

A Quality Improvement Project to Delay Umbilical Cord Clamping Time

Amanda N. Pauley, MD*; Amy Roy, MD*; Yaslam Balfaqih, MD†; Erin Casey MD‡; Rachel Marteney, MD‡; Joseph E. Evans, MD†

Abstract

Introduction: Delayed cord clamping (DCC) has numerous benefits to the neonate, including increased hemoglobin levels, decreased need for red blood cell transfusions, and decreased incidence of necrotizing enterocolitis and intraventricular hemorrhage. A preliminary observational study at our institution demonstrated 12% of the observed deliveries met the DCC standard, defined as umbilical cord clamping at least 30–60 seconds after birth. Therefore, we designed a quality improvement project to increase the percentage of deliveries using DCC. **Methods:** We planned a quality improvement project aiming to increase DCC rates on the university obstetrics service. Our interventions included provider education, installation of timers in the delivery suites, and modification to documentation in the electronic health record. We measured our results through the documented status of cord clamping, either: (1) greater than or equal to 30 seconds or (2) less than 30 seconds. We analyzed the DCC rates weekly and compared those results to the DCC goal of 80% of all deliveries. **Results:** Postintervention DCC rates were 96% overall. Rates of DCC met our aim of 80% or greater each of the 6 weeks we collected data. **Conclusion:** Simple and inexpensive interventions quickly led to improvements in DCC rates on our university obstetrics service. Our interventions including, provider education, installation of timers in delivery suites, and modification to cord clamping documentation in the electronic health record can be easily instituted at other hospitals. Additionally, the simplicity of this system can produce long-term sustainability of DCC. (*Pediatr Qual Saf* 2021;6:e452; doi: 10.1097/pq9.000000000000452; Published online September 24, 2021.)

INTRODUCTION

The optimal timing for umbilical cord clamping after the delivery of a baby has been debated for decades. In the middle of the 20th century, early umbilical cord clamping after birth became a standard practice.¹ More recently, it has been determined that delayed cord clamping (DCC),



usually defined as at least 30–60 seconds after birth, is beneficial for infants. DCC in preterm neonates is associated with increased hemoglobin and hematocrit levels with a corresponding decreased need for red blood cell transfusions.^{2–4} Furthermore, DCC in preterm babies is linked to a decreased risk of necrotizing enterocolitis and intraventricular hemorrhage.^{3–5} In term neonates, DCC increases hemoglobin levels and iron stores,^{6–8} which may lead to improved developmental outcomes.⁹

In 2014, the World Health Organization recommended umbilical cord clamping greater than 60 seconds after birth for improved maternal and infant health and nutrition outcomes.¹⁰ The 2016 *Textbook of Neonatal Resuscitation* recommended umbilical cord clamping at 30–60 seconds for most vigorous term and preterm newborns.¹¹ In January 2017, the American College of Obstetrics and Gynecology (ACOG) also recommended a delay in umbilical cord clamping for 30–60 seconds in vigorous preterm and term infants.¹²

We observed 34 randomly chosen deliveries at our institution before the ACOG recommendation. Only 12% of those umbilical cords were clamped greater than or equal to 30 seconds after delivery. A quality improvement project was designed to rapidly incorporate the ACOG recommendation into the university obstetrical practice's delivery room protocol at our hospital. The aim was for newborn umbilical cord clamping to take

From the *Department of Obstetrics and Gynecology, Joan C Edwards School of Medicine, Marshall University, Huntington, W.Va.; †Department of Pediatrics, Joan C Edwards School of Medicine, Marshall University, Huntington, W.Va.; and ‡Joan C Edwards School of Medicine, Marshall University, Huntington, W.Va.

Presented at the Quality Improvement and Patient Safety Summit, Huntington, WV, April 2018.

