

original article

Current umbilical cord clamping practices and attitudes of obstetricians and midwives toward delayed cord clamping in Saudi Arabia

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BACKGROUND: In Saudi Arabia, as in many countries, there is usually no clear definition of the timing of umbilical cord clamping (UCC) in the policies and procedures used by hospitals. The World Health Organization (WHO) recommends delayed cord clamping (DCC) (>1 minute after birth) as it can significantly improve hemodynamics and long-term neurodevelopment.

OBJECTIVE: To investigate current practices of healthcare professionals on the timing of UCC in Saudi Arabia.

DESIGN: Cross-sectional survey.

SETTING: Five tertiary hospitals in Riyadh, Saudi Arabia, during May to October 2016.

SUBJECTS AND METHODS: Obstetricians and midwives completed a widely-used questionnaire on UCC practices.

MAIN OUTCOME MEASURE: Current UCC practices and attitudes of obstetricians and midwives toward DCC.

RESULTS: Eighty-two obstetricians and 75 midwives completed the questionnaire for a response rate of 80%. The majority of respondents were aged 30 years or older (81%) and 84% were females. Most respondents were non-Saudi (66%) and had an educational level of bachelor's degree or higher (72%). Only 42% of respondents reported the existence of UCC guidelines in their practice; 38% reported the existence of a set time for UCC when the neonate was term and healthy, and only 32% had a set time for UCC in preterm neonates. While lower levels of agreement were reported among obstetricians and midwives on the benefits of DCC for babies requiring positive pressure ventilation, the majority of respondents (69-71%) thought that DCC was generally good for both term and preterm babies and that its benefits extend beyond the neonatal period.

CONCLUSIONS: While the majority of obstetricians and midwives that participated in this study had a positive perception toward DCC, this did not translate to their daily practice as most of these professionals reported a lack of existing UCC guidelines in their institutions. Further studies are warranted to confirm these findings.

LIMITATIONS: Participant selection by convenience sampling.

Umbilical cord clamping (UCC) is an important intervention that is applied routinely after birth. The baby's umbilical cord is normally clamped and cut. There are different policies on the timing of cord clamping. Early or immediate cord clamping (ICC) is generally done within the first 60 seconds after birth, whereas late or delayed cord clamping (DCC) is carried out more than one minute after birth or when cord pulsation has ceased.¹ The blood flow in the umbilical arteries and veins continues for a few minutes after birth. Any additional blood volume which is transferred to the baby after delivery through the placenta is called placental transfusion. It has been found that a 1-3 minute DCC can significantly impact a newborn's hemodynamics, mainly due to the improved blood volume and the sustained placental respiration.²

During the last century, ICC was the standard practice as it was believed to reduce the likelihood of postpartum hemorrhage (PPH). However, recent studies have shown that early clamping had no clear benefits including prevention of PPH.^{1,3} In 2012, the World Health Organization (WHO) recommended DCC for all births as a component of the active management of the third stage of labor (AMTSL), while initiating simultaneous essential newborn care.³ WHO recommendations clearly stated that ICC is generally contraindicated, unless the neonate is asphyxiated and needs to be moved immediately for resuscitation.³ Recently, WHO also recommended that in case of newborn resuscitation, the cord should not be clamped earlier than one minute in both newly-born term and preterm babies even when PPV is required.^{4,5}

The transition to systemic and cerebral oxygenation following birth was found to be smoother when the newborn starts spontaneous breathing prior to UCC.^{6,7} The negative pressure created when the lungs of the infant are inflated at the onset of breathing triggers a significant increase in blood flow to the lungs. This should replace umbilical venous return and substantially increase cardiac output. Therefore, ICC may increase the risk of restricted cardiac output, hypoxia and cardiac respiratory complications, especially if the infant is born with low oxygen levels or other respiratory problems.⁸

DCC is associated with numerous benefits including increased blood volume, decreased iron deficiency anemia and increased total iron stores by over 50% at 6 months of age. These potential valuable effects are thought to extend beyond the neonatal period, including improvements in long-term neurodevelopment.⁷⁻¹⁰ Furthermore, it has been found that DCC facilitates transplantation of stem cells into the newborn.⁹

