2024 VON Grand Rounds Date: 05/15/2024

Planners: Roger Soll MD; Denise Zayack RN, MPH

Speaker(s): Roger Soll MD, Danielle Ehret MD, Elizabeth Foglia MD; Erika Edwards PhD

Purpose Statement/Goal of this Activity: The 2024 VON Grand Rounds webinar series will provide evidence reviews, a summary of the current practice guidelines, a synthesis of the application of evidence in real work practice settings and will be supported by discussion and question and answer opportunities with expert faculty

The following have relevant financial relationships with ineligible companies (all have been mitigated):
All other speakers/planners/CMIE reviewers do not have ay relevant financial relationships.

This activity did not receive any support for ineligible companies (grants or in-kind).

All recommendations involving clinical medicine made during this talk were based on evidence that is accepted within the profession of medicine as adequate justification for their indication and contradictions in the care of patients.

In support of improving patient care, this activity ahs been planned and implemented by The Robert Larner College of Medicine at the University of Vermont and Vermont Oxford Network. The University of Vermont is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialling Center (ANCC), to provide continuing education for the healthcare team.

The University of Vermont designates this live activity for a maximum of 1.0 *AMA PRA Category 1 Credit(s)*™. Physicians should claim only the credit commensurate with the extend of their participation in the activity.

This program has been reviewed and is acceptable for up to 1.0 Nursing Contact Hours.

This activity was planned by and for the healthcare team, and learners will receive 1 Interprofessional Continuing Education (IPCE) credit for learning and change.

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VON Grand Rounds

Evidence to Practice: Management of oxygen in preterm infants

May 15th, 2024

VON Vermont Oxford NETWORK

2

VON Vermont Oxford NETWORK

Moderators

Roger F. Soll, MD
H. Wallace Professor of Neonatology, University of Vermont
Coordinating Editor, Cochrane Neonatal
Director, VON Institute for Evidence Based Practice, Vermont Oxford Network

Danielle Ehret, MD, MPH
Asfaw Yemiru Green and Gold Professor, University of Vermont
Chief Medical Officer, Director, Global Health, Vermont Oxford Network

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VON Vermont Oxford NETWORK

Discussants

Elizabeth Foglia, MD, MA, MSCE
Associate Professor of Pediatrics
Perelman School of Medicine at the University of Pennsylvania

Erika Edwards PhD
Research Associate Professor
University of Vermont
Chief Scientific Officer,
Vermont Oxford Network

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Evidence to Practice: Management of oxygen in preterm infants

Disclosures

Danielle Ehret MD, MPH is the Director of Global Health and Chief Medical Officer at Vermont Oxford Network (VON) and receives salary support to UVM for non-clinical time dedicated to her leadership roles.

Elizabeth Foglia, MD, MSCE has received consulting fees from Chiesi USA who have also funded a grant to her institution. She is a member of the International Liason Committee on Resuscitation (ILCOR) Neonatal Life Support Task Force and also the NRP Steering Committee. Previously, Dr. Foglia has consulted with Medtronic.

Erika Edwards, PhD is the Chief Scientific Officer at VON.

Roger F. Soll, MD is the H. Wallace Professor of Neonatology at the Larner College of Medicine at the University of Vermont, Vice President of the Vermont Oxford Network, Director of the VON Institute for Evidence Based Practice, and Coordinating Editor of Cochrane Neonatal. He is a consultant with the International Liaison Committee on Resuscitation (ILCOR).

No other relevant financial issues to disclose

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How to Participate in Today's Webinar

- Chat questions and comments to "Everyone" during the presentations and discussion.
- Respond to Zoom poll questions posed during the session. Select your answer(s) and click "Submit". Please do not respond to polls via Chat.

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Poll Question

Guidelines

Do you have written guidelines that address the initiation of oxygen in delivery room resuscitation: (check all that apply)

1. Yes, in term infants
2. Yes, in preterm infants
3. No, we do not have written guidelines for initiation of oxygen in neonatal resuscitation

Select your answer(s) and click "Submit"

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Evidence to Practice: Management of oxygen in the delivery room

Roger F. Soll, MD
H. Wallace Professor of Neonatology, University of Vermont
Coordinating Editor, Cochrane Neonatal
Director, VON Institute for Evidence Based Practice, Vermont Oxford Network

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Evidence to Practice: Management of oxygen in the delivery room

Evidence synthesis for informed decisions and better health including management of oxygen in delivery room resuscitation including:

1. Management of term infants
2. Management of preterm infants
3. What are our goals?

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Evidence to Practice: Management of oxygen in the delivery room

Oxygen was introduced in newborn care over 200 years ago.

In 1777, Dr. Chaussier developed a device for the use of oxygen in neonatal resuscitation and made oxygen the first drug to be used specifically in neonates.