*Corresponding author. Address: Joseph E. Evans, MD, Department of Pediatrics, Joan C Edwards School of Medicine, Marshall University, 1600 Medical Center Dr., Suite 3500, Huntington, WV 25701
PH: 304-691-1300; Fax: 304-691-1375
Email: evans83@marshall.edu

Copyright © 2021 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

To Cite: Pauley AN, Roy A, Balfaqih Y, Casey E, Marteney R, Evans JE. A Quality Improvement Project to Delay Umbilical Cord Clamping Time. *Pediatr Qual Saf* 2021;6:e452.

Received for publication August 20, 2020; Accepted March 3, 2021.

Published online September 24, 2021

DOI: 10.1097/pq9.000000000000452

place 30 seconds or more after delivery in 80% or more of deliveries on the university obstetrical service within 3 months of our initial meeting.

METHODS

This QI work took place in a university-affiliated regional hospital with approximately 2,600 deliveries annually, of which around 1,000 are typically on the university service. Initially, a total of 34 randomly selected deliveries (baseline), regardless of delivery service, were observed to determine the percentage of deliveries with umbilical cord clamping delayed to 30 seconds or greater. These deliveries were witnessed by medical students who recorded the time from birth to cord clamping. These students did not tell the delivery room personnel they were timing cord clamping.

After determining the current (baseline) DCC rate was 12%, we formed an improvement committee. This committee consisted of a pediatrician, an obstetrician, a pediatric resident, an OB/GYN resident, and 2 medical students. Our AIM statement was umbilical cord clamping which will be performed at greater than or equal to 30 seconds in 80% or more of all deliveries on the university service within 3 months from the time of our initial meeting. We developed key drivers to help achieve the study aim (Fig. 1). The obstetrician on the committee discussed DCC at OB/GYN grand rounds and presented the ACOG recommendations for DCC. These recommendations were also discussed with the delivery room nurses and personnel at shift changes on the hospital's obstetric unit. The pediatrician reviewed the DCC recommendations with staff neonatologists, including the neonatal intensive care unit medical director. Subsequently, the neonatal intensive care unit medical director informed the neonatal resuscitation team of the cord clamping recommendations. The pediatric resident on the committee discussed the project with the physician champion of the hospital electronic health record (EHR).

Additional changes included an addition to the delivery room note for documentation of cord clamping time. This addition was a statement "the cord was clamped" with a choice of either: (1) greater than or equal to 30 seconds after birth or (2) less than 30 seconds after birth. If choosing less than 30 seconds, an explanation of why the umbilical cord was clamped in less than 30 seconds was allowed in the EHR.

Furthermore, the team placed timers in all the delivery rooms. Immediately after a newborn's birth, a delivery room nurse would set the timer to alarm in 30 seconds. This alarm signified to the obstetrician that the umbilical cord could be clamped.

Following the implementation of these interventions, which took 6 weeks to complete, the team reviewed cord clamping times on all university service deliveries weekly.

The project was deemed exempt by the hospital's institutional review board chairman.

RESULTS

The results showed immediate improvement in the percentage of deliveries with DCC after the interventions (Fig. 2). Within 1 week of instituting the interventions, 15 of 16 deliveries (94%) on the university service used DCC. All 6 weeks studied after the interventions met the aim statement goal of 80% or greater rate of DCC. Overall, 65 of 68 (96%) total deliveries incorporated DCC. The last week study was 3 months after the first meeting for this quality improvement project. During that week, 18 of 19 (95%) deliveries involved DCC. The project aim was achieved within 3 months from the time of the initial meeting. Only 1 PDSA cycle was needed to achieve this goal.

The lowest percentage of DCC deliveries occurred in week 5 with 80%. However, there were only 5 deliveries on the university service that week. Only 3 of 68 total deliveries was umbilical cord clamping performed in less than 30 seconds. In all 3 of these deliveries, the obstetrician documented concern for immediate resuscitation for the newborn as the reason for early umbilical cord clamping.

DISCUSSION

After the institution of our interventions, the project aim was rapidly achieved. It took 6 weeks to institute all the quality project interventions and once those tasks were completed, the delayed umbilical cord clamping rate rapidly exceeded 80%, with an overall DCC rate of 96%.

