

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Family-Centered, Evidence-Based Phototherapy Delivery

Kinga A. Szucs and Marc B. Rosenman

Pediatrics 2013;131:e1982; originally published online May 13, 2013;

DOI: 10.1542/peds.2012-3479

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/131/6/e1982.full.html>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2013 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



Family-Centered, Evidence-Based Phototherapy Delivery

abstract

Jaundice develops in most newborn infants and is one of the most common reasons infants are rehospitalized after birth. American Academy of Pediatrics clinical practice guidelines strongly support the recommendation that clinicians promote and support breastfeeding. Recognizing that the disruptions associated with phototherapy interfere with breastfeeding, the challenge often faced by clinicians is how to provide effective phototherapy while supporting evidence-based practices, such as rooming-in, skin-to-skin contact, and breastfeeding. We report here on a case that reflects a common clinical scenario in newborn medicine in order to describe a technique for providing phototherapy while maintaining evidence-based practices. This approach will assist clinicians in providing best-practices and family-centered care. *Pediatrics* 2013;131:e1982–e1985

AUTHORS: Kinga A. Szucs, MD, FAAP and Marc B. Rosenman, MD

Department of Pediatrics, Indiana University School of Medicine, Indianapolis, Indiana

KEY WORDS

phototherapy, hyperbilirubinemia, kangaroo care, breastfeeding

ABBREVIATION

AAP—American Academy of Pediatrics

Dr Szucs conceptualized and designed the report, drafted the initial manuscript, revised the manuscript, and approved the final manuscript as submitted; and Dr Rosenman assisted in the concept and design of the report and in drafting and revising the manuscript and approved the final manuscript as submitted.

www.pediatrics.org/cgi/doi/10.1542/peds.2012-3479

doi:10.1542/peds.2012-3479

Accepted for publication Feb 25, 2013

Address correspondence to Kinga A. Szucs, MD, FAAP, Department of Pediatrics, Indiana University School of Medicine, Family Beginnings, Wishard Health Services, 1001 West 10th St, Indianapolis, IN 46202. E-mail: kszucs@iupui.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2013 by the American Academy of Pediatrics

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

FUNDING: No external funding.

Jaundice develops in most newborn infants^{1–3} and is one of the most common reasons infants are rehospitalized after birth.⁴ The focus of the American Academy of Pediatrics (AAP) guideline on the management of hyperbilirubinemia in newborns ≥ 35 weeks of gestation is “to reduce the incidence of severe hyperbilirubinemia and bilirubin encephalopathy . . . while minimizing the risks of unintended harm such as . . . decreased breastfeeding.”^{1,2} The number 1 key element listed in this AAP clinical practice guideline strongly supports the recommendation in many other AAP policy statements that clinicians promote and support breastfeeding.^{1,2} Recommendation 1.0 is to “advise mothers to nurse their infants at least 8 to 12 times per day for the first several days.”¹ The practice guideline also recommends steps for appropriate risk assessment and follow-up, and phototherapy when indicated.

It was recognized in the 1980s that the disruptions associated with phototherapy interfere with breastfeeding.^{5,6} When bili blankets were introduced in the early 1990s and were compared with conventional phototherapy, one of the benefits cited was the possibility of “the mother handling and nursing her infant during phototherapy,”⁷ and phototherapy at home also offered the possibility of less interference with breastfeeding.⁸ (Note that risk factors for hyperbilirubinemia include but are not limited to isoimmune hemolytic disease and glucose-6-phosphate dehydrogenase deficiency and that the AAP recommends that “home phototherapy should not be used in any infant with risk factors.”¹)

Two decades later, US hospitals’ methods for the delivery of phototherapy vary. On the basis of responses to a recent questionnaire on the Academic Pediatric Association Newborn Nursery Directors Special Interest Group list-serv, some hospitals transfer all infants

who require phototherapy to the NICU. Other hospitals treat infants in the newborn nursery in an isolette, in the mother’s room in an isolette, or in the mother’s room in an open bassinet.

