



May 2008: VOLUME 5, NUMBER 9

The Use of CPAP in the Delivery Room



In this Issue...

During resuscitation of preterm infants, respiratory support is often necessary immediately after birth. Two of the current strategies for delivery room (DR) respiratory care are intubation and mechanical ventilation with surfactant therapy, and the use of nasal continuous positive airway pressure (NCPAP). Although intubation and prophylactic surfactant administration is an evidence-based treatment of Respiratory Distress Syndrome (RDS), the CPAP strategy is often preferred because: a) in this era of antenatal steroids, a relevant number of preterm infants do not develop respiratory distress, and b) the adverse effects of invasive mechanical ventilation have to be considered.

In this issue, we review recently published data on DR respiratory support in very preterm infants, including the feasibility of studying CPAP in the DR, noninvasive lung recruitment interventions, the effects of nasal intermittent mandatory ventilation, oxygenation and ventilation in the DR during CPAP therapy, and the combination use of surfactant and CPAP.

Program Information

CE Info
Accreditation
Credit Designations
Intended Audience
Learning Objectives
Internet CME/CNE Policy
Faculty Disclosure
Disclaimer Statement

Length of Activity

1.0 hours Physicians
1 contact hour Nurses

Release Date

May 15, 2008

Expiration Date

May 14, 2010

Next Issue

June 12, 2008

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INTUBATION, SURFACTANT
ADMINISTRATION, AND RAPID
EXTUBATION NCPAP IN THE DELIVERY
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Course Directors

Edward E. Lawson, MD
Professor
Department of Pediatrics
Division of Neonatology
The Johns Hopkins University
School of Medicine

Christoph U. Lehmann, MD
Associate Professor
Department of Pediatrics
Division of Neonatology
The Johns Hopkins University
School of Medicine

Lawrence M. Noguee, MD
Associate Professor
Department of Pediatrics
Division of Neonatology
The Johns Hopkins University
School of Medicine

Mary Terhaar, DNSc, RN
Assistant Professor
Undergraduate Instruction
The Johns Hopkins University
School of Nursing

**Robert J. Kopotic, MSN, RRT,
FAARC**
President, Kair Medical Innovations
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GUEST AUTHORS OF THE MONTH



Reviews & Commentary:
Wolfgang Lindner, MD
University of Ulm Germany
Department of Pediatrics
Division of Neonatology and
Pediatric Intensive Care
Ulm, Baden-Württemberg,
Germany



Reviews:
Hans Fuchs, MD
University of Ulm Germany
Department of Pediatrics
Division of Neonatology and
Pediatric Intensive Care
Ulm, Baden-Württemberg,
Germany

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Dr. Lindner has no relevant financial relationships to disclose.

Dr. Fuchs has no relevant financial relationships to disclose.

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LEARNING OBJECTIVES

At the conclusion of this activity, participants should be able to:

- Discuss with colleagues the evidence-based facts of CPAP in the delivery room
- Identify for colleagues in the delivery room benefits and risks of CPAP
- Describe to colleagues the current research in the use of CPAP in the delivery room

COMMENTARY

A low rate of chronic lung disease (CLD) was observed in the pre-surfactant era in a center that used nasal CPAP (NCPAP) as first line therapy for preterm infants with respiratory distress.¹ Without evidence of benefit or safety, this method was widely adopted. Retrospective cohort studies reported improved pulmonary outcome with the use of CPAP.²⁻⁵

Recently, the American Academy of Pediatrics (AAP) Committee on Fetus and Newborn summarized that CPAP may reduce the need for surfactant and incidence of CLD without increased morbidity although large randomized controlled trials are lacking.⁶ The feasibility of undertaking such studies was proven by Finer et al. However, his multicenter trial revealed that the application of CPAP by facemask did not decrease the rate of intubation in the DR.

The COIN Trial, discussed in the context of BPD in the [eNeonatal Review March 2008 issue](#), deserves mention here. This landmark 2008 New England Journal of Medicine report by Morley et al,⁷ tested the hypothesis that the use of early NCPAP rather than intubation and mechanical ventilation would reduce the incidence of death or chronic lung disease (CLD) in very preterm infants, concluded that early NCPAP in infants born at 25 to 28 weeks gestation showed similar incidence of death or CLD as compared with intubation. Importantly, an increased rate of pneumothorax was found, with the majority of these air leaks occurring beyond 24 hours. Therefore, experienced staff is mandatory for detection of increasing dyspnea, a clinical sign often preceding air leaks. Indeed, the success of early CPAP has been found to improve with staff experience.⁸ *[Editor's Note: Clinicians may directly access the review of the COIN Trial by [visiting our archives online](#)].*