DCC is associated with a decreased likelihood of red

blood cell transfusions compared with ICC.¹¹ In preterm babies, DCC is safe and offers similar hematological benefits and hemodynamic stability. In addition, a number of studies have reported that DCC can reduce the risk of intraventricular hemorrhage (IVH) and necrotizing enterocolitis in preterm babies.^{12,13} DCC was also found to be both safe and feasible in infants with congenital heart disease.¹¹

An alternative method that can provide newborns with the desired additional blood volume is umbilical cord milking (UCM).^{14,15} This method can be more efficient to improve blood volume, particularly in premature infants and infants delivered by cesarean section. However, further studies are needed to assess the effect of UCM during the neonatal period on long-term outcomes.¹⁴⁻¹⁶

Despite the substantial evidence supporting the practice of DCC, ICC remains the routine practice in many countries and only a few institutions have set policies regarding this practice.^{17,18} Moreover, obstetricians' beliefs about the proper timing for UCC are not clear and are sometimes inconsistent with the evidence of its beneficial impact on neonatal outcomes. This might be due to a number of reasons including lack of clear policies and the typical challenge in changing the way things are done in clinical practice. It may also be related to a misunderstanding of placental physiology in the first few minutes after birth. Therefore uniform national guidelines for cord clamping should be made clear and need to be modified to reflect the recent WHO recommendations.¹⁹ This is also applicable to Saudi Arabia, where there is no clear definition of the timing of UCC in the policies and procedures used by hospitals. The purpose of this study was to investigate the current practices and timing of UCC in five tertiary hospitals in Saudi Arabia.

SUBJECTS AND METHODS

A cross-sectional survey was conducted using a validated questionnaire (in English) adopted from a study that explored practices of cord clamping in the Netherlands.¹⁷ The questionnaire is widely used and has been validated and shown to be reliable. The questionnaire was administered in the period between May-October 2016 to obstetricians and midwives in five tertiary hospitals in Riyadh, the capital city of Saudi Arabia: King Fahad Medical City (KFMC), King Faisal Specialist Hospital (KFSH), King Khaled University Medical City (KKUMC), National Guard Health Affairs (NGHA) and King Saud Medical City (KSMC). The study population was a convenience sample of all 220 obstetricians and midwives that work in these hospitals n=196, (89%).

Using the questionnaire, we gathered detailed information on existing guidelines and protocols used for the timing of UCC as well as perceptions of obstetricians and midwives toward DCC. The questionnaire consists of 24 items and is divided into three sections: demographic information (7 items) including age, gender, specialty, educational background and professional experience; methods and timing of UCC (9 items); and perception and attitudes of physicians and midwives toward DCC and UCM (8 items). The third section of the questionnaire was added to gather information on physicians and midwives' perceptions toward DCC and UCM. The validity and reliability of the modified questionnaire was established. The study was approved by the IRB Committee of King Abdullah International Medical Research Center (KAIMRC) and also by the respective hospitals prior to the distribution of the questionnaire.

Obstetricians and midwives in the five hospitals were approached by the study administrators, provided with a description of the study and its objectives and asked to participate. Participants were provided with a hard copy of the questionnaire and were given enough time to complete it (self-answered). The completed questionnaires were collected and safely stored. Data were uploaded and saved into an appropriately designed Excel spreadsheet. Data were processed in accordance with the best practices for raw data management to identify any inaccuracies or incompleteness before the statistical analyses. Responses to all items in the questionnaire were checked and compared against the possible minimum and maximum values of each variable and items with implausible values were flagged. A similar process was applied to demographic variables to identify any potential anomalies by running general frequency analyses.

Descriptive statistical analyses were performed on the data for the study participants. Continuous variables were summarized using mean and standard deviation (SD), and proportions were used for categorical variables. Scores measuring attitudes and perceptions toward DCC were analyzed and compared by age, gender, nationality, profession, educational background and years of practice. Comparisons were made using the chi-square test. Statistical significance was considered at $P < .05$. All statistical analyses were performed using IBM SPSS 21.0 (Armonk, NY: IBM Corp).

RESULTS

A total of 157 of 196 obstetricians and midwives completed the questionnaire (82 obstetricians and 75 midwives) for a response rate of 80%. The content validity

of the questionnaire items measuring the attitudes of obstetricians and midwives toward DCC was established by two experts who examined the appropriateness of the content after making necessary modifications to items to ensure they were comprehensive and accurately assessed and measured attitudes. In addition, the reliability of the questionnaire was examined using Cronbach's alpha (α), which is a measure of internal consistency, indicating how closely related a set of items are as a group. The Cronbach's α value was 0.69, indicating an acceptable level of internal consistency.

