

# Hemodynamic Effects of Delayed Cord Clamping in Premature Infants

**AUTHORS:** Ross Sommers, MD,<sup>a</sup> Barbara S. Stonestreet, MD,<sup>a</sup> William Oh, MD,<sup>a</sup> Abbot Lupton, MD,<sup>a</sup> Toby Debra Yanowitz, MD, MS,<sup>b</sup> Christina Raker, ScD,<sup>c</sup> and Judith Mercer, PhD<sup>a,d</sup>

Departments of <sup>a</sup>Neonatology and <sup>b</sup>Obstetrics and Gynecology, Women & Infants Hospital of Rhode Island & Alpert Medical School of Brown University, Providence, Rhode Island; <sup>c</sup>Neonatology, Magee Women's Hospital and University of Pittsburgh, Pittsburgh, Pennsylvania; and <sup>d</sup>College of Nursing, University of Rhode Island, Kingston, Rhode Island

## KEY WORDS

delayed cord clamping, premature infants

## ABBREVIATIONS

ANOVA—analysis of variance  
BFV—blood flow velocity  
DCC—delayed cord clamping  
ICC—immediate cord clamping  
MCA—middle cerebral artery  
PDA—persistent ductus arteriosus  
P/IVH—periventricular or intraventricular hemorrhage  
RVO—right ventricle output  
RV-SV—right ventricle stroke volume  
SMA—superior mesenteric artery  
SVC—superior vena cava

This trial has been registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (identifier NCT00818220).

[www.pediatrics.org/cgi/doi/10.1542/peds.2011-2550](http://www.pediatrics.org/cgi/doi/10.1542/peds.2011-2550)

doi:10.1542/peds.2011-2550

Accepted for publication Oct 27, 2011

Address correspondence to Ross Sommers, MD, Women & Infants Hospital, Department of Pediatrics, 101 Dudley St, Providence, RI 02905. E-mail: [drsommers@gmail.com](mailto:drsommers@gmail.com)

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4225).

Copyright © 2012 by the American Academy of Pediatrics

**FINANCIAL DISCLOSURE:** The authors have indicated they have no financial relationships relevant to this article to disclose.

**FUNDING:** This work was supported by National Institutes of Health, National Institute for Nursing Research grant 5R01NR010015.



**WHAT'S KNOWN ON THIS SUBJECT:** Delayed umbilical cord clamping in premature infants has been associated with decreased rates of intraventricular hemorrhage; however, the mechanisms that explain this finding have not been described.



**WHAT THIS STUDY ADDS:** Premature infants with delayed umbilical cord clamping have improved superior vena cava blood flow over the first days of life. This may provide one of the mechanism(s) by which this technique reduces the incidence in intraventricular hemorrhage in this at-risk population.

## abstract



**BACKGROUND AND OBJECTIVE:** Delayed cord clamping (DCC) has been advocated during preterm delivery to improve hemodynamic stability during the early neonatal period. The hemodynamic effects of DCC in premature infants after birth have not been previously examined. Our objective was to compare the hemodynamic differences between premature infants randomized to either DCC or immediate cord clamping (ICC).

**METHODS:** This prospective study was conducted on a subset of infants who were enrolled in a randomized controlled trial to evaluate the effects of DCC versus ICC. Entry criteria included gestational ages of 24<sup>0</sup> to 31<sup>6</sup> weeks. Twins and infants of mothers with substance abuse were excluded. Serial Doppler studies were performed at 6 ± 2, 24 ± 4, 48 ± 6, and 108 ± 12 hours of life. Measurements included superior vena cava blood flow, right ventricle output, middle cerebral artery blood flow velocity (BFV), superior mesenteric artery BFV, left ventricle shortening fraction, and presence of a persistent ductus arteriosus.

**RESULTS:** Twenty-five infants were enrolled in the DCC group and 26 in the ICC group. Gestational age, birth weight, and male gender were similar. Admission laboratory and clinical events were also similar. DCC resulted in significantly higher superior vena cava blood flow over the study period, as well as greater right ventricle output and right ventricular stroke volumes at 48 hours. No differences were noted in middle cerebral artery BFV, mean superior mesenteric artery BFV, shortening fraction, or the incidence of a persistent ductus arteriosus.

**CONCLUSIONS:** DCC in premature infants is associated with potentially beneficial hemodynamic changes over the first days of life. *Pediatrics* 2012;129:e667–e672