Different strategies have been proposed that might improve the results of NCPAP: noninvasive lung recruitment, the use of noninvasive intermittent mandatory ventilation, and prophylactic surfactant administration followed by NCPAP.



te Pas reported on a low rate of intubation (37%) and a decreased rate of CLD or death when a lung recruitment intervention preceded CPAP compared to standard treatment (facemask and hand bagging). Although large tidal volumes, applied without pressure limitation to intubated animals, caused lung injury,⁹ these interventions are different from the pressure-controlled, sustained inflations by nasopharyngeal tube used by te Pas or Lindner et al,¹⁰ who did not observe clinical signs of increased lung injury.

In the study by Kugelman et al, noninvasive intermittent mandatory ventilation was found to reduce the rate of intubation and CLD compared to NCPAP. Improved pulmonary outcome was reported by Geary et al with prophylactic surfactant application and rapid extubation to NCPAP in an historical cohort study. While these techniques are promising, to prove benefit and safety, further controlled trials are necessary.

The data reviewed herein appear to lead to the conclusion that a majority of very immature infants (≥ 25 weeks gestation) can be stabilized using NCPAP delivered by nasal prongs in the DR, and that surfactant replacement should be reserved for infants who fail NCPAP.

References

1. Avery ME, Tooley WH, Keller JB, et al. [Is chronic lung disease in low birth weight infants preventable? A survey of eight centers.](#) *Pediatrics*. 1987;79(1):26-30.
2. Poets CF, Sens B. [Changes in intubation rates and outcome of very low birth weight infants: a population-based study.](#) *Pediatrics*. 1996;98(1):24-27.
3. Lindner W, Vossbeck S, Hummler H, et al. [Delivery room management of extremely low birth weight infants: spontaneous breathing or intubation?](#) *Pediatrics*. 1999;103(5 Pt 1):961-967.
4. Van Marter LJ, Allred EN, Pagano M, et al. [Do clinical markers of barotrauma and oxygen toxicity explain interhospital variation in rates of chronic lung disease?](#) *Pediatrics*. 2000;105(6):1194-1201.
5. Vanpée M, Walfridsson-Schultz U, Katz-Salamon M, et al. [Resuscitation and ventilation strategies for extremely preterm infants: a comparison study between two neonatal centers in Boston and Stockholm.](#) *Acta Paediatr*. 2007;96(1):10-16.
6. Engle WA; AAP Committee on Fetus and Newborn. [Surfactant replacement therapy for respiratory distress in the preterm and term neonate.](#) *Pediatrics*. 2008;121(2):419-432.
7. Morley CJ, Davis PG, Doyle LW, Brion LP, Hascoet JM, Carlin JB, for the COIN trial Collaborators. [Nasal CPAP or intubation for the very preterm infants at birth: The COIN trial.](#) *N Engl J Med*. 2008;358:700-708.
8. Aly H, Massaro AN, Patel K, et al. [Is it safer to intubate premature infants in the delivery room?](#) *Pediatrics*. 2005;115(6):1660-1665.
9. Björklund LJ, Ingimarsson J, Curstedt T, et al. [Lung recruitment at birth does not improve lung function in immature lambs receiving surfactant.](#) *Acta Anaesthesiol Scand*. 2001;45(8):986-993.
10. Lindner W, Högel J, Pohlandt F. [Sustained pressure-controlled inflation or intermittent mandatory ventilation in the delivery room? A randomised controlled trial on initial respiratory support via nasopharyngeal tube.](#) *Acta Paediatr*. 2005;94(3):303-309.

FEASIBILITY OF RANDOMIZED CONTROLLED STUDIES ON NCPAP IN THE DELIVERY ROOM

Finer NN, Carlo WA, Duara S, et al. **Delivery room continuous positive airway pressure/positive end-expiratory pressure in extremely low birth weight infants: a feasibility trial.** *Pediatrics*. 2004;114(3):651-657.

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Although studies have suggested that early CPAP may be beneficial in reducing ventilator dependence and subsequent CLD in extremely low birth weight (ELBW) infants, until this 2004 report from Finer et al, there had been no prospective studies of infants who have received CPAP or positive end-expiratory pressure (PEEP) from initial resuscitation in the DR. The authors focused on evaluating the feasibility of randomizing ELBW infants to CPAP/PEEP versus no CPAP/PEEP during DR management.

