

## UMBILICAL CORD CLAMPING: BELIEFS AND PRACTICES OF AMERICAN NURSE-MIDWIVES

Judith S. Mercer, CNM, DNSc, FACNM, Carlene C. Nelson, CNM, PhD, and  
Rebecca L. Skovgaard, CNM, MS

### ABSTRACT

The optimal time for umbilical cord clamping after birth remains a critical unknown fact that has implications for the infant, the mother, and science. A national survey was conducted using a randomized sample ( $n = 303$ ) of the active membership of the ACNM to determine cord clamping practices and beliefs of American nurse-midwives. The response rate was 56%. The respondents fell into three cord clamping categories: early (EC) or before 1 minute (26%); intermediate (IC) or 1 to 3 minutes (35%); and late (LC) or after pulsations cease (33%). The EC group believes that early clamping facilitates management of the newborn. The IC group believes that a moderate delay of clamping allows for a gradual transition to extrauterine circulation, although many think that the timing of cord clamping is not significant. The LC group have strongly held beliefs that late clamping supports physiologic birth processes. The majority of CNMs (87%) place the baby on the mother's abdomen immediately after birth and 96% avoid clamping a nuchal cord whenever possible. Although *Varney's Midwifery* was cited most frequently as a reference, 78% of the respondents listed no references reflecting, in part, the absence of evidence-based recommendations for cord clamping practices. *J Midwifery Womens Health* 2000;45:58–66 © 2000 by the American College of Nurse-Midwives.

The optimal time for umbilical cord clamping after birth in humans is a critical unknown fact that has implications for the infant, the mother, and science. Timing of cord clamping and placement of the infant after birth may influence newborn cardiorespiratory transition, placental transfusion and newborn blood volume, and the course of third-stage labor for the mother. At every birth, providers make choices about the time of cord clamping and thereby—often unwittingly—affect these processes. Consistent, evidence-based recommendations to guide providers in timing of cord clamping and placement of

the newborn at birth are lacking in the literature (1). Textbooks defining obstetrical and midwifery\* practice rarely address cord management in depth (2–5). Instead, they present brief arguments for and against delayed clamping with few management recommendations.

Similarly, evidence is lacking in the literature regarding the common practices for cord management at birth. Only one older study examined the cord clamping practices of any provider of obstetrical care. In 1950, McCausland (6) published the results of a survey among 1,900 members of the American Board of Obstetrics and Gynecology, which revealed that although two-thirds of the physicians believed that cord clamping time is insignificant, 24% practiced cord stripping to increase neonatal blood volume. No studies were found that examine cord clamping beliefs and practices of midwives.

Although many issues related to cord clamping were addressed in the literature from 1950 through 1980, variations of designs, variables, and measurement techniques make these studies difficult to compare and evaluate (7). Most often, consensus is lacking. Much of the early research focused on physiologic outcomes in the immediate newborn period. Yao and Lind, for example, demonstrated that placement of the infant immediately after birth and timing of clamping influence the amount of placental transfusion by 25% to 50% (8). Newer studies suggest some benefits of placental transfusion as improved cardiopulmonary adaptation in premature infants (9–10); higher red blood cell flow to the brain, heart, and gastrointestinal tract in full term babies (11); increased pulmonary vasodilatation (12); and avoidance of hypovolemia and anemia (13–15). Debate persists, however, about potential dangers such as hyperbilirubinemia (16) and polycythemia (17,18). Management of newborns with meconium-stained amniotic fluid, which has included immediate cord clamping and transfer to the warmer for the purpose of suctioning and visualization of the trachea, is likewise unclear. This practice is now being questioned because systematic reviews of the literature fail to show better outcomes for intubated infants (19). The advent of cord blood banking

Address correspondence to Judith S. Mercer, CNM, DNSc, FACNM University of Rhode Island College of Nursing, Nurse-Midwifery Program, 2 Heathman Road, Kingston, RI 02881.

\* CNMs/CMs and midwives as used herein refer to those midwifery practitioners who are certified by the American College of Nurse-Midwives (ACNM) or the ACNM Certification Council, Inc; midwifery refers to the profession as practiced in accordance with the standards promulgated by the ACNM.

has raised a new issue related to cord clamping as immediate clamping is often employed to optimize collection of the sample. The scientific and ethical ramifications of this issue are debated vigorously in the literature (20).

The lack of evidence-based recommendations for practice creates a knowledge gap for midwives and other providers. This study begins to illustrate that gap. Its purpose was to identify and describe the current cord clamping beliefs and practices of American nurse-midwives and to specify the resources they use to provide a rationale for their practice. Research questions included:

- 1) What are certified nurse-midwives' (CNMs) beliefs about cord clamping?
- 2) How do CNMs manage this critical time in a newborn's life?
- 3) On what evidence do CNMs base their practice?

