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ARTICLE

Resuscitation of Preterm Neonates by Using Room Air or 100% Oxygen

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What's Known on This Subject

Current guidelines for initial F_{IO_2} during resuscitation of very preterm infants include the full range of available F_{IO_2} values, whereas the best available evidence indicates a potential advantage to the use of room air.

What This Study Adds

The current study is, to our knowledge, the first prospective, randomized comparison of the use of room air versus oxygen for the initial resuscitation of very preterm infants and raises concerns regarding the safety of room air for this population.

ABSTRACT

OBJECTIVE. In this study of preterm neonates of <32 weeks, we prospectively compared the use of room air versus 100% oxygen as the initial resuscitation gas.

METHODS. A 2-center, prospective, randomized, controlled trial of neonates with gestational ages of 23 to 32 weeks who required resuscitation was performed. The oxygen group was initially resuscitated with 100% oxygen, with decreases in the fraction of inspired oxygen after 5 minutes of life if pulse oxygen saturation was >95%. The room air group was initially resuscitated with 21% oxygen, which was increased to 100% oxygen if compressions were performed or if the heart rate was <100 beats per minute at 2 minutes of life. Oxygen was increased in 25% increments if pulse oxygen saturation was <70% at 3 minutes of life or <80% at 5 minutes of life.

RESULTS. Twenty-three infants in the oxygen group (mean gestational age: 27.6 weeks; range: 24–31 weeks; mean birth weight: 1013 g; range: 495–2309 g) and 18 in the room air group (mean gestational age: 28 weeks; range: 25–31 weeks; mean birth weight: 1091 g; range: 555–1840 g) were evaluated. Every resuscitated patient in the room air group met rescue criteria and received an increase in the fraction of inspired oxygen by 3 minutes of life, 6 patients directly to 100% and 12 with incremental increases. Pulse oxygen saturation was significantly lower in the room air group from 2 to 10 minutes (pulse oxygen saturation at 3 minutes: 55% in the room air group vs 87% in the oxygen group). Heart rates did not differ between groups in the first 10 minutes of life, and there were no differences in secondary outcomes.

CONCLUSIONS. Resuscitation with room air failed to achieve our target oxygen saturation by 3 minutes of life, and we recommend that it not be used for preterm neonates. *Pediatrics* 2008;121:1083–1089

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This trial has been registered at www.clinicaltrials.gov (identifier NCT00369720).

Key Words
oxygen, pulse oximeter, resuscitation, room air, very low birth weight

Abbreviations
Spo_2—pulse oxygen saturation
NRP—Neonatal Resuscitation Program
PPV—positive pressure ventilation
F_{IO_2}—fraction of inspired oxygen
UCSD—University of California, San Diego

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ROOM AIR RESUSCITATION has been used successfully for asphyxiated term neonates. Multiple trials showed room air to be at least as effective as 100% oxygen for resuscitation in this population.[1–6] Meta-analyses of the major randomized, controlled trials completed to date showed improved survival rates for term infants resuscitated with room air, compared with 100% oxygen. Subgroup analysis showed a larger survival benefit for infants born at <37 weeks of gestation.[7–9] Despite this information suggesting that room air might be beneficial for resuscitating preterm infants, there has never been a trial specifically evaluating the use of room air versus higher oxygen concentrations during newborn resuscitation in this group of infants.

The World Health Organization has stated that supplemental oxygen is not necessary as the initial resuscitating gas.[10,11] The International Liaison Committee on Resuscitation systematically reviewed the available evidence for the use of oxygen during newborn resuscitation and concluded that insufficient evidence existed to specify the concentration of oxygen that should be used at the onset of resuscitation.[12] The Neonatal Resuscitation Program (NRP) published the most recent revision of its textbook in 2006, which continues to recommend using 100% oxygen as the initial ventilating gas for term infants.[13] In addressing the care of preterm infants, this edition of the NRP textbook does not recommend a specific initial concentration of oxygen but does recommend monitoring pulse oxygen saturation (Spo_2) levels with pulse oximetry in the delivery room.

