Published in final edited form as:

Pediatrics. 2007 September ; 120(3): 527–531.

Neonatologists' Practice and Experience in Arranging Retinopathy of Prematurity Screening Services

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Abstract

BACKGROUND—Neonatologists play a central role in identifying infants who require screening for retinopathy of prematurity (ROP) and in coordinating screening and treatment when necessary. No previous study has evaluated neonatologists' practice or experience related to these activities.

METHODS—A national mail survey of a random sample of 300 neonatologists was conducted from September to November 2006.

RESULTS—The response rate was 62%. Nearly all (98%) of the respondents consider gestational age to identify infants for ROP screening. However, only 19% used the currently recommended gestational age criterion of 30 weeks; instead, 6% used a lower, more restrictive criterion, and 74% used a higher, more inclusive criterion. Fewer (77%) respondents consider birth weight to identify infants for ROP screening, most of whom (86%) use the current criterion of 1,500 grams or less. Although more than half of the respondents (67%) reported that pediatric ophthalmologists usually screen infants for ROP in their neonatal intensive care unit (NICU), nearly half (46%) reported that retinal specialists provide treatment. Some (36%) reported that they have been unable to transfer a child to a NICU of lower acuity or closer to the child's home because there are no specialists available there for ROP screening. Some (34%) also reported that they have had to delay discharge because outpatient follow-up ROP screening is not available near the family's home.

CONCLUSIONS—We found variations in how children are identified for ROP screening and how screening and treatment is provided. Future research is needed to understand how these variations affect visual outcomes and costs of care. Such work must also consider the impact of regional pediatric eye care workforce shortages on ROP screening and treatment strategies.

Keywords

retinopathy of prematurity; guideline adherence; ophthalmology; neonatology; health manpower; practice patterns

Introduction

Indirect ophthalmoscopy to screen for retinopathy of prematurity (ROP) is recommended for infants born in the United States with any of the following: birth weight of less than 1500 grams; gestational age of 30 weeks or less; or, birth weight between 1500 and 2000 grams or gestational age of more than 30 weeks and an unstable clinical course.¹ Although the birthh

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Financial Support: National Eye Institute (K23-EY14023)

Conflict of Interest: None

weight criterion has not changed, the recommendations regarding the gestational age criterion for the screening of infants for ROP has changed twice in 2006: in February 2006, the criterion was changed from 28 weeks or less to 32 weeks or less,^{2, 3} and in September 2006, a correction of the recommendations decreased the criterion to 30 weeks or less.¹ The incidence of any degree of ROP among infants with a gestational age of greater than 30 weeks has been estimated to be at least 2%.⁴

On average, neonates require from two to up to nine ROP examinations.^{5, 6} Little is known about the available eye care workforce or how care is organized for the detection and treatment of ROP. A survey conducted by the American Academy of Ophthalmology found that the number of pediatric ophthalmologists and retinal specialists that evaluate and treat ROP is decreasing, primarily due to liability concerns, poor reimbursement, and the complexity of scheduling care for children at risk for developing ROP.⁷ No national data are available regarding the degree to which infants receive recommended care for ROP or the impact of a possible shortage of specialists able and willing to screen for ROP.

Neonatologists play a central role in ensuring the timely identification of ROP. However, no data are available regarding the ROP-related activities performed by neonatologists. Although the recommendations specify the birth weight and gestational age criteria for ROP screening in the United States, the recommendations also state that “unit-specific criteria with respect to birth weight and gestational age for examination for ROP should be established for each NICU [neonatal intensive care unit] by consultation and agreement between neonatology and ophthalmology services.”³ Neonatologists are also responsible for ensuring that infants at risk for ROP are identified and receive timely examination. The guidelines recommend that neonatologists (1) ensure the availability of any needed follow-up eye care upon transfer or discharge, (2) discuss the need for these services with the accepting neonatologist or family, and (3) arrange the follow-up eye care before transfer or discharge.³ To begin to understand the delivery of care for children at risk for ROP we surveyed neonatologists about their practice and experience in arranging for ROP screening. Neonatologists serve a central role in coordinating the care for infants at risk for ROP and can provide a unique insight into the availability of eye care.

Methods

Sampling Frame

A national random sample of 300 neonatologists was drawn from the American Medical Association Masterfile, a database of all licensed physicians in the United States. The sampling frame included allopathic and osteopathic physicians in direct patient care. We excluded physicians in training and those who practice at military or federal facilities. Overall, there were 3,590 neonatologists who met our inclusion criteria.

Survey Instrument Development

We developed an instrument to assess responder and NICU demographic characteristics and practice, experience, and attitudes regarding screening infants for ROP. The instrument was pilot tested by a convenience sample of neonatologists and was revised to ensure clarity. The final instrument consisted of 21 questions which were primarily multiple-choice and Likert scales of agreement, and took fewer than 10 minutes to complete.