## METHODS

### Study Design

This study was conducted to identify and describe nurse-midwife beliefs and practices regarding cord-clamping practices at normal births and in the presence of distress. A survey design allowed the authors to obtain self-reported information on a questionnaire circulated to a random sample of the membership of the American College of Nurse-Midwives (ACNM).

### Sample

ACNM members who returned the questionnaire before the deadline constituted the sample for this study. A simple computer-randomized sample of 303 CNMs was

selected from the 4,114 active members of the ACNM in March, 1998. This number was adequate for an unbiased sample, which would be representative of the population at a 95% confidence level (21,22). Because the response rate was lower than anticipated (56%,  $n = 157$ ), however, it provided an adequate sample for only a 90% confidence level that the findings are representative of the membership (21,22).

### Instrument

The authors designed the survey instrument after a careful review of the literature to identify beliefs and practices in the cord-clamping debate for normal and distressed newborns. Demographic information was collected for descriptive purposes.

A multiple-choice design of nine questions was constructed. The six clinical questions addressed cord clamping practices with normal babies, cord clamping practices with distressed babies, placement of the infant immediately after birth, management when a nuchal cord is present, and the management of babies with meconium-stained amniotic fluid. The last clinical question in the survey described an example of a distressed infant who is "toneless, pale white with no reflexes and a heart rate above 100." The six questions addressing practice issues allowed only one answer; two questions about beliefs permitted the participant to choose multiple responses. The only open-ended question asked participants to list two references or resources for their rationale about cord-clamping practices.

The questionnaire was reviewed by two small groups of expert midwives ( $n = 10$ ) in different parts of the country for face and content validity, clarity of questions, and ease of completion. After the expert review, all questions were retained.

### Procedure

Approval was obtained from the ACNM Division of Research for the study. The authors purchased mailing labels from the ACNM membership office that had been randomized by computer to yield approximately 300 members. No student or associate members were included in the sample. ACNM is not able to retrieve names of CNMs by practice activity or sites. A pilot of the questionnaire was conducted by mailing to every twelfth name on the randomized mailing list ( $n = 25$ ). The 12 CNMs who responded were included in the total sample. Following the final analysis of the pilot data, the questionnaires, accompanied by an informed consent letter, were mailed to the identified members. The informed consent letter notified the participants about the background of the study, that approval had been obtained from the ACNM Division of Research, that their partic-

---

*Judith S. Melson Mercer received a diploma in nursing from the Johns Hopkins Hospital School of Nursing, a BSN from the University of Maryland, and MS and certificate in midwifery from Columbia University, and a doctorate in Nursing from the Catholic University of America. Dr. Mercer served on faculty at Georgetown University for 16 years and directed the program for 10 years. Her practice experience ranges from home births to medical centers. Currently, she serves on the faculty at the University of Rhode Island College of Nursing, Nurse-Midwifery Program, Kingston, RI. She is a Fellow of the American College of Nurse-Midwives.*

*Carlene Nelson has been a nurse-midwife for more than 20 years in settings ranging from tertiary care centers to home births. She received a BSN from Johns Hopkins University, MS and PhD from the University of Maryland, and a midwifery certificate from Georgetown University. She has taught nurse-midwifery at Georgetown University and the University of Michigan. She presently resides in La Jolla, California.*

*Rebecca L. Skovgaard received a masters in midwifery at Georgetown University and subsequently was on the faculty of the Georgetown University Nurse-Midwifery Program. She is currently an Associate in the Department of Obstetrics and Gynecology and an Assistant Professor in the School of Nursing, University of Rochester, Rochester, NY. She is a member of the editorial staff, Strong Perifax.*

---

**TABLE 1**  
**Description of the Sample (*n* = 157)**

	Mean	Range (SD)	Percent
Age	45.6	33–72 (6.4)	
Years experience	13.4	1–45 (7.1)	
Number of births attended per year	82	10–300 (58.0)	
Practice settings for births*			
Hospital			91.6
Birth center			11.6
Home birth			8.9
Not practicing			4.5

\* Total is > 100%, as some CNMs reported attending births at more than one setting.

ipation was voluntary, and that returning the questionnaire was evidence of their consent.

Questionnaires were returned by 170 of 303 members, a 56% response rate. One respondent returned only one page and twelve respondents did not complete the questionnaire stating that they had not worked in intrapartum for several years. Analyses were completed on the remaining 157 respondents. Data were entered into EpiInfo Program and the analyses were completed using the EpiInfo and SAS statistical packages. The analyses included descriptive statistics on all variables and analysis of variance (ANOVA) to compare mean scores for the cord clamping interval groups with demographic variables.

## RESULTS

### Description of the Sample

Demographics were gathered for the 157 respondents. The mean age of midwives in the sample was 45.6 years (range, 33–72, SD = 6.4). Table 1 provides the demographic description of the sample. Eight-eight percent of the sample reported more than 5 years of clinical midwifery experience. The demographic profile of the sample respondents is similar to the ACNM membership in age, years experience, and number of births per year (23).