Practicing rooming-in 24 hours per day is one of the steps in the World Health Organization/United Nations Children’s Fund’s “Ten Steps to Successful Breastfeeding.”⁹ The Ten Steps, and specifically rooming-in, were endorsed by the AAP and other professional organizations.^{10–12} In infants rooming-in compared with those not rooming-in, breastfeeding frequency was significantly higher, supplementation was lower, and weight gain was higher.¹³ Skin-to-skin contact (kangaroo mother care) assists with mother-infant attachment and bonding and facilitates breastfeeding. Multiple studies have shown that skin-to-skin contact provides thermoregulation to infants.^{14,15} In term infants it helps with neurobehavioral adaptation and has a beneficial effect on the neurophysiologic organization of the developing brain; kangaroo care infants spend more time in quiet sleep states and less time in fussy or crying states.¹⁵ Kangaroo care reduces morbidity and mortality, and at 6 months’ corrected age, the infants scored higher on the Bayley Mental Developmental Index.^{14,15} The AAP’s evidence-based recommendations include early skin-to-skin contact and exclusive breastfeeding; if phototherapy is required, continuous breastfeeding is recommended.

We report here on a case that reflects a common clinical scenario in newborn medicine to describe a technique we have developed for providing phototherapy while maintaining evidence-based practices in newborn care. The policy of Indiana University–Purdue University Indianapolis is that individual case reports are not reviewed by its institutional review board.

PATIENT PRESENTATION

A male infant with an estimated gestational age of 39 weeks was born to a 29-year-old gravida 1, para 1 mother via spontaneous vaginal delivery. The mother has an O blood type that is Rh positive and antibody negative. We ordered a blood type and direct Coombs test for the infant. The infant was noted to have an A blood type that was Rh and direct Coombs positive. This situation placed the infant at risk of hemolysis, including hyperbilirubinemia and anemia, so we ordered a hematocrit, a reticulocyte count, and a serum bilirubin level measurement. The hematocrit was 39%, the reticulocyte count was 11%, and serum bilirubin was 6.8 mg/dL at 8 hours of life and 11 mg/dL at 24 hours of life. The infant was started on intensive phototherapy by using both a neoBLUE LED phototherapy device (Natus Medical Inc, San Carlos, CA) on the high setting (delivers >30 uW/cm² per nm)¹⁶ and a GE Healthcare Ohmeda BiliBlanket Plus (Ohmeda Medical, Columbia, MD; delivers up to 45 uW/cm² per nm).¹⁷ The light source for the blanket is a halogen bulb, and the blanket contains 2400 optic fibers woven together. Infrared and UV filters maintain the light within the desired 400- to 550-nm range.¹⁷

The method we use at our institution is as follows: The phototherapy lights are administered in the mother’s room. The infant is placed on the mother’s ventrum. The phototherapy light is placed above the infant. To ensure the correct distance between the phototherapy light and the infant, we place a tape measure on the device (Fig 1). For our device, the correct distance for the light source is 12 inches (30.5 cm) from the infant. The light source can be adjusted both horizontally and vertically, as well as tilted over a wide range of angles. Both mother and infant wear protective eyewear (mother: Amber Lens Safety Glass [Grainger International Inc,



FIGURE 1

The infant under the phototherapy light with a bili blanket while on the mother's chest.

Lake Forest, IL]; infant: eye shield). The bili blanket is placed below the infant (Fig 1). We encourage frequent breastfeeding, review early feeding cues with the mother, and evaluate (by a trained provider, every shift) the latch and milk transfer. The subsequent serum bilirubin levels were 9 mg/dL at 36 hours and 8 mg/dL at 48 hours. Figure 2 depicts the infant without the bili blanket.

DISCUSSION

As Bergman¹⁸ has pointed out, "skin-to-skin contact is the natural 'habitat' for human infants." When separated from this contact, newborns' stress hormone levels increase, and they cry. By providing phototherapy on the mother's chest, this stress response can be avoided.

Some centers provide phototherapy in the mother's room, in an open bassinet. One of the difficulties encountered in these situations is that the infant cries and the family takes the infant out from under the lights. The family might become frustrated with the process, and



FIGURE 2

The infant under the phototherapy light and in skin-to-skin contact with the mother.

the bilirubin levels will not decrease as desired. Clinicians also may express concern that the infant will be taken out from under the lights for too long. One idea that some health care providers have is to take the infant out from under the light only for feeding. However, that approach may substantially reduce the phototherapy dose. De Carvalho et al¹⁹ found that more frequent feedings were associated with lower bilirubin levels. Eleven feedings in 24 hours resulted in the lowest bilirubin values. Infants spend a significant amount of time on the breast, and for cases of severe hyperbilirubinemia the best approach is to have them exposed to the phototherapy light continuously. If the mother is asleep, another family member (eg, father, grandparent) while seated in a chair can hold the infant in skin-to-skin contact.