Within a few years, oxygen was widely used in neonatal resuscitation throughout Europe….

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After centuries of use, we needed to give this practice more thought…

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Evidence to Practice: Management of oxygen in preterm infants

Ola Saugstad

Saugstad demonstrated that hypoxanthine, a purine metabolite, accumulates during hypoxia.

Introducing oxygen in the aftermath of hypoxia could lead to an explosive generation of oxygen-free radicals.

These studies represent the basis for understanding the hypoxia–reoxygenation or ischemia-reperfusion injury that has puzzled medicine far beyond neonatology.

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So….
What do we **know** from trials regarding delivery room management of oxygen in term and preterm infants

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Administration of Oxygen in Term Infants

2005 (Old): Supplementary oxygen is recommended whenever positive-pressure ventilation is indicated for resuscitation: free flow oxygen should be administered to infants who are breathing but have central cyanosis. The standard approach to resuscitation is to use 100% oxygen

2010 (Updated): Since 2010, these recommendations have shifted…

Why: There is growing experimental evidence, as well as evidence from studies of babies receiving resuscitation, that adverse outcomes may result from even brief exposure to excessive oxygen during and following resuscitation.

https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/part-13-neonatal-resuscitation/

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American Academy of Pediatrics

Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis.

Welsford M, Nishiyama C, Shortt C, Isayama T, Dawson JA, Weiner G, Roehr CC, Wyckoff MH, Rabi Y; International Liaison Committee on Resuscitation Neonatal Life Support Task Force.

Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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American Academy of Pediatrics

Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Objective: This systematic review and meta-analysis provides the scientific summary of initial FiO_2 in term and late preterm newborns (≥ 35 weeks' gestation) who receive respiratory support at birth.

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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Room Air vs. 100% Oxygen for Delivery Room Stabilization of Term Neonates

Study	Methods	N	Inclusion criteria
Ramji (1993)	quasi-random	84	Birth weight > 999 grams with apnea, HR < 80 bpm, or both
Saugstad (1998)	quasi-random	609	Birth weight 999 grams, apnea or gasping, HR <80 bpm, or both
Vento (2001)	random	40	Term infants with hypotonia, unresponsive to stimuli and HR < 80 bpm, or both
Vento (2003)	random	151	Term infants with apnea, hypotonia, unresponsive to stimuli, HR < 80 bpm, and pH <7.05. Birth weight > 999 grams
Ramji (2003)	quasi-random	431	Birth weight > 1000 grams, HR < 100 bpm, apneic, or both, and unresponsive to stimulation.
Bajaj (2005)	quasi-random	204	Birth weight 1000 grams or more with apnea or gasping respiration and/or heart rate less than 100 beats/min requiring positive pressure ventilation after initial steps of resuscitation
Vento (2005)	random	39	Severely asphyxiated term neonates. Severe asphyxia was defined as pale color, presence of bradycardia (< 80 beats/min), nonresponsive to stimuli, a cord pH of 7.0 or less at birth, and an Apgar score of 5 or less for more than 5 min.
Toma (2006)	random	54	Term infants with HR < 100 bpm, apnea
Toma (2006)	random	44	GA ≥ 34 weeks with HR < 100 bpm, apnea
Toma (2007)	random	56	Term infants with HR < 100 bpm, apnea

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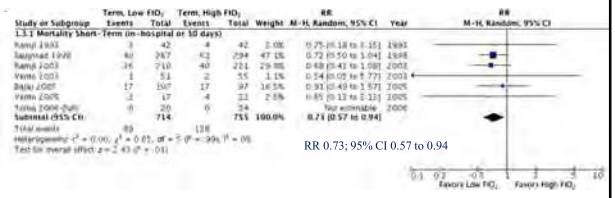
Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Term newborns receiving respiratory support comparing FiO_2 0.21 with 1.0
Short-term mortality (in-hospital or up to 30 days)



Benefit in short-term mortality compared with 100% oxygen (7 RCTs; n = 1469); risk ratio [RR] = 0.73; 95% confidence interval [CI]: 0.57 to 0.94.

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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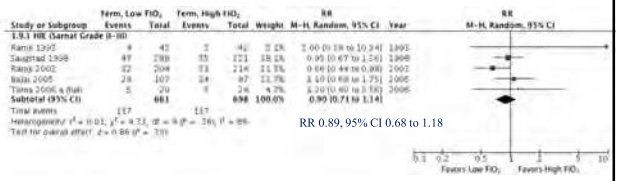
American Academy of Pediatrics

Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Term newborns receiving respiratory support comparing FiO_2 0.21 with 1.0
HIE (Sarnat Stage II–III)



No significant differences were observed in hypoxic-ischemic encephalopathy (5 RCTs; n = 1315); RR = 0.89; 95% CI: 0.68 to 1.18

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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American Academy of Pediatrics

Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Conclusions: Room air has a 27% relative reduction in short-term mortality compared with FiO_2 1.0 for initiating neonatal resuscitation ≥ 35 weeks' gestation.