Ninety-two percent (*n* = 142) of the respondents attended births in hospitals. Of that group, 6% also cover a birth center, 5% offer home births in addition to hospital births, and 3% offer births in all three sites. The number in the sample providing only birth center (3%) or only home birth (1%) coverage was too small for any comparisons among subgroups.

### Cord Clamping Practices and Beliefs at Normal Births

The first two questions asked about practice and rationale for cord clamping at normal births. Descriptive statistics

**TABLE 2**  
**Frequencies of Cord Clamping (CC) Practices of CNMs at Normal Births by Practice and by Grouping (*n* = 157)**

Group	Practice (n, %)	Group n Value	Group Percent
EC	Immediate CC (33, 21%) CC before 1 minute (8, 5%)	41	26.1
IC	CC between 1 and 3 minutes	56	35.7
LC	CC after 3 minutes (6, 3.8%) CC after pulsations ceased (46, 29.3%) CC after the placenta delivers (0)	52	33.1
Other		8	5.1

CC = cord clamping; EC = early clamping interval; IC = intermediate clamping interval; LC = late clamping interval.

revealed that out of 157 respondents, there was a fairly equal distribution of respondents across three cord clamping practices.

Respondents were given seven options to describe the timing of their cord clamping practices: immediate (21%), less than 1 minute (5%), 1 to 3 minutes (36%), after 3 minutes (4%), after the cord stops pulsating (29%), after the placenta delivers (0), and other (5%). Due to the small numbers of responses, three of the categories were collapsed into three variables as follows: EC for early clamping (immediate to before 1 minute), IC for intermediate clamping interval (1 to 3 minutes), and LC for late clamping (after the cord stops pulsating or after three minutes). The 5% in the “other” category could not be classified into one of the three groups. The subsequent data were analyzed using the designated EC, IC, and LC groups. Table 2 shows the distribution of the respondents in each of the three categories.

Analysis of variance (ANOVA) tested for differences in demographic characteristics among the three cord clamping group means. No differences were found between the cord clamping groups relative to age [ $F(2,140) = 0.99, p = .37$ ], years of experience [ $F(2,142) = 0.16, p = .86$ ], or number of births attended per year [ $F(2,144) = 0.02, p = .98$ ].

Table 3 lists the frequencies of beliefs chosen by the CNMs as rationale for cord clamping practices with normal babies in the EC, IC, and LC groups. The respondents were given the option of selecting more than one answer. For the EC group, the most frequently chosen response was early clamping to facilitate management of the neonate (*n* = 19). In the IC group, 50% stated that they delay for gradual transition; their second

**TABLE 3**  
**Frequencies of Beliefs About Cord Clamping**  
**for Normal Babies According to Cord Clamping**  
**Interval\***

<i>Beliefs</i>	<i>EC</i> [n = 41 (%)]	<i>IC</i> [n = 56 (%)]	<i>LC</i> [n = 52 (%)]
LC for gradual transition to extrauterine circulation	0 (0)	28 (50)	38 (73)
LC as the baby continues to receive oxygen from the mother when the cord is pulsating	3 (7)	17 (30)	33 (63)
LC to maximize the placental transfusion	1 (2)	8 (14)	21 (40)
LC only at the parents' request	17 (41)	14 (25)	3 (6)
Time of cord clamping is not significant	12 (29)	21 (38)	3 (6)
EC to facilitate management of the neonate	19 (46)	9 (16)	3 (6)
EC is the norm at my institution	14 (34)	2 (4)	0 (0)
EC to prevent neonatal jaundice	12 (29)	5 (9)	2 (4)

LC = late clamping; EC = early clamping.

Percentages are rounded.

\* Respondents could choose multiple responses.

choice (38%) was that timing of cord clamping is not significant to the newborn status. For the LC group, 73% chose to delay clamping to allow for a gradual transition to extrauterine circulation. This belief was not selected by anyone in the EC group. The following unsolicited statements from the respondents illustrate some of the rationale for their cord clamping practices.

EC: The whole question has come to the surface again here because our institution does nondirected cord blood banking so they want the cord clamped immediately in donor babies.

LC: I delay cutting with a normal baby to keep the baby with the mom: the nurses can't take it if the cord isn't cut (two respondents).

Fathers, support people, or children often cut the cord at my births.

When I first started practice (5 years ago), the neonatal nurse practitioner wanted to fill out an incident report [for late clamping]. I found three sources to share with her.

Pediatricians frequently claim our babies with delayed cord clamping have Hcts high enough to do exchange transfusions thus complicating discharge.