Survey Administration

The first survey mailing, accompanied by a cover letter, an inexpensive incentive gift, and a business reply envelope, was sent during September 2006 after publication of the 30 week

gestational age criterion. Two subsequent mailings to nonrespondents were sent at 3-week intervals.

Data Analysis

Initially, general frequency responses to all survey items were determined. After this, Pearson χ^2 tests of independence were used to test for associations among the categorical variables. All analyses were performed with Stata 8.2 software (Stata, College Station, TX). We considered $P < 0.05$ to be statistically significant. The Duke University Health System institutional review board approved this project.

Results

Response Rate and Demographic Characteristics

Of the 300 physicians in the sample, 13 did not provide direct neonatology care and 19 had undeliverable addresses. The response rate was 62% (166 eligible surveys).

Respondent and NICU demographic characteristics are listed in Table 1. Small NICUs (<26 beds) were less likely to be in urban compared to suburban areas (17% vs. 38%; $P < 0.01$). Compared to small NICUs, large (>60 beds) and medium-sized (26-60 beds) NICUs were more likely to be affiliated with residency or fellowship training programs (77% and 63% versus 30%; $P < 0.001$).

Criteria for ROP Screening

Nearly all respondents (98%, $n=162$) reported that gestational age is used to identify whether an infant should be screened for ROP. Of these, 22% did not consider birth weight to be a criterion to identify whether an infant should be screened for ROP. The median gestational age for ROP screening was 32 weeks or less, with a range of 28 to 35 weeks or less. Overall, 19% used the currently recommended gestational age criterion of 30 weeks, 6% used a lower, more restrictive criterion, and 74% used a higher, more inclusive criterion.

Most respondents (77%, $n=128$) reported that birth weight is used as a criterion to identify whether an infant should be screened for ROP. Only one respondent (<1%) considered birth weight but not gestational age as a criterion to identify children for ROP screening. The median birth weight for ROP screening was 1,500 grams or less, with a range of 1,000 to 2,500 grams or less. Overall, 86% used the recommended criterion of 1,500 grams, 5% used a lower, more restrictive criterion, and 9% used a higher, more inclusive criterion.

Many respondents (61%, $n=101$) used clinical course to identify children who are at risk of developing ROP. Only one respondent reported using clinical course but neither gestational age nor birth weight to identify children who require screening for ROP.

Many respondents (64%, $n=106$) reported that they have unit-specific written guidelines to track which infants need ROP screening. Use of written guidelines was not associated with the likelihood of using the recommended criteria for gestational age or birth weight ($P > 0.18$).

ROP Screening and Treatment

More than half of the respondents (67%) reported that within their NICUs pediatric ophthalmologists usually screen children for ROP. However, some also reported that retinal specialists, either alone (18%) or with pediatric ophthalmologists (4%), provide screening for ROP. Some (10%) also reported that general ophthalmologists provide the screening. One respondent reported that ophthalmology fellows screen infants for ROP.

In contrast, nearly half of the respondents (46%) reported that in their NICUs retinal specialists provide treatment for ROP in their main NICU practice setting. Other respondents reported that pediatric ophthalmologists, either alone (38%) or with retinal specialists (9%), provided treatment. Each of the following was reported as providing treatment by only one respondent each: general ophthalmologists, general ophthalmologist and retinal specialist, and ophthalmology fellows. Few respondents (4%) reported that children were transferred to another setting for ROP treatment. No difference was found between NICUs that train resident or fellow physicians in the likelihood of having a pediatric ophthalmologist providing screening or treatment ($P>0.36$).

Adequacy of Services and Barriers to Care

Although some (29%) of the respondents agreed that some children in their state develop ROP-related visual impairment which could have been prevented by timely screening, nearly all (98%) agreed that children within their NICU receive timely ROP screening. Nearly all respondents (99%) reported that ROP screening was rarely (42%) or never (57%) delayed for children born in their NICU by at least one week because the need for screening was not identified. Similarly, nearly all respondents (95%) reported that ROP screening was rarely (43%) or never (52%) delayed by at least one week among children transferred into their NICU because the need was not identified.

Table 2 presents the degree to which respondents considered each of the listed barriers to affect ROP screening in their experience. The most commonly reported major barrier was the lack of available eye care specialists. The degree to which this was considered to be a barrier did not vary by urban/suburban/rural setting ($P=0.20$), number of beds ($P=0.43$) or whether their NICU trains resident or fellow physicians ($P=0.13$). The most commonly reported barrier overall was the perception that families do not follow-up for scheduled ROP screening exams after discharge. The degree to which neonatologists endorsed this barrier did not vary by setting ($p=0.29$), size ($p=0.54$), or whether their NICU trains physicians ($p=0.89$).