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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Circulation

Oxygen for Term Resuscitation

Treatment Recommendations

Treatment recommendation (below) is unchanged from 2019.

For newborn infants at 35 weeks' or greater gestation receiving respiratory support at birth, we suggest starting with 21% oxygen (air) (weak recommendation, low certainty of evidence).

We recommend against starting with 100% oxygen (strong recommendation, low certainty of evidence).

Wyckoff and colleagues. Neonatal Life Support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2020;142:S185–S221. https://doi.org/10.1161/CIR.0000000000000895

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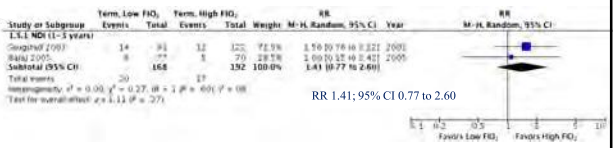
Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis

Term newborns receiving respiratory support comparing FiO_2 0.21 with 1.0
Long-term NDI (1–3 years)



No significant differences were observed in neurodevelopmental impairment (2 RCTs; n = 360); RR = 1.41; 95% CI: 0.77 to 2.60)

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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Initial Oxygen Use for Preterm Newborn Resuscitation:
A Systematic Review With Meta-analysis.

Outcome	Studies	Infants	RR and RD (95% CI)	
• Short-term mortality	7 studies	1469 infants	RR 0.73 (0.57 to 0.94) RD −4.6 (−7.3 to −1.0)	↓
• Hypoxic Ischemic Encephalopathy	5 studies	1359 infants	RR 0.90 (0.71 to 1.14) RD −2.0 (−5.7 to 2.7)	
• NDI long-term	2 studies	360 infants	RR 1.41 (0.77 to 2.60) RD 3.6 (−2.0 to 4.2)	?

GRADE Certainty of Evidence low to very low

Welsford and colleagues. Room Air for Initiating Term Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019 Jan;143(1):e20181825. doi: 10.1542/peds.2018-1825.

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Oxygen in the Delivery Room: Evidence in Term Infants

We lack real evidence that room air resuscitation is safe for term infants….

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Seminars in FETAL & NEONATAL

Optimizing oxygen therapy for preterm infants at birth: Are we there yet?

Kapadia V, Oei JL.

Semin Fetal Neonatal Med. 2020 Apr;25(2):101081. doi: 10.1016/j.siny.2020.101081.

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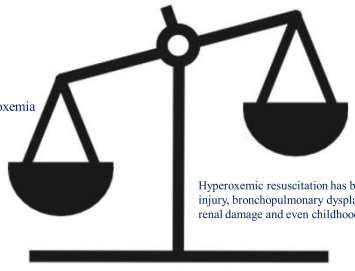
A delicate balance!

Too much oxygen, hyperoxemia and resultant oxygen toxicity

Too little oxygen, hypoxemia



Hyperoxemic resuscitation has been linked with lung injury, bronchopulmonary dysplasia, cardiac damage, renal damage and even childhood cancer.

Leading to tissue injury, organ damage and adverse clinical outcomes including increased mortality

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American Academy of Pediatrics

Preterm resuscitation with low oxygen causes less oxidative stress, inflammation, and chronic lung disease.

Vento M, Moro M, Escrig R, Arruza L, Villar G, Izquierdo I, Roberts LJ 2nd, Arduini A, Escobar JJ, Sastre J, Asensi MA.

Pediatrics. 2009 Sep;124(3):e439-49. doi: 10.1542/peds.2009-0434. PMID: 19661049

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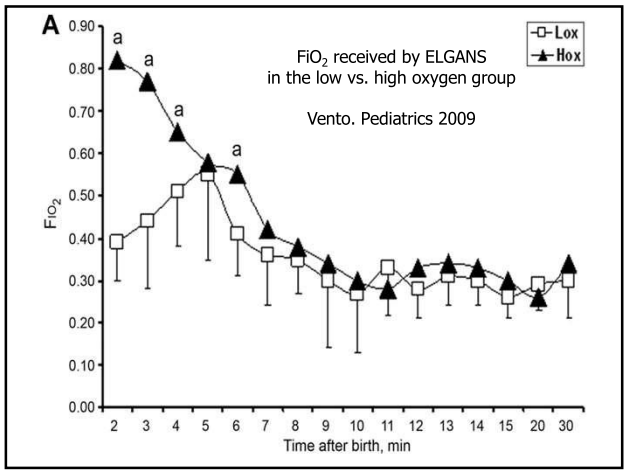

