

# The Use of Oxygen in the Delivery Room

Roger F. Soll, MD

We hope to base our practice on the best evidence available. The International Liaison Committee on Resuscitation (ILCOR) is committed to a transparent process that allows its guideline developers as well as the subsequent guideline users to understand how the evidence base was created and how the evidence is valued.

In 2015, the ILCOR adopted a process that would enable a near continuous review of resuscitation science by evaluating high-priority population, intervention, comparator, and outcome (PICO) questions.<sup>1</sup> The process is ambitious. Knowledge synthesis units with expertise in searching scientific databases and performing systematic reviews and meta-analysis address broad PICO questions (questions that may be large and complicated or topics covering several PICO questions that can be grouped together and explored by using sensitivity or subgroup analyses). Potentially, such a systematic review will lead to a meta-analysis and a broader understanding of the available evidence.

Importantly, the ILCOR has endorsed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.<sup>2,3</sup> By using GRADE, the quality of the evidence supporting the effect of an intervention on a specific outcome of interest is rated. Randomized controlled trials (RCTs) start as high-quality evidence, and observational studies start as low-quality evidence. Five factors may lead to downgrading the quality of the evidence. For RCTs, the 5 critical domains that could

downgrade the evidence are the risk of bias, imprecision, generalizability, inconsistency, and publication bias.

Two examples of this process related to neonatal interventions are reported in this issue of *Pediatrics*.<sup>4,5</sup> A general PICO question was created, leading to 2 separate systematic reviews of initial oxygen use in the resuscitation of preterm and term infants. A detailed, complete, and methodologically sound analysis is presented. In term infants, the authors report on 10 studies (5 RCTs and 5 quasi RCTs). For term infants, the initial use of room air compared with 100% oxygen in resuscitation was associated with a benefit in short-term mortality (typical relative risk: 0.73; 95% confidence interval [CI]: 0.57–0.94; 7 studies [1469 infants]). Hypoxic-ischemic encephalopathy was not reduced in this analysis (typical relative risk: 0.89; 95% CI: 0.68–1.18; 5 studies [1315 infants]). Fewer studies reported on developmental follow-up, and no differences were noted (typical relative risk: 1.41; 95% CI: 0.77–2.60; 2 studies [360 infants]).

For preterm infants, the results are less clear. The authors identified 10 RCTs and 4 observational studies. There were no statistically significant benefits or harms from starting with a lower compared with a higher fraction of inspired oxygen. No difference in the risk of short-term mortality is reported (typical relative risk: 0.83; 95% CI: 0.50–1.37; 10 studies [968 infants]).

Importantly, the authors report on the GRADE assessment of the quality of the evidence. The terminology for GRADE recommendations has evolved

Larner College of Medicine, University of Vermont,  
Burlington, Vermont

Opinions expressed in these commentaries are those of the author and not necessarily those of the American Academy of Pediatrics or its Committees.

**DOI:** <https://doi.org/10.1542/peds.2018-3365>

Accepted for publication Oct 22, 2018

Address correspondence to Roger F. Soll, MD, Neonatal-Perinatal Medicine Division, University of Vermont Medical Center, Smith 551, 111 Colchester Ave, Burlington, VT 05401. E-mail: [roger.soll@uvmhealth.org](mailto:roger.soll@uvmhealth.org)

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

Copyright © 2019 by the American Academy of Pediatrics

**FINANCIAL DISCLOSURE:** The author has indicated he has no financial relationships relevant to this article to disclose.

**FUNDING:** No external funding.

**POTENTIAL CONFLICT OF INTEREST:** Dr Soll is the president of Vermont Oxford Network and the coordinating editor of *Cochrane Neonatal*.

**COMPANION PAPER:** Companions to this article can be found online at [www.pediatrics.org/cgi/doi/10.1542/peds.2018-1825](http://www.pediatrics.org/cgi/doi/10.1542/peds.2018-1825) and [www.pediatrics.org/cgi/doi/10.1542/peds.2018-1828](http://www.pediatrics.org/cgi/doi/10.1542/peds.2018-1828).