The majority of respondents were aged 30 years or older (81%) and 84% were females (**Table 1**). Most respondents were non-Saudi (66%), had an educational level of bachelor's degree or higher (72%) and obtained their degree outside Saudi Arabia (66%). The distribution of years of obstetrics/gynecology (OB/GYN) practice was as follows: 30% had more than 16 years of practice, 47% had 5-16 years and only 23% had less than 5 years of practice; 76% of respondents had 4 or more years of practice inside Saudi Arabia. Forty-two percent of respondents reported the existence of UCC guidelines in their practice (**Table 2**). Only 60 of the 157 respondents (38%) stated that they have a set UCC time for term babies. Of those, only 20 reported the exact time, and 55% (11/20) reported a time of >1 minute. Thirty-six percent of respondents reported that they routinely apply UCC according to protocol, while 27% apply it to prevent polycythemia or hyperbilirubinemia and 26% had no specific reason for their UCC routine.

Only 33% reported that they always clamp the cord immediately. Forty-eight percent of respondents reported earlier UCC with a low APGAR score, whereas 46% reported early UCC when the umbilical cord was short or nuchal and 20% reported early UCC when there was considerable vaginal blood loss. While 46% of respondents reported no occasion for applying later UCC, 26% reported later UCC when the umbilical cord was still pulsating. Twelve percent reported DCC when the placenta was still attached to the uterine wall and 12% reported DCC based on the wish of the parents.

In preterm neonates, only 32% of respondents reported a set UCC time in their practice. Forty-one percent reported they apply ICC for preterm neonates for no specific reason or for the usual reasons for term neonates. For babies delivered by elective cesarean delivery, 27% apply ICC, 26% use the same timing as in vaginal delivery and 19% apply cord milking. In contrast, when babies are delivered by secondary cesarean delivery (mother has already had a previous cesarean delivery), 15% apply ICC, 29% use the same

timing as in vaginal delivery and 20% reported applying cord milking.

Seventy-one percent of respondents agreed that DCC increases iron stores during the neonatal period in preterm babies and 63% thought that the benefits of DCC extend beyond the neonatal period including better long-term neurodevelopment (Table 3). The majority of respondents agreed that DCC is good for term and preterm babies not requiring positive pressure ventilation (PPV) (71% and 69%, respectively). In contrast, lower levels of agreement were reported on the benefits of DCC for babies requiring PPV, on its positive effect on circulation and on its benefits in reducing blood transfusions and necrotizing enterocolitis and IVH in preterm babies (51% and 58%, respectively). Most respondents were not sure or did not agree that DCC is not applicable for babies delivered by cesarean delivery (71%), while 45% thought that, for cesarean delivery babies, UCM is more applicable than DCC.

The rate of reporting the existence of UCC guidelines was not significantly different by most demographic and practice-related factors ($P > .05$) (Table 4). The only difference observed was by the country where respondent's highest degree was obtained; 58% of respondents with Saudi degrees reported the existence of UCC guidelines in their practice compared to only 35% for others ($P = .007$). In contrast, the rate of reporting the existence of a set UCC time for term neonates was significantly different by several demographic characteristics including profession, nationality and country where respondent's highest degree was obtained. Significantly higher rates of reporting the existence of a set UCC time for term neonates were observed among obstetricians (49% vs. 31% among midwives), respondents having a Saudi nationality (56% vs. 32% among non-Saudis) and among those who obtained their highest degree in Saudi Arabia (53% vs. 34% among others) ($P = .023$, $.004$ and $.031$, respectively). Similar findings were observed for reporting the existence of a set UCC time for preterm neonates. That is, significantly higher rates of reporting the existence of a set UCC time for preterm neonates were also observed among obstetricians (41% vs. 23% among midwives), respondents with Saudi nationality (44% vs. 27% among non-Saudis) and among those who obtained their highest degree in Saudi Arabia (52% vs. 24% among others) ($P = .018$, $.029$ and $.001$, respectively). No other demographic and practice-related characteristics were associated with the rate of reporting of the existence of UCC guidelines or set times for term or preterm neonates ($P > .05$).