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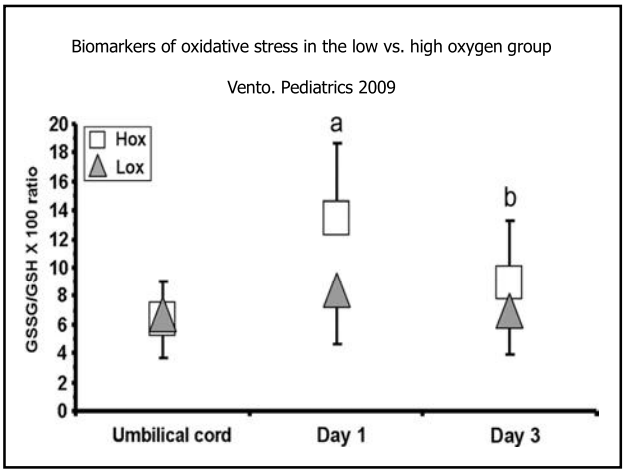

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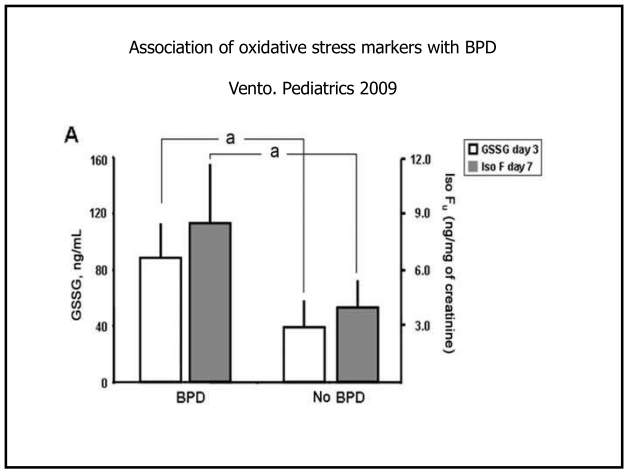

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Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis

Welsford M, Nishiyama C, Shortt C, Weiner G, Roehr CC, Isayama T, Dawson JA, Wyckoff MH, Rabi Y; International Liaison Committee on Resuscitation Neonatal Life Support Task Force.

Pediatrics. 2019 Jan;143(1):e20181828. doi: 10.1542/peds.2018-1828.

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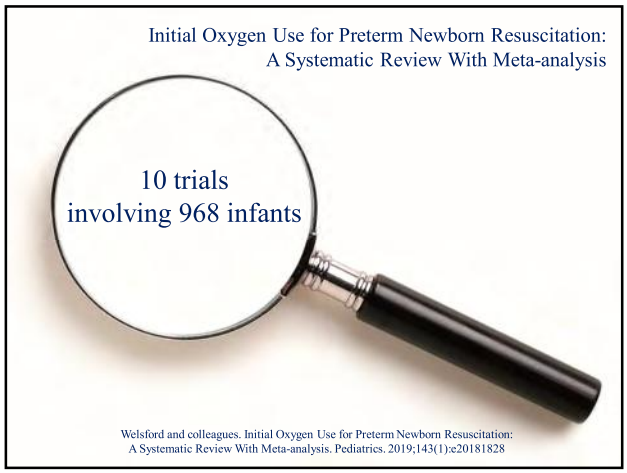

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American Academy of Pediatrics

Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis.

Objectives: This systematic review and meta-analysis provides the scientific summary of initial FiO_2 in preterm newborns (< 35 weeks' gestation) who receive respiratory support at birth.

Welsford and colleagues. Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019;143(1):e20181828

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Initial Oxygen Use for Preterm Newborn Resuscitation

Study	Methods	N	Intervention	Oxygen saturation target (SpO_2)
Lundstrøm 1995	random	70	low 21% vs high 80%	N/A
Harling 2005	random	52	low 50% vs high 100%	N/A
Wang 2008	random	41	low 21% vs high 100%	SpO_2 80%–85% at 5 minutes, maintain after 7 minutes
Vento 2009	random	78	low 30 % vs high 90%	Titrated to attain oxygen saturation
Rabi 2011	random	106	low 21% vs high 100%	SpO_2 85%–92%
Armanian 2012	random	32	low 30% vs high 100%	Titrated to HR >100 beats per minute and oxygen saturation SpO_2 >85%
Kapadia 2013	random	88	low 21% vs high 100%	SpO_2 88%–94%
Aguar 2013	random	60	low 30% vs high 60%	SpO_2 88%–94% at 10 minutes after birth
Rook 2014	random	193	low 30% vs high 65%	SpO_2 88%–94% at 10 minutes after birth
Oei 2017 (To2rpido)	random	287	low 21% vs high 100%	SpO_2 80%–95% at 5–10 minutes

Welsford and colleagues. Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019;143(1):e20181828

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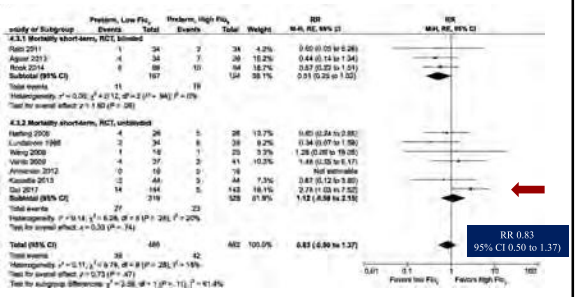
Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis.