**TABLE 4**  
**Frequencies of Beliefs About Cord Clamping**  
**With Distressed Neonates\***

<i>Beliefs</i>	<i>n (%)</i>
I clamp early to facilitate resuscitation of the neonate	132 (84.1)
I believe that the baby continues to receive oxygen from the mother when the cord is pulsating	26 (16.6)
LC to allow gradual transition to extrauterine circulation	18 (11.5)
I delay clamping to maximize the placental transfusion	18 (11.5)
EC is the norm at my institution	16 (10.2)
The timing of cord clamping is not significant to newborn status	6 (3.8)

LC = late clamping; EC = early clamping.

\* Respondents could choose multiple responses so total is > 100%.

### **Cord Clamping Practices and Beliefs With Distressed Babies**

Three questions dealt with practices and beliefs related to management of distressed newborns at birth. In the first two questions, the word "distress" was purposely not defined for the respondents. The third question gave a specific example of a clinically distressed infant and offered management choices.

When asked about the cord clamping interval when the neonate appeared distressed, EC was the predominate practice (89%). Only 6.4% and 4.5% chose IC and LC, respectively.

The question about beliefs with a distressed baby allowed multiple responses. Table 4 shows the distribution of CNM beliefs when the infant is distressed. The belief most commonly chosen (84%) was early clamping to facilitate resuscitation of the neonate. The small group ( $n = 10$ , 6.4%) who reported an intermediate interval (IC) provided conflicting rationale for their practice; half chose facilitating resuscitation and the other half believed that the baby continues to receive oxygen from the mother while the cord pulsates. Eight out of the 10 in this group chose to delay clamping for the specific clinical example of a distressed baby.

The group that practiced LC in the presence of distress uniformly chose the belief that newborns continue to receive oxygen from the mother while the cord is pulsating. One participant who practices in all three birth settings stated that, with a distressed newborn, she delays clamping at home and at the birth center but clamps early at the hospital. Table 5 shows all of the responses when the CNMs were given the clinical example of a distressed infant.

Unsolicited comments by the participants demonstrate beliefs as well as dilemmas faced by some CNMs.

**TABLE 5**  
**CNM Management of Specific Clinical Example of**  
**Distressed Infants (n = 155)**

<i>Practice</i>	n (%)
CC stat, move to warmer for resuscitation	80 (51.6)
Place baby on mother's abdomen, stimulate without CC	43 (27.7)
Resuscitate at the perineum, leaving cord attached	15 (9.7)
Lower baby below introitus for 20 to 30 seconds, CC, to warmer	7 (4.5)
Other	10 (6.5)

CC = cord clamping; stat = immediate.

EC: I cut immediately with a depressed baby because the nurses would have my head if I didn't.

While I feel the distressed newborns may benefit the most from delayed clamping, I feel there is not enough support to do so and accomplish adequate resuscitation efforts.

We have a resuscitation team at our hospital and if the baby has any difficulty in second stage they are present and want the baby in the warmer as soon as possible.

IC: I would probably choose to keep the baby attached and resuscitate at the perineum if the hospital staff was agreeable. Are there good references supporting this approach?

With a nonbreathing baby, I bag at the perineum; if there is no response, I call peds and clamp cord when they are there to take over.

LC: The unclamped cord can be important resuscitation equipment—increasing blood volume and oxygen.

### Placement of Infant After Birth

When asked about their placement of the normal baby immediately after birth, the majority (87%) of the participants place the infant on the mother's abdomen after birth. Only 11% keep the infant at the perineum and less than 2% place the infant below the level of the introitus. Participant comments about placement on the mother's abdomen reflected concerns related to neonatal blood volume changes.

In my institution—large county teaching hospital—my management of any but the most normal of babies is controlled by the pediatric service. Your options for delayed cord clamping and management on the bed or mother would be ridiculed . . . the MD chief of the dept believes the cord is like a stiff hose and responds to gravity so that on the mom's belly the baby gets anemic, below the perineum the baby gets an infusion of blood and potentially increased jaundice.

I believe that if you put the baby on the mother's stomach right after birth, you need to clamp the cord to stop baby's blood loss to the placenta.

### Management of Nuchal Cord at Birth

When questioned about management of a nuchal cord, 57% of the respondents chose to clamp and cut only when the cord was very tight. The somersault maneuver (24) was selected by 40% of the participants as their best option for managing nuchal cord. Only 3% stated that they clamp and cut the cord in most such cases.

### Management of Infants With Meconium-stained Amniotic Fluid

After suctioning with the head on the perineum, 53% of the respondents clamp the cord immediately and move the baby with meconium staining to the warmer to visualize the cords. Thirty-six percent hesitate long enough to suction the infant again after birth before they cut the cord and move the infant to the warmer. Of the twelve CNMs (8%) who resuscitate these babies at the perineum without cutting the cord, six were involved with home or birth center births.