Strength of our project was the involvement and input from various delivery room participants, including obstetric attending physicians, residents, delivery room nurses, and neonatal resuscitation team members. All of these team members were given education regarding DCC. Discussing the project with delivery room personnel at shift changes allowed us to speak directly to most important team members that provide delivery room patient care.

The timing of ACOG's DCC recommendation may have made it easier for us to meet our aim. Our preliminary observation of a 12% DCC rate came before the ACOG recommendation (but after the WHO and *Textbook of Neonatal Resuscitation* recommendations). We do not know the degree of impact the release of the ACOG recommendation alone would have on DCC rates.

The logical next step at our institution is expanding this project to involve the other delivery services (other than the university service). We are optimistic that this can be achieved relatively easily. Our project's delivery room personnel are the same personnel involved in all deliveries at our hospital. The only additional step needed for this expansion of DCC would involve the education of nonuniversity obstetricians.

We found no previous quality improvement studies involving DCC in term newborns. However, 2

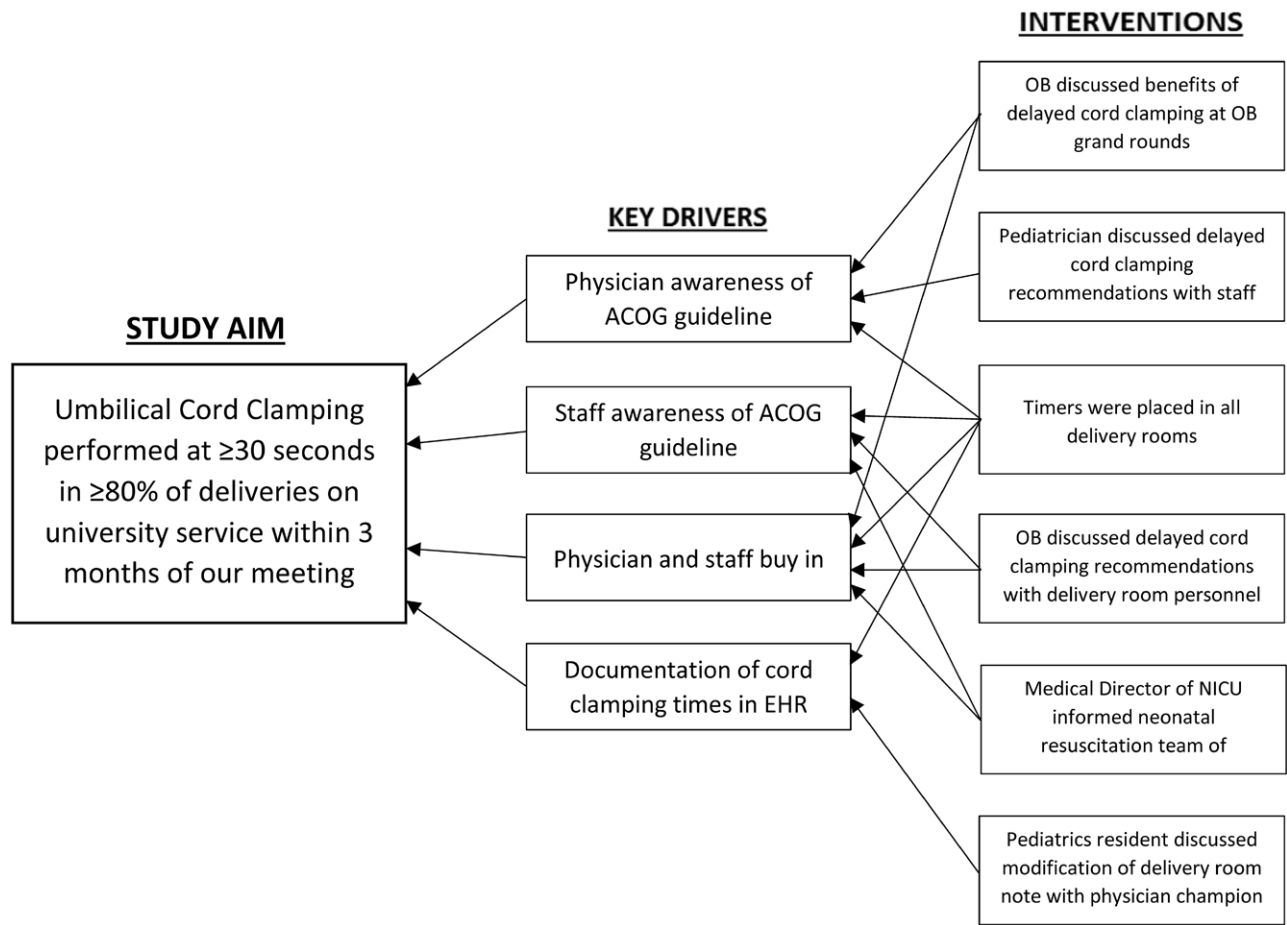


Fig. 1. Key driver diagram. NICU, neonatal intensive care unit.

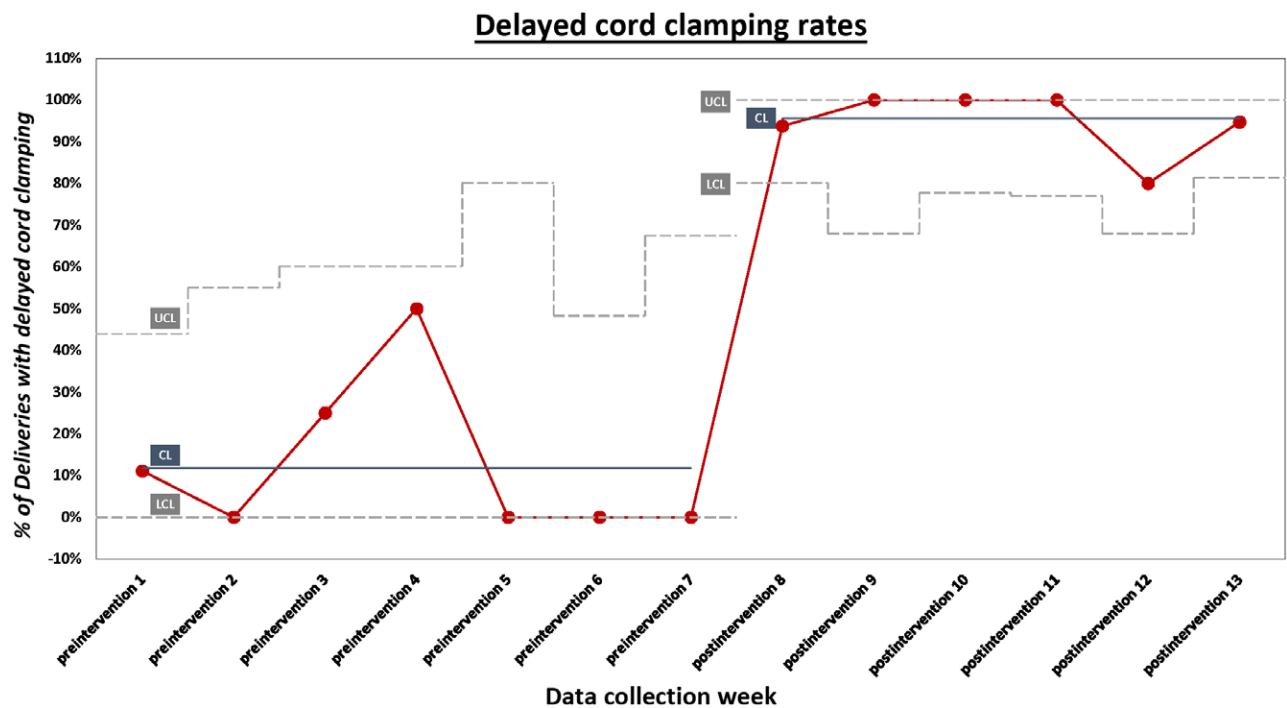


Fig. 2. Control chart (p-chart). CL, control limit; LCL, lower control limit; UCL, upper control limit.

previously published studies used quality improvement interventions to incorporate DCC in preterm newborns.^{13,14} One study only evaluated infants weighing less than 1,500 g at birth, and their protocol called for DCC at 60 seconds.¹³ The other study exclusively selected newborns born at less than 34 weeks gestation, and their protocol involved cord clamping at 30 seconds.¹⁴ Both projects achieved greater than 70% DCC. In contrast, our study included all newborns and our aim was for cord clamping to occur at greater than or equal to 30 seconds after birth.