Effect on short term mortality



Welsford and colleagues. Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019;143(1):e20181828

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Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis.

Outcome	Studies	Infants	Relative risk and 95% CI
• Short-term mortality	10 studies	968 infants	RR 0.83 (0.50 to 1.37)
• Long-term mortality	3 studies	491 infants	RR 1.05 (0.32 to 3.39)
• ROP	7 studies	806 infants	RR 0.73 (0.42 to 1.27)
• NEC	8 studies	847 infants	RR 1.34 (0.63 to 2.84)
• BPD	8 studies	843 infants	RR 1.00 (0.71 to 1.40)
• Major IVH (grade III or IV)	7 studies	795 infants	RR 0.96 (0.61 to 1.51)
• NDI long-term	3 studies	389 infants	RR 1.14 (0.78 to 1.67)

GRADE Certainty of Evidence very low

Welsford and colleagues. Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019;143(1):e20181828

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Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis.

Limitations: The Grading of Recommendations Assessment, Development and Evaluation certainty of evidence was very low for all outcomes due to RoB, inconsistency, and imprecision.

Conclusions: The ideal initial FiO_2 for preterm newborns is still unknown, although the majority of newborns ≤ 32 weeks' gestation will require oxygen supplementation.

Welsford and colleagues. Initial Oxygen Use for Preterm Newborn Resuscitation: A Systematic Review With Meta-analysis. Pediatrics. 2019;143(1):e20181828

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Circulation

Oxygen for Preterm Resuscitation (NLS 864: 2019 CoSTR) S201

Treatment Recommendations

For preterm newborn infants (less than 35 weeks' gestation) who receive respiratory support at birth, we suggest starting with a lower oxygen concentration (21% to 30%) rather than higher initial oxygen concentration (60% to 100%) (weak recommendation, very low-certainty evidence).

We suggest the range of 21% to 30% oxygen because all trials used this for the low oxygen concentration group.

Subsequent titration of oxygen concentration using pulse oximetry is advised (weak recommendation, very low-certainty

Wyckoff and colleagues. Neonatal Life Support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2020;142:S185–S221. https://doi.org/10.1161/CIR.0000000000000895

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What is current practice regarding the use of oxygen in resuscitation of preterm infants?

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ACTA PÆDIATRICA
NURTURING THE CHILD

A review of international clinical practice guidelines for the use of oxygen in the delivery room resuscitation of preterm infants.

Wilson A, Vento M, Shah PS, Saugstad O, Finer N, Rich W, Morton RL, Rabi Y, Tarnow-Mordi W, Suzuki K, Wright IM, Oei JL.

Acta Paediatr. 2018 Jan;107(1):20-27. doi: 10.1111/apa.14012.

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A review of international clinical practice guidelines for the use of oxygen in the delivery room resuscitation of preterm infants

Aim: To collate and assess international clinical practice guidelines (CPG) to determine current recommendations guiding oxygen management for respiratory stabilization of preterm infants at delivery.

Results: A total of 45 CPGs were identified.

36 provided gestation specific recommendations (< 28 to < 37 weeks) while eight distinguished only between 'preterm' and 'term'.

The most frequently recommended initial FiO2 were between 0.21 and 0.30 (n = 17). Most countries suggested altering FiO_2 to meet SpO_2 targets recommended by expert committees, However, specific five-minute SpO_2 targets differed by up to 20% (70-90%) between guidelines. Five countries did not specify SpO_2 targets.

Conclusion: CPG recommendations for delivery room oxygen management of preterm infants vary greatly, particularly in regard to gestational ages, initial FiO_2 and SpO_2 targets and most acknowledge the lack of evidence behind these recommendations.

Wilson and colleagues. A review of international clinical practice guidelines for the use of oxygen in the delivery room resuscitation of preterm infants. Acta Paediatr. 2018 Jan;107(1):20-27. doi: 10.1111/apa.14012.