### References or Resources Sited for Cord Clamping Practice

The last question asked for two references or resources underlying the respondent's rationale for practice. Seventy-eight percent of the respondents listed no references for practice. Some of this group cited experience, clinical training, or tradition as their rationale. Of the 22% who listed a reference, 17 cited *Varney's Midwifery* (2), 12 listed *Williams Obstetrics* (3), 6 referenced the *Neonatal Resuscitation Manual* (25), and two cited each of the following: *Journal of Nurse-Midwifery*, *Gabbe's Obstetrics: Normal and Problem Pregnancies* (4), and Dr. Caldeyro-Barcia's work. Ten percent of the EC group, 20% of the IC group, and 16% of the LC group listed at least one reference. Some participants addressed the lack of research on this topic.

Everything I know about this is anecdotal and intuitive, not at all evidence based.

I do not feel that there is sufficient research available to make a basis for my management decisions.

### DISCUSSION

The demographic profile of the respondents was similar to the ACNM membership in the important areas of age, years experience, and number of births per year (23). The distribution of birth settings in the sample was the same

for hospital births but fewer respondents practiced in out-of-hospital settings. Thus, the cord clamping practices and beliefs of CNMs at births with normal and distressed babies as identified in this study probably represent common clinical scenarios.

The controversies and lack of consensus regarding cord clamping recommendations and policies are clearly represented in the responses of these experienced midwives. The nearly equal distribution between early, intermediate, and late cord clamping is a natural ramification of an inadequate scientific knowledge base. Responses to the questionnaire suggest that this is a topic of great interest to practicing midwives. Although written comments were not requested, nor was space provided, many respondents were moved to add their observations, questions, and concerns. The following discussion will address CNMs practices and beliefs at births with normal and distressed babies by preference of early, moderate, or late cord clamping.

### **Early Clamping**

The respondents in the EC group believe that early clamping allows them to best facilitate management of the newborn. Since the instrument allowed for more than one response to the belief question, there is likely overlap with the 33% who reported that immediate clamping is the norm in their institution and a similar number who believe that early clamping will prevent neonatal jaundice. One respondent raised the issue of polycythemia as a rationale for early clamping.

The concerns about neonatal jaundice and the potential for polycythemia were supported in publications by Saigal and Usher (26,27). These beliefs are so prevalent that one often finds them stated in the literature as accepted unreferenced facts (16,17). There are larger studies from the same era that report no pathology even when infants were held at the level of the perineum and cord clamping was delayed until pulsations ceased (28). In addition, the results of the controlled trials in the recent literature do not support this concern. Neither problem was reported in recent studies involving preterm infants held 20 cm below the placenta while cord clamping was delayed 30 to 90 seconds (9–10, Wardrop, personal communication) despite the higher risk for hyperbilirubinemia in premature infants. Nelle, studying full term infants placed on the maternal abdomen after birth with a 3-minute cord clamping delay, reported no jaundice or polycythemia (12–14). One case report was found involving polycythemia after a water birth with delayed clamping (18).

The fact that almost half of the EC group will delay clamping when the parents' request it, suggests that the midwives concern about neonatal jaundice and polycythemia does not supercede the parents' request for

delayed clamping. Varney (29) supports the point of view of those who feel that the timing of cord clamping is not significant to newborn status when she states that neither early nor late clamping has any effect on the rate of infant mortality in term gestations. These authors, however, found no studies on cord clamping with long-term follow-up of infants examining mortality or morbidity over the first year of life. Cunningham describes a policy of cord clamping at about 30 seconds after birth (30). Sweet (31) and Varney (29) recommend early clamping with rhesus negative mothers and otherwise make no definitive recommendations.

Although early clamping became the norm among the majority of all respondents when distress is present, the conflicts between their beliefs and practice are apparent. While 84% stated that they clamp the cord early to facilitate neonatal resuscitation, a sizable minority (see Table 4) also held beliefs about physiology that could serve as rationale for a delay in clamping. Several midwives questioned the practice of immediate cord clamping in distressed infants in their comments but stated that research is lacking to support any other treatment plan at this time. Others implied that their practice is dictated by institutional policies, independent of their beliefs. One example is the respondent who clamps early in the hospital and late at the birth center and at a home birth. The practice of immediate or early cord clamping with transfer of the distressed infant to the warmer and to the pediatric staff is the current routine and standard of care in most American hospitals and the resuscitation literature (25). Frand et al (32) acknowledge that resuscitation is often more of an art than a science as few of the practices have been subjected to clinical trials.

### **Intermediate Clamping**

The widest variation of beliefs occurred in the IC group. Fully half of this group appear to feel that a delay of 1–3 minutes is sufficient for the infant to benefit from a gradual transition to extrauterine circulation, however, 38% believe that timing is not significant to the newborn. The responses of the IC group emphasize the fact that consistent science-based recommendations to guide providers are lacking in the literature.