**To cite:** Soll RF. The Use of Oxygen in the Delivery Room. *Pediatrics*. 2019;143(1):e20183365

in recent years. Originally, terms such as “low-quality evidence” or “high-quality evidence” were used in GRADE. More recently, the term “certainty of evidence” has become the preferred term.<sup>6</sup> When seen in this light, the next steps of creating recommendations on the basis of this evidence become more problematic. Marginal effects or no effects are noted from the intervention. In addition, the estimates are imprecise, and the inherent bias of trials that are difficult to blind comes into play. In both analyses, short-term outcomes, such as mortality, are judged as low certainty, and longer-term neurodevelopmental outcomes are judged as very low certainty. Even if one had faith in the evidence, how we would apply the intervention? What are the targets? How long should we take to achieve the desired target?

That is why the next steps are so hard. Guideline developers must not only grapple with the quality or certainty of the evidence but also account for individual and societal values and preferences, resource implications, and feasibility.<sup>7</sup>

As these reviews move toward recommendations, the fact is that we will begin our resuscitation with some oxygen (as low as 21% or as

high as 100%). Ultimately, a decision will have to be made regarding how much oxygen with which we start. Yet, given the paucity of evidence, the single greatest point we can take from these analyses is that we are uncertain. Although we must act, our obligation is not simply to conduct the well-thought-out recommendations that will evolve from this process but to acknowledge the huge gaps in knowledge that exist and commit to further research on the subject.

#### ABBREVIATIONS

CI: confidence interval

GRADE: Grading of  
Recommendations  
Assessment,  
Development and  
Evaluation

ILCOR: International Liaison  
Committee on  
Resuscitation

PICO: population, intervention,  
comparator, and outcome

RCT: randomized controlled trial

#### REFERENCES

1. Nolan JP, Hazinski MF, Aicken R, et al. Part 1: executive summary: 2015

international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation*. 2015;95:e1–e31

2. Guyatt GH, Oxman AD, Vist GE, et al; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336(7650):924–926
3. Guyatt GH, Oxman AD, Kunz R, Vist GE, Falck-Ytter Y, Schünemann HJ; GRADE Working Group. What is “quality of evidence” and why is it important to clinicians? *BMJ*. 2008;336(7651):995–998
4. Welsford M, Nishiyama C, Shortt C, et al. Room air for initiating term newborn resuscitation: a systematic review with meta-analysis. *Pediatrics*. 2019;143(1):e20181825
5. Welsford M, Nishiyama C, Shortt C, et al. Initial oxygen use for preterm newborn resuscitation: a systematic review with meta-analysis. *Pediatrics*. 2019;143(1):e20181828
6. Hultcrantz M, Rind D, Akl EA, et al. The GRADE Working Group clarifies the construct of certainty of evidence. *J Clin Epidemiol*. 2017;87:4–13
7. Guyatt GH, Oxman AD, Kunz R, et al; GRADE Working Group. Going from evidence to recommendations. *BMJ*. 2008;336(7652):1049–1051

## The Use of Oxygen in the Delivery Room

Roger F. Soll

*Pediatrics* 2019;143;

DOI: 10.1542/peds.2018-3365 originally published online December 21, 2018;

### Updated Information & Services

including high resolution figures, can be found at:  
<http://pediatrics.aappublications.org/content/143/1/e20183365>

### References

This article cites 7 articles, 5 of which you can access for free at:  
<http://pediatrics.aappublications.org/content/143/1/e20183365#BIBL>

### Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):  
**Fetus/Newborn Infant**  
[http://www.aappublications.org/cgi/collection/fetus:newborn\\_infant\\_sub](http://www.aappublications.org/cgi/collection/fetus:newborn_infant_sub)  
**Neonatology**  
[http://www.aappublications.org/cgi/collection/neonatology\\_sub](http://www.aappublications.org/cgi/collection/neonatology_sub)

### Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:  
<http://www.aappublications.org/site/misc/Permissions.xhtml>

### Reprints

Information about ordering reprints can be found online:  
<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **The Use of Oxygen in the Delivery Room**

Roger F. Soll

*Pediatrics* 2019;143;

DOI: 10.1542/peds.2018-3365 originally published online December 21, 2018;

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/143/1/e20183365>

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 © 2019 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