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Contents lists available at ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resuscitation
ELSEVIER
EUROPEAN RESUSCITATION COUNCIL

Outcome of preterm infants following the introduction of room air resuscitation

Rabi Y, Lodha A, Soraisham A, Singhal N, Barrington K, Shah PS.
Resuscitation 2015; 96: 252-59

- ✓ In 2006 most NICUs in Canada introduced room air resuscitation for babies at term and changed their practice for preterm babies – previously 100% O2, to either starting in 21% or at some intermediate concentration i.e. 40%.
- ✓ Reviewed CNN database for babies between 23 and 27 weeks gestation,
- ✓ Evaluated occurrence of death or a severe brain injury (grade 3 or 4 IVH or PVL), for the 2 years up to their change in practice, and for 2 years after following 1 year washout

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Contents lists available at ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resuscitation
ELSEVIER
EUROPEAN RESUSCITATION COUNCIL

Outcome of preterm infants following the introduction of room air resuscitation

Canadian evidence raises concerns about lower initial FiO2 in preterm infants.

- Cohort of 2,326 infants ≤ 27 weeks gestation in 17 NICUs in 2004-2009.
- Initial FiO_2 was reduced in 2006 from 100% to 21-40%.
- Mean SNAP illness severity score decreased from 17 to 14 (P<0.01).
- Death or severe neurologic injury ***increased*** – **AOR 1.36 (1.11 to 1.66).**

Resuscitation 2015; 96: 252-59

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American Academy of Pediatrics

Defining the reference range for oxygen saturation for infants after birth.

Dawson JA, Kamlin CO, Vento M, Wong C, Cole TJ, Donath SM, Davis PG, Morley CJ.

Pediatrics. (2010) 125:e1340–7. 10.1542/peds.2009-1510

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American Academy of Pediatrics

Defining the reference range for oxygen saturation for infants after birth

Objective: The goal was to define reference ranges for pulse oxygen saturation (SpO_2) values in the first 10 minutes after birth for infants who received no medical intervention in the delivery room.

Methods: Infants were eligible if a member of the research team was available to record SpO_2 immediately after birth. Infants were excluded if they received supplemental oxygen or any type of assisted ventilation. SpO_2 was measured with a sensor applied to the right hand or wrist as soon as possible after birth; data were collected every 2 seconds.

Results: We studied 468 infants and recorded 61650 SpO_2 data points.

Dawson and colleagues. Defining the reference range for oxygen saturation for infants after birth. Pediatrics. (2010) 125:e1340–7. 10.1542/peds.2009-1510

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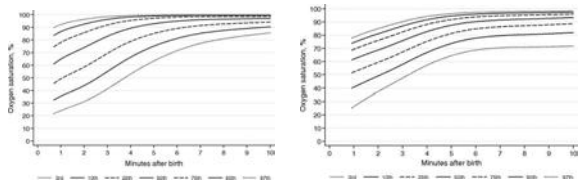
Defining the reference range for oxygen saturation for infants after birth

Third, 10th, 25th, 50th, 75th, 90th, and 97th Spo2 percentiles



term infants at ≥ 37 weeks' gestation with no medical intervention after birth

preterm infants at < 32 weeks' gestation with no medical intervention after birth

Dawson and colleagues. Defining the reference range for oxygen saturation for infants after birth. Pediatrics. (2010) 125:e1340–7. 10.1542/peds.2009-1510

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How to titrate the oxygen in the DR

There is no clear guideline for how fast and how frequently FiO_2 should be titrated.

None of the study protocols dictated a titration strategy, but left to the clinician on how to titrate the FiO_2 to achieve target SpO_2.

Studies have shown that there is a delay between dialed FiO_2 on a blender at the proximal end and desired FiO_2 at the distal end reaching the infant. The delay could be as high as 30 seconds and it may depend on the device used to deliver oxygen.

There are no data to guide which percentage titration should be attempted during neonatal resuscitation. Titration frequency and percentage of change may impact the achieved SpO_2 and time spent below or above SpO_2 targets.

Until further evidence is available, clinicians should use their own judgement in how titration of FiO_2 is done during neonatal resuscitation.

Kapadia and Oei JL. Optimizing oxygen therapy for preterm infants at birth: Are we there yet? Semin Fetal Neonatal Med. 2020 Apr;25(2):101081. doi: 10.1016/j.siny.2020.101081.

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FETAL& NEONATAL

Outcomes of oxygen saturation targeting during delivery room stabilisation of preterm infants.

Oei JL, Finer NN, Saugstad OD, Wright IM, Rabi Y, Tarnow-Mordi W, Rich W, Kapadia V, Rook D, Smyth JP, Lui K, Vento M.

Arch Dis Child Fetal Neonatal Ed. 2018 Sep;103(5):F446-F454. doi: 10.1136/archdischild-2016-312366.

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FETAL& NEONATAL

Outcomes of oxygen saturation targeting during delivery room stabilization of preterm infants

Objective: To determine the association between SpO_2 at 5 min and preterm infant outcomes.