The potential for toxicity resulting from hyperoxia in preterm neonates has long been hypothesized. There is now an emerging body of information suggesting that many of the morbid conditions associated with extreme immaturity

are potentiated by an excess of free radicals occurring in infants who are intrinsically deficient in antioxidants, such as superoxide dismutase, catalase, and glutathione peroxidase.[14] Low plasma antioxidant activity at birth in preterm infants has been shown to be an independent risk factor for death.[14] Associations have been made between hyperoxia and important neonatal outcomes, including necrotizing enterocolitis, retinopathy of prematurity, and bronchopulmonary dysplasia.[15–20] A number of animal models[21–23] have demonstrated tissue damage from reactive oxygen species triggered during resuscitation with 100% oxygen. End-organ effects, including elevated cardiac enzyme levels, have been documented in term neonates resuscitated with 100% oxygen.[24] None of these observations is the result of prospective, randomized, clinical trials.

It is well known that intrauterine Pao_2 levels are 15 to 25 mm Hg before delivery[25] and increase to 50 to 80 mm Hg after delivery. Data obtained from a randomized trial comparing the use of room air or 100% oxygen for the resuscitation of asphyxiated term infants reported arterial blood gas levels obtained from the umbilical artery during resuscitation. In the infants resuscitated with pure oxygen, the Pao_2 levels were >100 mm Hg at 5 to 6 minutes, 15 minutes, and thereafter, whereas values for infants resuscitated with room air did not exceed 80 to 90 mm Hg (126.3 ± 21.8 mm Hg at 6.8 minutes of life vs 72.2 ± 6.8 mm Hg at 5.3 minutes of life).[4]

Observations in healthy neonates in the first minutes after birth demonstrate a slow increase in Spo_2 levels over the first 15 minutes of life, with a median Spo_2 at 3 minutes of life of 76% (interquartile range: 64%–87%) and a median Spo_2 at 5 minutes of life of 90% (79%–91%). In the few preterm neonates evaluated, the median Spo_2 at 5 minutes of life was 83% (74%–91%).[26] The median time to reach a Spo_2 of >90% has been reported to be 8 minutes.[27] A significant gradient between preductal and postductal Spo_2 persists for the first 15 minutes of life, with most untreated neonates not reaching a preductal Spo_2 of 90% in the first 5 minutes of life.[28] Limited information exists on the Spo_2 of preterm infants during resuscitation, and studies to date have not evaluated Spo_2 with different delivered fractions of inspired oxygen (Fio_2) values in this population.

We initiated this trial because, despite the suggestions that room air would be a better resuscitation gas for preterm infants, the use of room air for resuscitation has never been evaluated systematically in this special population, especially the smallest preterm infants. We hypothesized that, for preterm neonates, resuscitation initiated with room air and adjusted on the basis of Spo_2 levels (targeted oxygen delivery) would be more effective than pure oxygen in achieving Spo_2 values similar to those of nonresuscitated transitioning neonates.

METHODS

This was a prospective, dual-center, randomized, controlled, clinical trial conducted at the University of California, San Diego (UCSD), Medical Center, a regional NICU with 40 beds and a high-risk perinatal service admitting ~110 very low birth weight infants per year, and at Santa Clara Valley Medical Center, a 40-bed regional NICU admitting ~80 very low birth weight infants per year. This project was approved by the institutional review boards of both centers, and prenatal parental consent was obtained for all enrolled subjects. Subjects were all inborn, with gestational ages of $23^{0/7}$ to $31^{6/7}$ weeks. Neonates with known congenital malformations or chromosomal anomalies were excluded. Multiple gestations were assigned randomly according to pregnancy, not individual neonates. When delivery was imminent, subjects were randomly assigned to 2 groups by using sealed envelopes. Randomization was in blocks of 10. Patients were included in the trial if any resuscitation was received. The study was designed to test feasibility, with the goals of evaluating Spo_2 values during resuscitation in the 2 groups, determining whether there was significant separation between the groups, and evaluating whether the interventions were safe.