Noninvasive ventilation was delivered via facemask and t-piece ventilator (peak inspiratory pressure, 15 to 25 cmH₂O; PEEP/CPAP, 0 vs 5 cmH₂O). The Neonatal Resuscitation



Program guidelines were applied, with the restriction that the infant should not be intubated for prophylactic surfactant administration before 10 minutes of age and that surfactant should be given only after arrival at the NICU, unless urgently necessary. After admission to the NICU, all infants with $\text{FiO}_2 > 0.21$ received CPAP (5-6 cmH_2O). Criteria for intubation were clearly defined: $\text{FiO}_2 > 0.3$ to maintain $\text{SpO}_2 > 90\%$ or $\text{PaO}_2 > 45$ mmHg [6 kPa], $\text{PaCO}_2 > 55$ mmHg [7.3 kPa] with a $\text{pH} < 7.25$, or apnea requiring bag and mask ventilation. Primary outcome was the percentage of enrolled infants who could be treated according to the study protocol over a 12-month interval.

One-hundred-four infants were enrolled. Demographic data in both groups were similar, except that the CPAP group had more infants with a birth weight of ≤ 600 g and more infants of 23 weeks gestational age (GA). Mean birth weight (g) was 756 ± 196 vs 789 ± 196 . Protocol compliance was 91%. Forty infants in each group had noninvasive positive pressure ventilation (CPAP, 73%; control, 82%). Data on failure to deliver the correct peak inspiratory pressure or PEEP/CPAP (leakage of the mask) during the resuscitation were not given. Twenty-seven of 55 CPAP infants and 20 of 49 controls were intubated in the DR ($p = 0.4$). Overall, 80% of infants required intubation within the first 7 days of life (CPAP, 43 vs control, 40; $p = 0.21$). Death occurred in 21% (CPAP, 27% vs control, 13%, non-significant after adjustment for birth weight). There was no difference in the incidence of pneumothorax (CPAP, 13% vs control, 9%) and chronic lung disease (CPAP, 29.4% vs control, 27.9%).

The authors concluded that this study demonstrated the feasibility of randomization of infants < 28 weeks to a DR intervention of CPAP/PEEP compared with no CPAP/PEEP. Almost half of infants < 28 weeks GA were intubated in the DR, and CPAP/PEEP was not found to decrease the need for intubation. The information gained from this preliminary trial should be useful in designing further studies.

OXYGEN SATURATION, FiO_2 AND PCO_2 DURING NASAL CPAP IN THE DELIVERY ROOM

Lindner W, Pohlandt F. **Oxygenation and ventilation in spontaneously breathing very preterm infants with nasopharyngeal CPAP in the delivery room.** *Acta Paediatr.* 2007;96(1):17-22.

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This prospective observational study was conducted to obtain data on FiO_2 , SpO_2 , spontaneous respiratory rate, PCO_2 , pH and base deficit in infants treated with a lung recruitment intervention in the DR followed by CPAP (4-6 cmH_2O) during the first 48 hours of life. Data were collected from 48 infants (GA, 25 to 28 weeks) with an umbilical arterial catheter in place. Blood gas samples were drawn from the umbilical artery of the placenta in the DR (age 23 [11- 44] minutes), at the time of admission at the NICU (age 49 [28-71] minutes), and at 7 specified intervals up to 48 hours. Criteria for intubation were clearly defined ($\text{FiO}_2 > 0.60$ with $\text{SpO}_2 < 85$ [$\text{SpO}_2 < 80$ in the DR], $\text{PCO}_2 > 60$ mmHg [8 kPa], and > 5 apneas per hour). Secondary outcomes were survival and rates of CLD and severe IVH.

Twenty-two infants (46%) were not intubated (Group A, median GA 26.4 weeks, prenatal betamethasone 82%). The median FiO_2 was 0.40 before transport to the NICU (age 40 [20-60] min) and decreased to 0.21 within the next 5 hours. The PCO_2 increased from 42.8 [5.7 kPa] (median, placenta) to a maximum of 60 (48-81) mmHg (8 [6.4-10.8] kPa) at the age of 24 (11-44) minutes and decreased in all infants with $\text{PCO}_2 > 60$ mmHg (8 kPa) within 46 minutes. At the age of 1-2 hours, the median PCO_2 had reached a stable level of 45.0 to 50.3 mmHg (6 to 6.7 kPa) for the next 46 hours. Twelve infants (25%) were intubated in the NICU (Group B, median GA 26.7 weeks, prenatal betamethasone 100%). FiO_2 was higher in group B compared to group A when data of the whole study period were pooled (0.4 vs 0.21, $p < 0.001$). PCO_2 was not different in group A and B. Intubation was necessary in 14 infants (29%) in the DR. One infant in group B died. Rates of CLD

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and severe IVH were 4.5% and 9% (group A) and 25% and 15% (group B) respectively.