Design: Data from 768 infants < 32 weeks gestation from 8 randomized controlled trials (RCTs) of lower (≤ 0.3) versus higher (≥ 0.6) initial inspiratory fractions of oxygen (FiO_2) for resuscitation, were examined.

Interventions: Lower (≤ 0.3) versus higher (≥ 0.6) oxygen resuscitation strategies targeted to specific predefined SpO_2 before 10 min of age.

Patients: Infants < 32 weeks gestation.

Main outcome measures: Relationship between SpO_2 at 5 min, death and intraventricular hemorrhage (IVH) > grade 3.

Results: 5 min SpO_2 data were obtained from 706 (92%) infants.

Only 159 (23%) infants met SpO_2 study targets and 323 (46%) did not reach SpO_2 80%.

Oei and colleagues. Outcomes of oxygen saturation targeting during delivery room stabilisation of preterm infants. Arch Dis Child Fetal Neonatal Ed. 2018 Sep;103(5):F446-F454. doi: 10.1136/archdischild-2016-312366.

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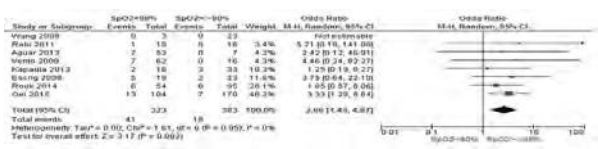
Outcomes of oxygen saturation targeting during delivery room stabilization of preterm infants

Risks of death in infants with 5 minute SpO_2 less than or greater than 80%.



RR 2.66 95% CI 1.45 to 4.87)

Oei and colleagues. Outcomes of oxygen saturation targeting during delivery room stabilisation of preterm infants. Arch Dis Child Fetal Neonatal Ed. 2018 Sep;103(5):F446-F454. doi: 10.1136/archdischild-2016-312366.

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What is already known on this topic?

► Clinicians initiate preterm infant resuscitation with low levels of blended oxygen (FiO_2 < 0.4) that is manipulated to meet SpO_2 derived from healthy term and preterm infants.

► This is now almost standard practice but whether clinicians are able to achieve recommended SpO_2 targets is unknown.

What this study adds?

► Almost half of preterm infants enrolled in oxygen titration studies did not reach SpO_2 80% at 5 min, and this was associated with increased risk of major intraventricular hemorrhage and bradycardia (heart rate <100 bpm).

► Bradycardia at 5 minutes increased risk of death by almost five times, suggesting that randomized trials to determine the consequences of oxygen titration and SpO_2 targeting strategies in preterm infants are urgently needed.

Oei and colleagues. Outcomes of oxygen saturation targeting during delivery room stabilisation of preterm infants. Arch Dis Child Fetal Neonatal Ed. 2018 Sep;103(5):F446-F454. doi: 10.1136/archdischild-2016-312366.

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Oxygen Concentration for Resuscitating Premature Newborns - Intervention (NRP 864)

Knowledge Gaps

The most appropriate time-specific oxygen targets for premature newborns need to be defined.

Neurodevelopmental outcomes for preterm newborns resuscitated with low- and high-oxygen concentrations need to be determined.

Circulation. 2015;132(suppl 1): S204–S241.

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Cochrane Neonatal

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Questions regarding the use of oxygen in the resuscitation of term or preterm infants:

Where does the evidence take us?

What are best "practices" regarding the use of oxygen in the resuscitation of term or preterm infants?

What future research is urgently needed?

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Moderators

Roger F. Soll, MD
H. Wallace Professor of Neonatology, University of Vermont
Coordinating Editor, Cochrane Neonatal
Director, VON Institute for Evidence Based Practice, Vermont Oxford Network

Danielle Ehret, MD, MPH
Asfaw Yemiru Green and Gold Professor, University of Vermont
Chief Medical Officer, Director, Global Health, Vermont Oxford Network

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Discussants

Elizabeth Foglia, MD, MA, MSCE
Associate Professor of Pediatrics
Perelman School of Medicine at the University of Pennsylvania

Erika Edwards PhD
Research Associate Professor
University of Vermont
Chief Scientific Officer
Vermont Oxford Network

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1. How should we think about oxygen targeting in the Delivery Room?

What are the right SpO_2 targets for preterm infants?
- Same as healthy term infants?
- What if they need respiratory support?
- What about delayed cord clamping?

How should we achieve those targets?
- Initial FiO_2 is only part of the picture
  - Only 23% of preterm infants met 5 min goal SpO_2*
- How quickly should we adjust FiO_2?
- How quickly does a change in FiO_2 take to reach the baby?