The number of respondents who chose IC practices with a distressed infant was quite small ( $n = 10$ ). However, their rationale was based on provision of oxygen as often as it was based on facilitating resuscitation of the newborn, revealing the contradictions in their beliefs. It is interesting to note that the majority of this group chose to delay clamping when presented with the specific clinical example of a distressed baby.

## Late Clamping

The most common choices of the LC group reflect their strongly held beliefs in supporting physiologic birth processes. Leboyer's *Birth Without Violence* (33) supports the idea of a gradual transition and a continuing oxygen supply for the newborn at birth based on his experience. Varney includes a clear brief description of Leboyer's rationale (29).

Several other authors support delayed clamping as theoretically fitting with the physiologic process of birth (5,34–35). Enkin lists early versus late cord clamping under "Forms of Care of Unknown Effectiveness" but suggests not rushing to cut the cord at preterm births (36). The WHO consensus statement on normal birth (35) recommends delayed cord clamping as part of the physiologic birth process and to prevent infant anemia, a worldwide concern.

Of the small group who selected delayed clamping with distressed babies, over three-fourths attend births at home or at a birth center. Their belief that the infant continues to receive oxygen from the mother immediately after birth may be even more important for the distressed infant. However, the practices resulting from these beliefs did not appear to withstand the pressure in hospital settings for immediate clamping to facilitate neonatal resuscitation.

Despite the perceived difficulty of resuscitating infants at the perineum, supporting concepts have been in the literature for over 30 years. Dunn (37) addresses the concept of postnatal placental respiration. Using data from other studies (38–39), Dunn states that "immediately after delivery the placenta seems capable of both combating acidosis in the infant and providing it with oxygen, glucose, and a blood transfusion." Engstrom et al (39) and Marquis (40) estimate that the oxygen transport from the placenta immediately after birth is sufficient to meet the infant's basic needs. Working with sheep, Peltonen (41) found that the placental circulation after birth functions as an extracorporeal oxygenator of the blood. More recently, Morley (42) encourages resuscitating the infant without clamping the cord as long as the cord is full and pulsating. No recent research studies addressing the topic of postnatal placental respiration were found, however.

## Placement of Infant at Birth

Placement of the infant on the mother's abdomen was chosen by the majority of the CNMs for normal births and almost one-third selected this option for the clinical description of a distressed baby. However, opponents of this practice expressed concern about a potential loss of neonatal blood volume to the placenta. Nelle used the maternal abdomen for placement of newborns while

awaiting a 3-minute delay in cord clamping. Looking at healthy full-term infants with no prenatal or intrapartal complications, Nelle found increased blood volume, more pulmonary vasodilatation, and better red blood cell flow to the brain, heart, and intestines in these infants when compared to infants with immediate cord clamping (11–13).

## Nuchal Cord

In the presence of a nuchal cord, an overwhelming 97% of all the respondents chose to preserve the integrity of the cord unless it was very tight. Forty percent of those selected the somersault maneuver (24) as their best option in this clinical situation. The management of a nuchal cord and associated risks are seldom addressed in obstetrics literature. Studies and reports in the literature suggest an association between tight nuchal cords and neonatal anemia and hypovolemic shock (43–47). The presence of a nuchal cord may constitute a circumstance in which delayed cord clamping is of particular importance.

## Resources for Practice Rationale

The large number of respondents who cited no recent references to support their practice or beliefs demonstrates that the research-based evidence is not readily available to the midwives. This lack of evidence leaves these and other providers to make theory-based or intuitive decisions about cord clamping, or to follow the dogma of institutional policies and routines. Several of the participants expressed concern about the lack of recent references to provide a rational basis for management decisions.

Although the authors found pertinent studies published between 1990 and 1998 with regard to cord clamping and placental transfusion, most of the work is being done in Europe and is not widely reported in American medical literature. Furthermore, the complex physiologic content described in these references often demands in-depth study to understand the interrelationships and significance of the concepts and terms presented. A current review article—the last was published in 1982—is not available.

## Limitations

The survey had several limitations. The sample pool was limited to active members of the ACNM in 1998 and did not include CNMs and other midwives who were not members. The questionnaire allowed little space for written comments and no attempt was made to analyze comments that were returned by the participants. Minimal demographic data were obtained. Factors, other than

beliefs, that might influence how a midwife practices, were not examined. Unsolicited comments suggest that factors such as hospital routines and pediatric policies may greatly influence practice.