Some respondents reported that they are usually (10%) or sometimes (26%) unable to transfer a child to a lower acuity NICU or one closer to the child's home because there are no specialists available there for ROP screening. Some also reported that they usually (7%) or sometimes (27%) delay discharge by more than one day because outpatient follow-up ROP screening is not available near the family's home. The proportion reporting these delays did not vary by urban/suburban/rural setting ($P>0.47$), size ($P>0.47$), or whether their NICU trains physicians ($P>0.15$).

Discussion

We found that many neonatologists use a more inclusive gestational age criterion for identifying children for ROP screening than is currently recommended. This may reflect the lag time between the correction of the guidelines and modification of clinical practice. It may also represent a more conservative approach in order to avoid missing infants who may develop sight-threatening ROP. However, our finding that some neonatologists do not consider birth weight as a separate criterion and the variability of the birth weight criterion among those who do consider birth weight suggests that there are important variations in how children are identified for ROP screening. While under-referral could lead to missed cases of severe ROP and blindness, over-referral could exacerbate any workforce shortage and crowd out those children at higher risk for the development of ROP.

Although nearly all neonatologists reported that infants in their NICUs receive timely ROP screening, some reported that some infants within their state have developed potentially preventable visual impairment because they did not receive timely screening. We believe that

this emphasizes the need for quality improvement activities to ensure that all infants receive timely ROP examinations, both before and, when necessary, after discharge. However, quality improvement activities that extend beyond admission are challenging and may be expensive to coordinate. Furthermore, it is unclear who should have primary responsibility for such activities.

Half of the respondents reported that lack of available eye care specialists is at least a minor barrier. It is noteworthy that many eye care specialists other than pediatric ophthalmologists provide screening for ROP. No data are available regarding the training or experience of other providers, including retinal specialists, in the care of ROP or even the level of interobserver agreement of examination results with pediatric ophthalmologists. Variations in care might lead to important differences in visual outcomes and cost. Gathering evidence related to differences in threshold for diagnosis or treatment is difficult, however, because it is not feasible to have any individual neonate undergo repeated examinations by multiple different provider types.

Nearly all of the neonatologists in this study were concerned about lack of follow-up for ROP screening exams after discharge. Small studies have described how transfer to another neonatal intensive care unit (NICU) or hospital discharge are particularly risky times for missed eye care, most likely because the need for eye care follow-up is not communicated, appointments are not scheduled, or parents do not follow-up.⁸⁻¹⁰ We believe that this is a good first step for developing interventions to assure appropriate follow-up care.

The true impact of differences in NICU screening criteria or the impact of the reported barriers to care is unknown. Although almost all of the respondents believed that patients received timely ROP screening in their NICU, some believed that children in their state may have developed preventable visual impairment because of delayed care. We did find evidence that eye care workforce shortages negatively affect health care utilization by delaying transfer to other NICUs or discharge to home.

An important limitation of this study is that we surveyed neonatologists shortly after the recommendations were changed from including those infants with a gestational age of 32 weeks and less to 30 weeks and less. Practice patterns may change as neonatologists and ophthalmologists become more familiar with the guidelines. We believe that future research is needed to understand how care is provided at the child level and the relationship of such care to health outcomes and cost. Such data will be necessary to develop systems and ensure appropriate resources, including an adequate number of appropriately-trained pediatric eye care specialists, to efficiently and effectively identify and treat ROP.

Abbreviations

NICU, (neonatal intensive care unit); ROP, (retinopathy of prematurity).

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Table 1
Respondent and NICU Demographic Characteristics

	% (n) [*]
Respondent neonatal-perinatal medicine qualification	
Board certified	95% (157)
Board eligible	4% (6)
Neither board certified or eligible	1% (2)
Respondent is NICU medical director	31% (51)
NICU is a training site for resident or fellow physicians	58% (97)
NICU size	
More than 60 beds	20% (34)
26 to 60 beds	54% (90)
Fewer than 26 beds	24% (40)
Missing	1% (2)
NICU Setting	
Urban	65% (107)
Suburban	30% (49)
Rural	6% (10)

^{*} Categories may not add to 100% due to rounding.

Table 2

Degree to which respondents report the listed barriers as affecting ROP screening*

	Major Barrier	Minor Barrier	Not a Barrier
Lack of available eye care specialists	26%	27%	47%
Difficulty in tracking which children in the NICU need to be examined	5%	18%	77%
Inability to ensure children receive screening after transfer to another NICU	11%	43%	45%
Difficulty in arranging screening for children who are discharged to home	11%	48%	42%
Families do not follow-up for scheduled ROP screening exams after discharge	21%	62%	18%

* Rows may not add to 100% due to rounding.