The nursing staff does not continuously observe the infants. Bedside safety checks are performed every 6 hours by the nursing staff. With each check, the nurses document the various items such as "biliblanket," "bililight," "equipment settings verified," "eye patches in place/secure," and so forth.

Readers may ask about the risk that a mother or other family member might fall asleep while holding the infant. We have not had any of our nurses find a mother asleep with her infant in bed during phototherapy. Because skin-to-skin contact is encouraged for all infants in our institution, whether or not they are receiving phototherapy, the risk of a mother (or other family member) falling asleep is not limited to the infants receiving phototherapy. The AAP policy statement encourages "direct skin-to-skin contact . . . throughout the newborn period."¹⁰ Our institution (as is probably the case at many other institutions) also has a local policy that encourages skin-to-skin contact. Mothers (or fathers or other family members) are encouraged to have continuous skin-

to-skin contact with their infants when she (or the father or other family member) is not asleep. Whether or not the infant has been prescribed phototherapy, the family is instructed to place the infant in the bassinet when the adult family member who was holding the infant decides to sleep.

At our hospital, when we found that caregivers tended to take the infants out from under the lights when they were crying (often at night) and for feeding, we arranged for protective eye cover to be available for the mothers (or fathers), who can then hold the infant while under the phototherapy light. If the mother is awake, she (in her bed) holds the infant, with both she and infant wearing protective eyewear. The nurse then aims the phototherapy light over the infant. It is important to check the instruction manual of the particular phototherapy device one is using (regarding how far the baby should be placed from the light source, etc.). When appropriate, it is important to make sure that the light is on the "high" setting, if there is such a setting. With the neoBLUE there is no need for additional "banks" of light. (In the past, we had the option of 1, 2, or 3 banks of light.) When all caregivers in the room are asleep, the infant is placed in the bassinet with the light above and the blanket below.

If the infant has high bilirubin levels, we use neoBLUE on the "high" setting from above and a bili blanket placed below the infant. If the bilirubin level is lower, and the family cannot cope with the light (which is rare, because most families like the fact that they can hold the infant while he or she is receiving phototherapy), we have used 1 blanket from above and another from below the infant, or just 1 blanket. However, for infants with high bilirubin levels, bili blankets alone do not seem to work as well; it is more effective to include a light.²⁰

Our institution's phototherapy policy includes the stipulation that all clothing items, including hats, be removed from the infant, because the newborn's head has a relatively large surface area. Diapers remain on the infant. We have had no problems with temperature regulation. It is our practice to check the mother's and infant's temperatures every 6 hours. We have not had any problems with hypothermia in the infants or overheating of the mothers or infants while using this method of phototherapy delivery.

The protective glasses are light-weight and comfortable, similar to a pair of

sunglasses. The mothers (and other family members) in our institution have not minded wearing them. The purpose of the amber glasses is to shield the mother's retinas from the blue light. We could find no published scientific evidence that, if the mother were not wearing amber glasses, the short-term (a few days') exposure to phototherapy light would pose a risk. Although it has been hypothesized that blue light may be a risk factor for age-related macular degeneration, the evidence for an association has not been firmly established.²¹ The exposure that the mother might receive in the hospital is probably

a tiny fraction of her lifetime exposure. Still, out of an abundance of caution, we require that the mothers wear the protective amber glasses.

The most recent US data show a 76.9% breastfeeding initiation rate.²² The phototherapy method described here can help support evidence-based methods for large numbers of infants. Families appreciate the solution of holding the infant while under the lights (because the infant stops crying) and are happy with this approach for phototherapy. Practitioners will find this method of phototherapy delivery helpful in providing family-centered care.