### Implications for Future Research

The responses of the CNMs to this questionnaire identify many issues related to cord clamping practices and the benefits and risks of placental transfusion at birth that demand more research. First, a general review article of past and present literature on cord clamping is essential. In depth reviews of the literature on specific issues such as management of neonates with nuchal cord and meconium-stained amniotic fluid should follow. The present survey could be repeated with equal numbers of CNMs who practice at home births, birth centers, and the hospital to allow for more comparisons in practices. Practices should be linked to outcomes. Development of a safe, accurate method to measure neonatal blood volume would advance comparisons of early and late clamping outcomes. It would also allow scientists to differentiate whether polycythemia is due to volume overload or other pathology that might cause hemoconcentration, as discussed by Wardrop et al (14). Optimal blood volume versus suboptimal but nonacute hypovolemia and their potential impact on infants needs to be identified. The merits of infant resuscitation with intact placental circulation need to be explored. Definitive answers to the questions raised require long-term follow-up of babies with validated amounts of placental transfusion. These questions should be addressed before the harvesting of large amounts of fetal cord blood becomes routine.

### Implications for Midwifery Practice

Early clamping of the umbilical cord is an intervention in the normal process of birth, which like many other interventions, has not been evaluated. Currently, the most recent studies show benefit for full term and preterm infants when delayed cord clamping is practiced.

In some settings, immediate cord clamping may be dictated by fetal distress during labor and urgent intervention at birth, the need for neonatal resuscitation, or the presence of thick meconium. Some of these circumstances can be avoided by basic, careful and skillful midwifery management of labor that promotes fetal and maternal tolerance of the natural stress of labor. Others are issues that may involve midwifery advocacy and negotiation with colleagues in nursing, obstetrics, and pediatrics. It is incumbent upon midwives to assist in the transmission of the current knowledge and pursue the evidence for practice, yet guard normal processes and serve as the infant's, as well as the mother's, advocate.

---

This study was supported by the authors' contributions; the data analyses were funded by the Research Committee at the University of Rhode Island College of Nursing. The authors would like to thank the Maine ACNM Chapter members who provided input and careful review of the questionnaire, the midwives at the Strong Memorial Midwifery Service for additional feedback, and all the CNMs who participated in the survey. Also, we are grateful to Dr. Margaret McGrath for her advice and critique in the preparation of this article.

---

### REFERENCES

1. Enkin M, Keirse M, Renfrew M, Neilson J. A guide to effective care in pregnancy and childbirth. 2nd ed. Oxford: Oxford Medical Publications, 1995.
2. Varney H. Varney's midwifery. 3rd ed. Boston: Jones and Bartlett Publishers, 1997.
3. Cunningham FG, McDonald P, Gant N, Leveno K, Gilstrap L, Hankins G, et al. Williams obstetrics. 20th ed. Stamford (CT): Appleton & Lange, 1997.
4. Gabbe SG, Niebyl JR, Simpson JL, editors. Obstetrics: normal and problem pregnancies. New York: Churchill-Livingstone, 1996.
5. Sweet B, Tiran D. Mayes midwifery: a textbook for midwives. London: Bailliere Tindall, 1997.
6. McCausland A, Holmes F, Schumann W. Management of cord and placental blood and its effect upon newborn. *West J Surg* 1950;58:591-608.
7. Linderkamp OL. Placental transfusion: determinants and effects. *Clin Perinatol* 1982;9:559-92.
8. Yao AC, Lind J. Placental transfusion [review]. *Am J Dis Child* 1974;127:128-41.
9. Kinmond S, Aitchison TC, Holland BM, Jones JG, Turner TL, Wardrop CA. Umbilical cord clamping and preterm infants: a randomized trial. *BMJ* 1993;306:173-5.
10. Nelle M, Fischer S, Conze S, Beedgen B, Brischke EM, Linderkamp O. ESPR abstracts: effects of later cord clamping on circulation in pretermatures. *Pediatr Res* 1998;44:420.
11. Nelle M, Zilow EP, Bastert G, Linderkamp O. Effect of Leboyer childbirth on cardiac output, cerebral and gastrointestinal blood flow velocities in full-term neonates. *Am J Perinatol* 1995;12:212-6.
12. Nelle M, Kraus M, Bastert G, Linderkamp O. Effects of Leboyer childbirth on left- and right-systolic time intervals in healthy term neonates. *J Perinat Med* 1996;24:513-20.
13. Nelle M, Zilow EP, Kraus M, Bastert G, Linderkamp O. The effect of Leboyer delivery on blood viscosity and other hemorheologic parameters in term neonates. *Am J Obstet Gynecol* 1993;169:189-93.
14. Waldrop CA, Holland BM. The roles and vital importance of placental blood to the newborn infant. *J Perinat Med* 1995;23:139-41.
15. Grajeda R, Perez-Escamilla R, Dewey K. Delayed clamping of the umbilical cord improves hematologic status of Guatemalan infants at 2 months of age. *Am J Clin Nutr* 1997;65:425-31.
16. Blackburn S. Hyperbilirubinemia and neonatal jaundice. *Neonatal Netw* 1995;14:15-25.
17. Oh W. Neonatal polycythemia and hyperviscosity. *Pediatr Clin North Am* 1986;33:23-32.
18. Austin T, Bridges N, Markiewicz M, Abrahamson E. Severe neonatal polycythaemia after third stage of labor underwater. *Lancet* 1997; 350:1445.
19. Halliday HL. Endotracheal intubation at birth in vigorous term meconium-stained babies. (Cochrane review). In: *The Cochrane Library*, Issue 4. Oxford: Update Software, 1998.
20. Ende N. Cord blood collection: effects on newborns (medical-legal). *Blood* 1995;86:4699-700.
21. Kalton G. Introduction to survey sampling. Series: quantitative

applications in the social sciences, Sage University Paper 35. Newbury Park (CA): Sage Publications, 1983.