The investigators found that a transient period of hypercapnia may occur in very preterm infants treated with lung recruitment intervention followed by NCPAP in the DR. This hypercapnia was not associated with an increased rate of IVH and normalized without intubation. However, the author's comment that the number of infants was small and therefore their results cannot be generalized.

THE USE OF NONINVASIVE LUNG RECRUITMENT INTERVENTIONS FOLLOWED BY NASAL CPAP

te Pas AB, Walther FJ. **A randomized controlled trial of delivery room respiratory management in very preterm infants.** *Pediatrics.* 2007;120(2):322-329.

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This prospective study sought to determine whether early NCPAP, preceded by lung recruitment intervention (pressure-controlled sustained inflation), is more effective than conventional intervention (self-inflating bag and mask) in preventing intubation within 72 hours of age in very preterm infants. Two-hundred-seventy-seven of 217 (95%) infants born during the study period at a GA of 25 to 32 weeks were randomly assigned to early lung recruitment intervention (sustained [10 seconds] inflation via nasopharyngeal tube [20-25 cmH₂O] followed by NCPAP, 5-6 cmH₂O [lung recruitment group]) or to conventional respiratory treatment with an initial inflation pressure of 30 to 40 cmH₂O followed by inflation pressures <20 cmH₂O (conventional group). Primary outcome measure was intubation within 72 hours of age. Criteria for intubation were clearly defined (SpO₂ < 88% or PaO₂ ≤50 mmHg [6.7 kPa] with FiO₂ ≥0.4, PaCO₂ >60 mmHg [8 kPa] with pH <7.20, >4 apneas per hour or >2 episodes of bagging per hour). The demographic data of both groups were similar, with mean GA at 29 weeks. The use of antenatal corticosteroids was 82% (lung recruitment group) and 81% (conventional group).

The authors report that fewer infants were intubated within 72 hours of age in the lung recruitment group (37% vs 51%; OR 0.57; 95% CI, 0.32-0.98). Further, the incidence of respiratory distress syndrome was decreased (38% vs 54%) and the median duration of ventilatory support including CPAP was shorter in the lung recruitment group (2.7 vs 4.3 days). In the subgroup of infants <28 weeks gestation, fewer infants were intubated in the DR of the lung recruitment group, but the rate of intubation within 72 hours was similar (65% vs 79%, non-significant) compared with the conventional group. The rate of severe CLD was lower in the lung recruitment group (9% vs 19%; OR 0.41; 95% CI, 0.18-0.96; p = 0.04). Other outcomes like mortality, necrotizing enterocolitis (NEC), severe retinopathy of prematurity (ROP), severe intraventricular hemorrhage (IVH) (7% vs 3%), cystic PVL and the incidence of pneumothoraces (1% vs 7%) were not different between groups.

The authors conclude that to reduce the rate of intubation within 72 hours of age, a sustained inflation via nasopharyngeal tube followed by NCPAP is a more effective strategy than repeated manual inflations with a self-inflating bag and mask followed by CPAP on admission to the NICU.

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THE USE OF NONINVASIVE INTERMITTENT MANDATORY VENTILATION IN THE DELIVERY ROOM

Kugelman A, Feferkorn I, Riskin A, et al. **Nasal intermittent mandatory ventilation versus nasal continuous positive airway pressure for respiratory distress syndrome: a randomized, controlled, prospective study.** *J Pediatr.* 2007;150(5):521-526.

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Davis PG, Lemyre B, De Paoli AG. **Nasal intermittent positive pressure ventilation (NIPPV) versus nasal continuous positive airway pressure (NCPAP) for preterm neonates after extubation.** *Cochrane Database Syst Rev.* 2003;(3):CD000143.

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The 2003 report by Davis et al found that nasal intermittent mandatory ventilation (NIMV) was superior to NCPAP post-extubation in preterm infants. Kugelman's group sought to evaluate whether NIMV would decrease the requirements for endotracheal ventilation when compared with nasal CPAP in the initial treatment of premature infants with respiratory distress syndrome.