Oei et al Arch Dis Child Fetal Neonatal Ed 2018

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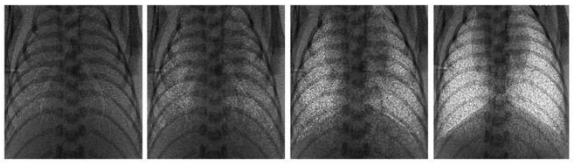
2. How should we promote oxygenation after birth?



Lung Aeration

CPAP FiO_2

te Pas, Ped Res 2009

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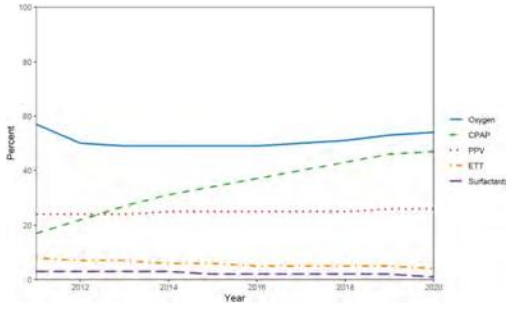
Variation and Temporal Trends in Delivery Room Management of Moderate and Late Preterm Infants



Handley and colleagues. Variation and Temporal Trends in Delivery Room Management of Moderate and Late Preterm Infants. Pediatrics. 2022 Aug 1;150(2):e2021055994. doi: 10.1542/peds.2021-055994.

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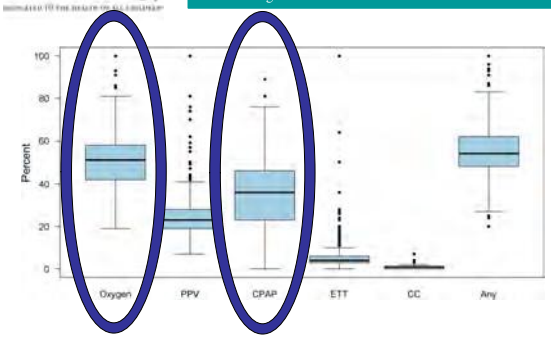
Variation and Temporal Trends in Delivery Room Management of Moderate and Late Preterm Infants



Handley and colleagues. Variation and Temporal Trends in Delivery Room Management of Moderate and Late Preterm Infants. Pediatrics. 2022 Aug 1;150(2):e2021055994. doi: 10.1542/peds.2021-055994.

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3. What do we know about "real life" resuscitation?

2750 US obstetric hospitals:
37%: <500 deliveries/yr
21%: 501-1,000 deliveries/yr
21%: 1,001-2,000 deliveries/yr
20%: >2,000 deliveries/yr

Where most resuscitation research is performed is not where most resuscitation is performed

Handley S, JAMA Network Open 2021

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DRIVE
Delivery Room Intervention & Evaluation Network

Multi-site consortium of US delivery hospitals convened and led by the American Academy of Pediatrics

Objective: to study and improve delivery room resuscitation performance and outcomes

Interested in joining?

DRIVE Network: DRIVENetwork@aap.org

Liz Foglia: foglia@chop.edu

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Poll Question

Do you have "time-based" oxygen saturation targets available and easily referenced in the delivery room?

1. Yes
2. No
3. I'm not sure

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Poll Question

If "yes", do you have different oxygen saturation targets for term and preterm infants?

1. Yes
2. No
3. I'm not sure

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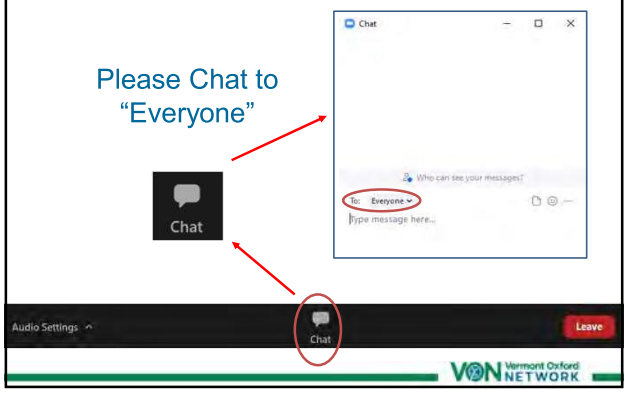
Questions? Comments? Ideas to Share?

Please Chat to "Everyone"



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Continuing Education Credit

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Future sessions

August 14th - Evidence to Practice: Preventing hypothermia

November 13th - Follow up and follow through

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Neuroprotective Quality Improvement

Prevent injury | Protect normal maturation/development | Promote positive experiences/relationships

- Potentially better practices/change ideas and clinical examples
- Measurement plans and reporting
- Foundational QI resources
- Consultation and collaboration with care experts and other teams

Stay tuned for specific clinical topics in 2025!

A QI collaborative exclusive to VON Quality Circle membership. Enroll your center now!

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