22. Scheaffer R, Mendenhall W, Lyman O. Elementary survey sampling. 4th ed. Boston: PWS-KENT Publishing Company, 1990.

23. Walsh LV, Boggess JH. Findings of the American College of Nurse-Midwives annual membership surveys, 1993 and 1994. *J Nurse Midwifery* 1996;41:230–5.

24. Schorn MN, Blanco JD. Management of the nuchal cord. *J Nurse Midwifery* 1991;36:131–2.

25. Bloom RS, Cropley C. AHA/AAP Neonatal Resuscitation Program Steering Committee. Textbook of neonatal resuscitation. Chicago: American Academy of Pediatrics, 1995.

26. Saigal S, O'Neill A, Surainder Y, Chua L, Usher R. Placental transfusion and hyperbilirubinemia in the premature. *Pediatrics* 1972;49:406–19.

27. Saigal S, Usher RH. Symptomatic neonatal plethora. *Biol Neonate* 1977;32:62–72.

28. Oh W, Arcilla R, Lind J, Gessner I. Arterial blood gas and acid base balance in the newborn infant: effects of cord clamping at birth. *Acta Paediat Scand* 1966;55:593–9.

29. Varney H. Varney's midwifery. 3rd ed. Boston: Jones and Bartlett Publishers, 1997:455.

30. Cunningham FG, McDonald P, Gant N, Leveno K, Gilstrap L, Hankins G, et al. Williams obstetrics. 20th ed. Williams Obstetrics. 20th ed. Stamford (CT): Appleton & Lange, 1997:383.

31. Sweet B, Tiran D. Mayes midwifery: A textbook for midwives. Williams Obstetrics. 20th ed. Stamford (CT): Appleton & Lange, 1997:406.

32. Frand MN, Honig KL, Hageman JR. Neonatal cardiopulmonary resuscitation: the good news and the bad. *Pediatr Clin North Am* 1998;45:587–98.

33. Leboyer F. Birth without violence. New York: Alfred A. Knopf, 1975.

34. Odent M. Birth reborn. London: Livingstone, 1994.

35. World Health Organization. Care in normal birth: report of the Technical Working Group Meeting on Normal Birth March 25–29, 1996. Geneva: World Health Organization, Maternal Health and Safe Motherhood Program, 1996.

36. Enkin M, Keirse M, Renfrew M, Neilson J. A guide to effective care in pregnancy and childbirth. 2nd ed,<sup>1</sup> 405, 282.

37. Dunn PM. Postnatal placental respiration. *Dev Med Child Neurol* 1966;8:607–8.

38. Engstrom L, Karlberg P, Rooth G, Tunell R. The onset of respiration: a study of respiration and changes in blood gases and acid–base balance. New York: Aid for Crippled Children, 1966.

39. Stembera Z, Hodr J, Janda J. Umbilical blood flow in healthy newborn infants during the first few minutes after birth. *Am J Obstet Gynecol* 1965;91:568–74.

40. Marquis L, Ackerman B. Placental respiration in the immediate newborn period. *Am J Obstet Gynecol* 1973;117:358–63.

41. Peltonen T. Placental transfusion—advantages and disadvantages. *Eur J Pediatr* 1981;137:141–6.

42. Morley GM. Cord closure: can hasty clamping injure the newborn? *OBG Management* 1998;7:29–36.

43. Cunningham FG, McDonald P, Gant N, et al. Williams obstetrics. 20th ed. Williams Obstetrics. 20th ed. Stamford (CT): Appleton & Lange, 1997:450.

44. Cashore WJ, Usher R. Hypovolemia resulting from a tight nuchal cord at birth [abstract]. *Pediatr Res* 1973;7:399.

45. Jauniaux E, Ramsay B, Peellaerts C, Scholler Y. Perinatal features of pregnancies complicated by nuchal cord. *Am J Perinatol* 1995;12:255–8.

46. Shepherd AJ, Richardson CJ, Brown JP. Nuchal cord as a cause of neonatal anemia. *Am J Dis Child* 1985;139:71–3.

47. Vanhaesebrouck P, Vanneste K, De Praeter C, Van Trapper Y, Thiery M. Tight nuchal cord and hypovolaemic shock. *Arch Dis Child* 1987;62:1276–7.