We believe our improvements are sustainable, and our interventions can be easily instituted at other hospitals. The monetary costs were negligible and limited to purchasing inexpensive timers for the delivery rooms. The other interventions were educational or through a simple modification of the EHR. The simplicity of the interventions and the weight of the ACOG recommendation should lead to DCCs sustainability. Ongoing data collection by periodic chart reviews of umbilical cord clamping times will allow us to determine if subsequent PDSA cycles will need to be implemented.

CONCLUDING SUMMARY

This quality improvement project successfully met the project aim of 80% or greater DCC in all deliveries by the university service at our hospital within 3 months of the initial organizational meeting. The interventions were simple, inexpensive, and we believe they are easily adoptable by other institutions.

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

1. Kim AJH, Warren JB. Optimal timing of umbilical cord clamping: is the debate settled? Part 1 of 2: history, rationale, influencing factors, and concerns. *NeoReviews*. 2015;16:e263–e269.
2. Kim AJH, Warren JB. Optimal timing of umbilical cord clamping: is the debate settled? Part 2 of 2: evidence in preterm and term infants, alternatives, and unanswered questions. *NeoReviews*. 2015;16:e270–e277.
3. Brocato B, Holliday N, Whitehurst RM Jr, et al. Delayed cord clamping in preterm neonates: a review of benefits and risks. *Obstet Gynecol Surv*. 2016;71:39–42.
4. Rabe H, Diaz-Rossello JL, Duley L, et al. 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*. 2012;8:CD003248.
5. Mercer JS, Vohr BR, McGrath MM, et al. Delayed cord clamping in very preterm infants reduces the incidence of intraventricular hemorrhage and late-onset sepsis: a randomized, controlled trial. *Pediatrics*. 2006;117:1235–1242.
6. McDonald SJ, Middleton P, Dowswell T, et al. Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. *Cochrane Database Syst Rev*. 2013;2013:CD004074.
7. Ceriani Cernadas JM, Carroli G, Pellegrini L, et al. The effect of timing of cord clamping on neonatal venous hematocrit values and clinical outcome at term: a randomized, controlled trial. *Pediatrics*. 2006;117:e779–e786.
8. Kc A, Rana N, Målqvist M, et al. Effects of delayed umbilical cord clamping vs early clamping on anemia in infants at 8 and 12 months: a randomized clinical trial. *JAMA Pediatr*. 2017;171:264–270.
9. Andersson O, Lindquist B, Lindgren M, et al. Effect of delayed cord clamping on neurodevelopment at 4 years of age: a randomized clinical trial. *JAMA Pediatr*. 2015;169:631–638.
10. World Health Organization. *Guideline: Delayed Umbilical Cord Clamping for Improved Maternal and Infant Health and Nutrition Outcomes*. World Health Organization; 2014.
11. American Academy of Pediatrics. *Textbook of Neonatal Resuscitation*. 7th ed. American Academy of Pediatrics; 2016.
12. Delayed umbilical cord clamping after birth. Committee Opinion No. 684. American College of Obstetricians and Gynecologists. *Obstet Gynecol*. 2017;129:e5–e1.
13. Bolstridge J, Bell T, Dean B, et al. A quality improvement initiative for delayed umbilical cord clamping in very low-birthweight infants. *BMC Pediatr*. 2016;16:155.
14. Ruangkit C, Moroney V, Viswanathan S, et al. Safety and efficacy of delayed umbilical cord clamping in multiple and singleton premature infants - a quality improvement study. *J Neonatal Perinatal Med*. 2015;8:393–402.