Significantly different rates of positive attitudes toward DCC were observed by gender and years of

Table 1. Demographic and clinical characteristics of respondents (n=157).

Hospital	
KFMC	47 (29.9)
KFSH	9 (5.7)
KKUMC	30 (19.1)
KSMC	38 (24.2)
NGHA	33 (21.0)
Gender n (%)	
Male	25 (15.9)
Female	132 (84.1)
Age group (years) n (%)	
Below 30	29 (18.5)
30-45	74 (47.1)
Above 45	30 (19.1)
Missing	24 (15.3)
Profession n (%)	
Obstetrician	82 (52.2)
Midwife	75 (47.8)
Nationality n (%)	
Saudi	53 (33.8)
Non-Saudi	104 (66.2)
Educational Level n (%)	
Diploma	44 (28.0)
Bachelor	31 (19.7)
Higher degree	82 (52.2)
Degree obtained n (%)	
In Saudi Arabia	48 (30.6)
Outside Saudi Arabia	103 (65.6)
Missing	6 (3.8)
Years of OB/GYN practice n (%)	
Less than 5	36 (22.9)
5-16	73 (46.5)
More than 16	47 (29.9)
Missing	1 (0.6)
Years of practice in Saudi Arabia n (%)	
Less than 4	37 (23.6)
4-14	86 (54.8)
More than 14	33 (21.0)
Missing	1 (0.6)

Values are number and percentage.

Table 2. Existing umbilical cord clamping practices (n=157).

Item	Options	No. of Responses	%
Existing guidelines for UCC?	Yes	66	42.0
	No	88	56.1
	Missing	3	1.9
Set UCC time - term neonate?	Yes	60	38.2
	No	90	57.3
	Missing	7	4.5
UCC routine*	No specific reason for UCC routine	41	26.1
	UCC according to a protocol	56	35.7
	UCC to prevent polycythemia or hyperbilirubinemia	43	27.4
	Wait as long as possible; not worried about polycythemia or hyperbilirubinemia	6	3.8
	Wait until the pulsations have ceased to optimize blood supply	32	20.4
	Wait until normal neonatal breathing to optimize blood supply	17	10.8
	Administration of meds (e.g. oxytocine) during AMTSL is a reason for UCC	7	4.5
Other/missing	16	10.2	
Occasions for earlier UCC*	N/A. I always do UCC immediately	52	33.1
	Neonate has a low APGAR score	76	48.4
	A lot of vaginal blood loss	31	19.7
	Short umbilical cord	35	22.3
	Neonate has Hypothermia	11	7.0
	Nuchal cord	38	24.2
	Wish of the parents	6	3.8
	Pulsations have already ceased	19	12.1
	Placental detachment from the uterine wall	19	12.1
	Admin. of oxytocin/other uterotonics	7	4.5
	Low position of the infant	7	4.5
	To prevent polycythemia/hyperbilirubinemia	12	7.6
	Other/missing	11	7.0
Occasions for later UCC*	Not applicable	72	45.9
	UC is still pulsating when applying UCC	41	26.1
	Placenta is still attached to the uterine wall	19	12.1
	The mother is breastfeeding	19	12.1
	No vaginal blood loss	16	10.2
	Wish of the parents	19	12.1
	Other/missing	13	8.2

Table 2 (cont.). Existing umbilical cord clamping practices (n=157).

Item	Options	No. of Responses	%
Set UCC time - preterm neonate?	Yes	50	31.8
	No	103	65.6
	Missing	4	2.5
Reason for UCC - preterm neonate	No reason	30	19.1
	Same reason as term neonates	34	21.7
	DCC benefits are important	6	3.8
	ECC benefits are important to pediatrician	13	8.3
	Condition of the child is important	44	28.0
	Other	4	2.5
	Missing	26	16.6
UCC time-elective C-section?	Same time as in vaginal delivery	41	26.1
	As soon as possible	43	27.4
	Cord stripping or milking	29	18.5
	Not applicable	27	17.2
	Missing	17	10.8
UCC time-secondary C-section?	Same time as in vaginal delivery	46	29.3
	As soon as possible.	24	15.3
	Cord stripping or milking	32	20.4
	Not applicable	31	19.7
	Missing	24	15.3

*More than one response allowed.