At UCSD Medical Center, each delivery was attended by a team consisting of a pediatric resident, a neonatal fellow, a neonatal nurse, and a respiratory therapist. An attending neonatologist also was present at most of the deliveries. Colorimetric carbon dioxide detectors (Pedicap; Nellcor Puritan Bennett, Pleasanton, CA) were used to facilitate bag-mask ventilation[29] and to confirm intubation. A T-piece resuscitator (Neopuff; Fisher&Paykel, Auckland, NZ) was used in most cases, with occasional use of a flow-inflating bag. At Santa Clara Valley Medical Center, all deliveries were attended by a team consisting of a neonatal respiratory therapist and either a neonatal nurse practitioner, a pediatric resident, or a pediatrician. A neonatologist also attended deliveries of infants at <28 weeks of gestation. Flow-inflating bags were used. For both groups at both centers, routine NRP protocol was followed.

For all infants, a pulse oximeter was applied by the respiratory therapist within the first 30 seconds of life. All Spo_2 values obtained and recorded were from a preductal site, always the right wrist. The base unit was turned on and the probe was applied to the infant, followed by attachment of the probe to the base unit. This method follows manufacturer's guidelines, to decrease maximally the time to a reliable signal, as confirmed by O'Donnell et al.[30] Radical oximeters (Masimo, Irvine, CA) were used with HiFi sensors (Masimo, Irvine, CA), which automatically set the oximeter to maximal sensitivity, and 2-second averaging. Resuscitations at UCSD were video-recorded by using our previously described methods.[31] A purpose-built, computerized, data acquisition system continuously collected delivered Fio_2 data by using the output of an inline polarographic oxygen analyzer, airway pressure from the T-piece or flow-inflating bag, time-linked video, and pulse oximeter outputs, including pulse rate and Spo_2.[32] At Santa Clara Valley Medical Center, the method was similar, with the following exceptions: video recordings and computerized data acquisition were not used. Data were obtained from 2 independent observers and pulse oximeter downloads.

For the oxygen group, resuscitation was initiated with

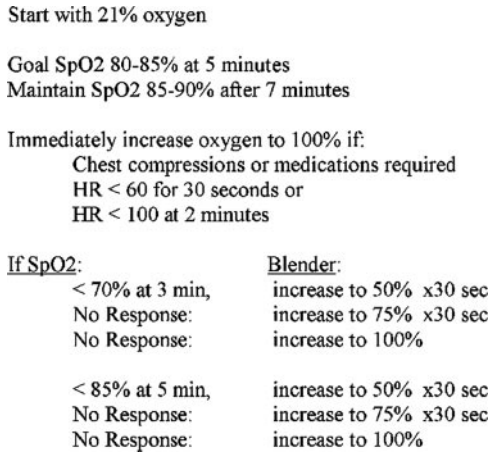

FIGURE 1
Protocol for room air resuscitation. HR indicates heart rate; values are in beats per minute.

100% oxygen. At 5 minutes of life, oxygen treatment was weaned if the Spo_2 was consistently >95%. In the room air group, 21% oxygen was used as the initial resuscitation gas. Fio_2 was immediately increased to 100% under the following conditions: need for chest compressions or medication administration, heart rate of <100 beats per minute at 2 minutes of life, or heart rate of <60 beats per minute for 30 seconds at any time. Fio_2 was increased in 25% increments if Spo_2 was <70% at 3 minutes of life or <85% at 5 minutes of life. This method is detailed in Fig 1.

The research team reviewed the available video recordings and evaluated adherence to the NRP and study protocols. With the video recordings linked to the analog data on heart rate, Spo_2, Fio_2, peak inspiratory pressure, and positive end expiratory pressure, the exact time at which resuscitation events occurred, including any changes in Fio_2 and administration of positive pressure ventilation (PPV), was documented in relation to the status of the infant at the time.