REFERENCES

- American Academy of Pediatrics Subcommittee on Hyperbilirubinemia. Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. *Pediatrics*. 2004;114(1):297–316
- Maisels MJ, Bhutani VK, Bogen D, Newman TB, Stark AR, Watchko JF. Hyperbilirubinemia in the newborn infant > or =35 weeks' gestation: an update with clarifications. *Pediatrics*. 2009;124(4):1193–1198
- Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #22: guidelines for management of jaundice in the breastfeeding infant equal to or greater than 35 weeks' gestation. *Breastfeed Med*. 2010;5(2):87–93
- Newman TB, Liljestrand P, Jeremy RJ, et al; Jaundice and Infant Feeding Study Team. Outcomes among newborns with total serum bilirubin levels of 25 mg per deciliter or more. *N Engl J Med*. 2006;354(18):1889–1900
- Kemper K, Forsyth B, McCarthy P. Jaundice, terminating breast-feeding, and the vulnerable child. *Pediatrics*. 1989;84(5):773–778
- Elander G, Lindberg T. Hospital routines in infants with hyperbilirubinemia influence the duration of breast feeding. *Acta Paediatr Scand*. 1986;75(5):708–712
- Tudehope D, Crawshaw A. Fiberoptic versus conventional phototherapy for treatment of neonatal jaundice. *J Paediatr Child Health*. 1995;31(1):6–7
- James JM, Williams SD, Osborn LM. Discontinuation of breast-feeding infrequent among jaundiced neonates treated at home. *Pediatrics*. 1993;92(1):153–155
- World Health Organization/United Nations Children's Fund. Ten steps to successful breastfeeding. Available at: www.unicef.org/newsline/tensteps.htm. Accessed November 11, 2012
- Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics*. 2012;129(3). Available at: www.pediatrics.org/cgi/content/full/129/3/e827
- Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #7: model breastfeeding policy (revision 2010). *Breastfeed Med*. 2010;5:173–177
- American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women; Committee on Obstetric Practice. Special report from ACOG. Breastfeeding: maternal and infant aspects. *ACOG Clin Rev*. 2007;12(suppl 1):1S–16S
- Yamauchi Y, Yamanouchi I. The relationship between rooming-in/not rooming-in and breast-feeding variables. *Acta Paediatr Scand*. 1990;79(11):1017–1022
- Feldman R, Eidelman AI, Sirota L, Weller A. Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development. *Pediatrics*. 2002;110(1 pt 1):16–26
- Ferber SG, Makhoul IR. The effect of skin-to-skin contact (kangaroo care) shortly after birth on the neurobehavioral responses of the term newborn: a randomized, controlled trial. *Pediatrics*. 2004;113(4):858–865
- neoBLUE LED Phototherapy user manual. San Carlos, CA: Natus Medical Inc. Available at: www.natus.com. Accessed October 26, 2012
- Healthcare GE. Products and solutions, phototherapy. Available at: www.gehealthcare.com/euen/maternal-infant-care/products/phototherapy/biliblanket_plus.html. Accessed January 21, 2013
- Bergman N. Restoring the original paradigm for infant care. Available at: www.skin.kangaroomothercare.com/prevtalk01.htm. Accessed November 10, 2012
- De Carvalho M, Klaus MH, Merkatz RB. Frequency of breast-feeding and serum bilirubin concentration. *Am J Dis Child*. 1982;136(8):737–738
- Mills JF, Tudehope D. Fiberoptic phototherapy for neonatal jaundice. *Cochrane Database Syst Rev*. 2001;1(1):CD002060
- Margrain TH, Boulton M, Marshall J, Sliney DH. Do blue light filters confer protection against age-related macular degeneration? *Prog Retin Eye Res*. 2004;23(5):523–531
- Centers for Disease Control and Prevention. Breastfeeding among U.S. children born 2000-2009, CDC National Immunization Survey. Available at: www.cdc.gov/breastfeeding/data/nis_data/. Accessed November 11, 2012

Family-Centered, Evidence-Based Phototherapy Delivery

Kinga A. Szucs and Marc B. Rosenman

Pediatrics 2013;131:e1982; originally published online May 13, 2013;

DOI: 10.1542/peds.2012-3479

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/131/6/e1982.full.html
References	This article cites 16 articles, 7 of which can be accessed free at: http://pediatrics.aappublications.org/content/131/6/e1982.full.html#ref-list-1
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://pediatrics.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://pediatrics.aappublications.org/site/misc/reprints.xhtml

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2013 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