Table 3. Attitudes toward delayed cord clamping (Likert items).

Item	Mean	SD	Percent agree/strongly agree
DCC is good for preterm babies not requiring PPV	3.95	1.06	71.2
DCC is good for term babies not requiring PPV	3.33	1.67	68.6
DCC is good even for babies who do require PPV	3.06	1.55	51.4
DCC increases iron stores during the neonatal period in pre/term babies	3.92	0.85	70.5
DCC has valuable effects that extend beyond the neonatal period including better long term neurodevelopment	3.35	1.50	62.6
DCC may help preterm babies by stabilizing circulation, reducing blood transfusions and necrotizing enterocolitis and IVH	3.69	0.93	58.3
DCC is not applicable for babies delivered by C-section	2.70	1.23	28.6
UCM is more applicable especially for babies delivered by C-section	2.91	1.51	45.0

Coding: 5=strongly agree, 4=agree, 3=not sure, 2=agree, 1=strongly disagree.

Table 4. Existing umbilical cord clamping practices demographic characteristics.

	n	Number with characteristic	%	P
Existence of UCC guidelines/protocols				
Profession				
Obstetrician	81	37	45.7	.46
Midwife	73	29	39.7	
Nationality				
Saudi	53	27	50.9	.14
Non-Saudi	101	39	38.6	
Degree obtained				
In Saudi Arabia	48	28	58.3	.007
Outside Saudi Arabia	100	35	35.0	
Existence of set time for UCC for term neonates				
Profession				
Obstetrician	78	38	48.7	.023
Midwife	72	22	30.6	
Nationality				
Saudi	52	29	55.8	.004
Non-Saudi	98	31	31.6	
Degree obtained				
In Saudi Arabia	45	24	53.3	.031
Outside Saudi Arabia	99	34	34.3	
Existence of set time for UCC for preterm neonates				
Profession				
Obstetrician	80	33	41.2	.018
Midwife	73	17	23.3	
Nationality				
Saudi	52	23	44.2	.029
Non-Saudi	101	27	26.7	
Degree obtained				
In Saudi Arabia	46	24	52.2	.001
Outside Saudi Arabia	101	24	23.8	

Data not available for all respondents. Statistical analysis by chi-square test

Top section (Existence of UCC guidelines/protocols): footnote: χ^2 (df)=0.56 (1), 2.16 (1) and 7.22 (1), for profession, nationality and degree obtained, respectively.

Middle section (Existence of set time for UCC for term neonates): footnote: χ^2 (df)=5.15(1), 8.25(1) and 4.64 (1), for profession, nationality and degree obtained, respectively.

Lower section (Existence of set time for UCC for preterm neonates): footnote: χ^2 (df)=5.60 (1), 4.78 (1) and 11.60 (1), for profession, nationality and degree obtained, respectively.

OB/GYN practice (**Table 5**). Male respondents had significantly higher rates of positive attitudes toward DCC than females (59% vs. 32%; $P=.015$). Significantly higher rates of positive attitudes toward DCC were also observed among respondents with more years of OB/GYN practice (49% among those with more than 16 years vs. 31% among those with less practice years; $P=.043$). No significant differences in attitudes were observed by profession. Also, none of the other demographic or practice-related characteristics of respondents (not shown) were associated with attitudes toward DCC ($P>.05$).

DISCUSSION

This study explored practices of UCC and attitudes toward DCC among obstetricians and midwives in five tertiary hospitals in the capital city of Riyadh in Saudi Arabia. There were several key findings. Only 42% of respondents reported the existence of UCC guidelines in their practice, which may not necessarily consist of written UCC policies, but rather a set of verbal agreements between clinical staff. These are usually communicated in orientation programs and sessions that are usually administered by the hospital to all newly recruited obstetricians and midwives. While general OB/GYN and other documented clinical policies and practices are discussed during these orientation sessions, no written guidelines specific to UCC practices are provided.

A slightly lower percentage was observed for reporting the existence of a set UCC time when the neonate is term and healthy (38%), and only 32% reported having a set time for UCC when the neonate is preterm. While the association between reporting the existence of a set UCC time and profession is anticipated, the substantially lower reporting among non-Saudi professionals and among those with non-Saudi degrees was somewhat puzzling. This finding, however, could be related to cultural and language differences, particularly when a set UCC timing guideline is only communicated verbally between hospital staff and thus assumed to be known without the need for documentation. This may also explain the anticipated differences by profession as obstetricians maybe more updated on these guidelines and are more likely to discuss them during their daily practice.