Descriptive statistics were calculated by using SigmaStat 3.0.1a (Systat, San Jose, CA). Student's *t* test was used to compare normally distributed variables. The Mann-Whitney rank-sum test was used to test significance for non–normally distributed variables. One-way, repeated-measures analysis of variance was performed for Spo_2 by using SPSS for Windows 10 (SPSS, Chicago, IL).

RESULTS

Baseline Characteristics

Forty-three infants were randomized in this trial between December 2005 and March 2007, two of whom did not require resuscitation. Eighteen infants received room air and 23 infants received oxygen. A total of 32 patients were enrolled at UCSD and 11 at Santa Clara Valley Medical Center. Baseline characteristics and maternal factors are detailed in Table 1. No differences were seen between groups with respect to baseline characteristics, delivery room interventions (Table 2), or maternal factors. Prenatal steroid administration was defined as delivery of the neonate a minimum of 48 hours after the first dose of prenatal steroid treatment. The two patients who were randomly assigned (1 to each group) but did not require any resuscitation, were a 31-week preterm neonate assigned to the oxygen group and a 29-week preterm infant assigned to the room air group. Neither required continuous positive airway pressure therapy or PPV and these patients were not included in the analyses.

TABLE 1 **Maternal Factors and Baseline Characteristics**

	Room Air (n = 18)	100% Oxygen (n = 23)
Gestation, mean ± SD, wk	28.1 ± 2.23	27.6 ± 2.1
Birth weight, mean ± SD, g	1066 ± 368	1013 ± 444
Female, *n* (%)	11 (61)	14 (61)
Prenatal steroid therapy, *n* (%)	11 (62)	17 (74)
IUGR, *n* (%)	3 (17)	8 (35)
Maternal age, mean ± SD, y	28 ± 8.5	28 ± 6.5
PPROM, *n* (%)	5 (28)	10 (43)
Cesarean section, *n* (%)	9 (50)	16 (70)
Maternal chorioamnionitis, *n* (%)	3 (17)	8 (35)
Singleton, *n* (%)	16 (89)	16 (69)
PIH, *n* (%)	6 (33)	5 (21)

IUGR indicates intrauterine growth retardation; PPROM, preterm prolonged rupture of membranes; PIH, pregnancy-induced hypertension.

Resuscitations

Every patient in the room air group required an increase in Fio_2 at or before 3 minutes of life. Fio_2 was increased directly to 100% because of bradycardia by 2 minutes of age for 6 patients, and Fio_2 was increased incrementally for failure to meet Spo_2 criteria at 3 minutes of life for the remaining 12 patients. Heart rates of <100 beats per minute at 2 minutes of life were seen in 4 patients in the oxygen group. Significant differences were seen in Spo_2 at 2, 3, 4, 5, 6, 7, 8, 9, and 10 minutes (P = .01, analysis of variance) (Fig 2). The delivered Fio_2 is detailed in Fig 3. Heart rates did not differ between groups in the first

TABLE 2 **Delivery Room Interventions and Early Parameters**

	Room Air (n = 18)	100% Oxygen (n = 23)	P
Surfactant treatment in DR, *n* (%)	10 (55)	10 (43)	.5
Intubation in DR, *n* (%)	10 (55)	10 (43)	.5
Chest compressions in DR, *n* (%)	0 (0)	3 (13)	.48
Medications in DR, *n* (%)	0 (0)	1 (4)	.8
Apgar score at 1 min, median	5	4	.8
Apgar score at 5 min, median	8	9	.034
Apgar score at 10 minutes, median[a]	8	7	.43
Cord arterial pH, mean ± SD	7.3 ± 0.05	7.27 ± 0.08	.2
PPV, *n* (%)	16 (89)	22 (95)	.7
CPAP only, *n* (%)	2 (11)	1 (5)	.96
Initial arterial blood gas levels after resuscitation			
pH, mean ± SD	7.26 ± 0.18	7.3 ± 0.09	.44
Pco_2, mean ± SD, mm Hg	54 ± 31	46 ± 7	.9
Po_2, mean ± SD, mm Hg	59 ± 16	68 ± 28	.4
Base deficit, mean ± SD, mol	1.5 ± 5.7	4 ± 3.1	.17

DR indicates delivery room; CPAP, continuous positive airway pressure.
[a] Apgar scores at 10 minutes were determined for only 5 patients in each group.