In this randomized controlled trial, 84 preterm infants (GA 24.0-34.6 weeks) were treated with either NCPAP or synchronized NIMV, if respiratory support was indicated and no immediate intubation in the DR was required. Objective criteria for failure of nasal support were predefined. Demographic data and cardiorespiratory status were similar in both groups at study entry. Mean GA was 30.6 ± 3.0 vs 31.1 ± 2.3 weeks.

The investigators found that infants treated with NIMV needed less endotracheal ventilation than infants treated with NCPAP (25% vs 49%; $p = 0.04$), with a similar trend in infants <1500 g ($n = 40$; 31% vs 62%, $p = 0.06$). Further, time to stop nasal support in case of success was 4.9 days in both groups. There were no differences between the two treatment groups in the clinical variables (mean blood pressure, heart rate, and respiratory rate). Peak inspiratory pressure was 19.5 ± 2.4 cmH₂O in the NIMV group and the NIMV rate was 22.2 breaths/min. Three infants had pneumothorax (2 in the NCPAP group and 1 infant in the NIMV group). Two twin infants in the NIMV group had NEC. The rate of IVH was comparable (8% vs 8%). BPD rate was reduced in the NIMV group (2% vs 17%, $p = 0.03$).

The authors conclude that NIMV was more successful than NCPAP in preventing endotracheal ventilation, a finding associated with a decreased rate of CLD. Possible side effects of NIMV (gastric distension, perforation, or oral feeding intolerance) were not observed in this study. However, the authors recommend that these results have to be taken with caution, as this study had insufficient statistical power to detect differences in infrequent complications like IVH, NEC, or pneumothorax, and suggest that this study provide the basis for further larger trials.

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INTUBATION, SURFACTANT ADMINISTRATION, AND RAPID EXTUBATION NCPAP IN THE DELIVERY ROOM

Geary C, Caskey M, Fonseca R, et al. **Decreased incidence of bronchopulmonary dysplasia after early management changes, including surfactant and nasal continuous positive airway pressure treatment at delivery, lowered oxygen saturation goals, and early amino acid administration: a historical cohort study.** *Pediatrics*. 2008;121(1):89-96.

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Geary et al performed a retrospective chart review to investigate the pulmonary outcomes before and after the introduction of three practices in the early management of ELBW neonates: 1) changing to a respiratory strategy of prophylactic surfactant administration followed by immediate extubation to NCPAP treatment in the DR (instead of placement on a mechanical ventilator); 2) lowering the goals for oxygen saturation from >95% to 90% and starting with an initial FiO_2 of 0.4 instead of 0.6; and 3) starting early amino acid supplementation with 3 gm/kg/d on the first day of life instead of 1-1.5 g/kg/d on day of life 2 to 4 with gradual increase. Treatment was similar in respect of other aspects of early management of infant in the two periods.

Charts were reviewed of 163 infants with birth weight ≤ 1000 grams and appropriate size at birth to compare pulmonary outcome in the periods 18 months before and after implementation of the changes (January 2002 - June 2002 vs July 2004 - December 2005). Demographic data of both cohorts were similar.

The investigators found that implementation of changes decreased the mean duration of mechanical ventilation from 35 to 15 days, and that the highest oxygen exposure on day of life 1, 3, 7, 14 and 28 also decreased in the second period. The incidence of moderate and severe bronchopulmonary dysplasia (BPD) decreased from 43% to 24%, and the proportion of infants discharged to home on oxygen decreased from 25.7% to 10%. There were no differences in rates of death, IVH, PVL, pneumothorax, chest tube requirement, pulmonary hemorrhage, NEC, or ROP. Fewer infants received postnatal steroids in the post-change implementation period (37% vs 14%), and the use of vasopressor therapy in the first 24 hours of life decreased in the second period. However, more infants in the second period required surgical ligation of the PDA.

The authors concluded that prophylactic surfactant treatment and enhanced nutrition, followed by early management that decreases barotrauma and oxidant injury, seems to improve pulmonary outcomes.

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- **Edward E. Lawson, MD** has indicated a financial relationship of grant/research support from the National Institute of Health (NIH). He also receives financial/material support from Nature Publishing Group as the Editor of the *Journal of Perinatology*.
- **Christoph U. Lehmann, MD** has received grant support from the Agency for Healthcare Research and Quality and the Thomas Wilson Sanitarium of Children of Baltimore City.
- **Lawrence M. Nogee, MD** has received grant support from the NIH.
- **Mary Terhaar, DNSc, RN** has indicated no financial relationship with commercial supporters.
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