Weiner, G.M., Wyckoff, M.H., Lee, H.C., & American Heart Association and American Academy of Pediatrics. 2024. 2023 American Heart Association and American Academy of Pediatrics focused update on neonatal resuscitation: An update to the American Heart Association Guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation* **149**(1): e157-e166.
- Yao, A.C., Lind, J. 1977. Effect of early and late cord clamping on the systolic time intervals of the newborn infant. *Acta Paediatr Scand* **66**(4): 489-93.