The majority of respondents (69-71%) thought that DCC is generally good for both term and preterm babies and 63% thought that its benefits extend beyond the neonatal period including better long-term neurodevelopment. These findings are consistent with those reported in recently published studies where DCC was almost universally recommended, particularly for pre-

term babies.¹⁷ In fact, DCC in preterm babies who need resuscitation can now be facilitated by providing a mobile resuscitation unit with an intact cord at the bedside.^{5,17} The safety and acceptability of this method and its effect on outcome are still being investigated. As reported in previous studies, lower levels of agreement were observed among obstetricians and midwives on the benefits of DCC for babies requiring PPV.²⁰

Variations in respondents' attitudes toward DCC were also observed; significantly higher rates of positive attitudes toward DCC were noted among male respondents and among those with more years of OB/GYN practice. While the latter finding is anticipated, the difference by gender could not be fully explained and thus needs further investigation. One possible explanation of this difference could be that while both male and female professionals may well be aware of the existence of newly established and perhaps not yet documented WHO recommendations on the benefits of DCC, females have a higher tendency to follow guidelines only when they are written and clearly documented and thus were less likely to have a favorable perception about later UCC.²¹

Our findings imply the need to offer educational programs on the various benefits of DCC, particularly for midwives and non-Saudi OB/GYN professionals. Such programs can focus on discussing documented guidelines and set times for UCC at the institutional level. This has been shown to be crucial to improving UCC knowledge and practice.²² Some institutions in other countries have already initiated the development of educational programs for obstetricians, midwives and neonatologists.²²

A strength of this study is its use of a widely-used instrument to measure practices of UCC and attitudes toward DCC among OB/GYN professionals. While numerous studies have focused on the importance of improving UCC practices in the Gulf region, this appears to be the first study that thoroughly assessed OB/GYN professionals' self-reported UCC practices and attitudes toward DCC in this particular region. Another important outcome of this study was its value in terms of further exploring practices and attitudes by identifying demographic and practice-related characteristics that may be associated with particular practices and attitudes.

The major limitation of this study was that the participants were selected by convenience sampling, which may limit the generalizability of the findings to other hospitals in the region and around the world. Nevertheless, we were able to approach and administer the survey to 89% of obstetricians and midwives that work in the five hospitals. While we used a convenience

Table 5. Number and percent with positive attitude toward DCC by characteristics.

	n	Number with positive attitude	%	P
All respondents	132	48	36.4	
Profession				
Obstetrician	71	27	38.0	.67
Midwife	61	21	34.4	
Gender				
Male	22	13	59.1	.015
Female	110	35	31.8	
Years of OB/GYN practice				
16 or less	88	27	30.7	.043
More than 16	43	21	48.8	

Data not available for all respondents. Positive attitude indicated by selecting "agree" or "strongly agree" for all 7 statements about DCC. Statistical analysis by the chi-square test.

χ^2 (df)=0.18 (1), 5.89 (1) and 4.10 (1), for profession, gender and years of OB/GYN practice, respectively.

sample, our study covered the vast majority of obstetricians and midwives in these hospitals as evidenced by the high response rate of 80%. Also, we used an instrument that consists of items that assess a broad range of UCC practices and opinions, future qualitative studies are warranted to extract more detailed information reflecting the reasons behind these practices and opinions.

The majority of obstetricians and midwives that participated in this study appeared to have a positive perception toward DCC. However, most of these professionals reported a lack of existing UCC guidelines in their practice. The existence of written hospital guidelines for UCC is crucial to maintaining a consistent and safe practice by all OB/GYN professionals. These findings are extremely valuable and can be used to design educational programs, particularly among professionals reporting a lack of UCC guidelines or less favorable attitudes toward DCC. Hopefully, the findings of this study will also set the stage for conducting further studies to evaluate the effect of implementing educational programs to enhance UCC knowledge and guidelines and improve attitudes toward DCC among OB/GYN professionals, regionally and internationally.

Conflict of interest

The authors report no conflict of interest.

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