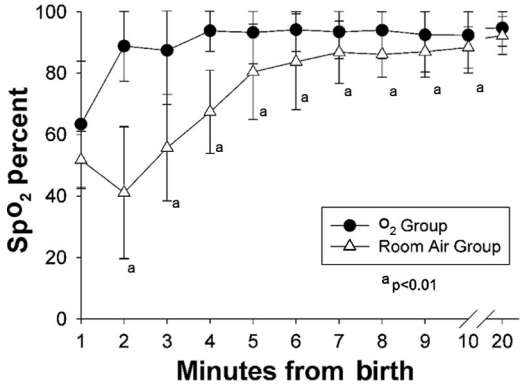

FIGURE 2
Mean Spo_2 at each minute of life. Bars represent SD.

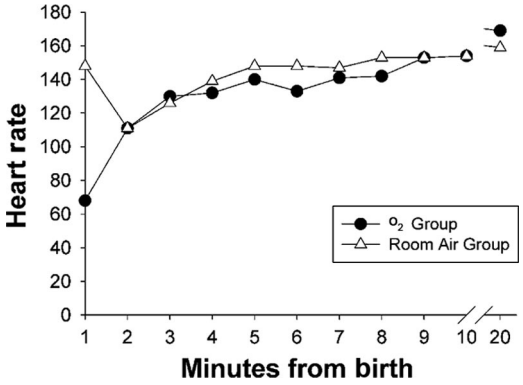

FIGURE 4
Mean heart rate at each minute of life. Values are in beats per minute.

10 minutes of life, and the times to establish a heart rate of >100 beats per minute did not differ (Fig 4). A greater percentage of neonates in the oxygen group had Spo_2 of >95% at each minute of resuscitation ($P < .05$ at 4 and 5 minutes only, Mann-Whitney test) (Fig 5).

Protocol and NRP Deviations

Two patients in the room air group had their FIO_2 increased because of bradycardia before initiation of PPV. This represents a deviation from both NRP guidelines and our protocol. One patient in the room air group with Spo_2 in the 30% to 50% range did not have FIO_2 increased until 7 minutes of life. Two patients in the oxygen group had their oxygen weaned at 4 minutes of life.

Secondary Outcomes

Secondary outcomes are detailed in Table 3. There were no significant differences in the occurrence of any of the evaluated outcomes, including intraventricular hemorrhage, retinopathy of prematurity, necrotizing enterocolitis, and chronic lung disease. There was 1 death in each group. In the room air group, an infant of 24 weeks of gestation died at 3 days of life as a result of respiratory failure, pulmonary hemorrhage, and grade IV intraventricular hemorrhage; in the oxygen group, an infant of 25 weeks of gestation died at 7 days of life as a result of sepsis, respiratory distress syndrome, and pneumothorax.

DISCUSSION

To our knowledge, this is the first prospective randomized study comparing the use of room air and pure oxygen in preterm infants of gestational age of <32 weeks. In designing our trial, we attempted to compare the standard of care for resuscitation with a new targeted oxygen delivery approach. The most current edition of the NRP textbook indicates that resuscitation of preterm neonates can be initiated with FIO_2 between 21% and 100% and that Spo_2 should be monitored. Our study was initiated before the introduction of this recommendation, at a time when most centers in the United States resuscitated preterm neonates with 100% oxygen and did not have the capability to provide blended oxygen. In addition, most centers did not routinely use pulse oximeters in the delivery room.[33] Therefore, most preterm infants resuscitated in the United States would have received 100% oxygen for the entire duration of the delivery room stay. We have shown that this duration in our center is 23 minutes, on average.[34] We chose to use 100% oxygen in the control group for the first 5 minutes of life because this was the standard of care at the time. We chose to initiate resuscitation with room air in the study group because of the evidence from studies in term neonates that room air is as effective as or better

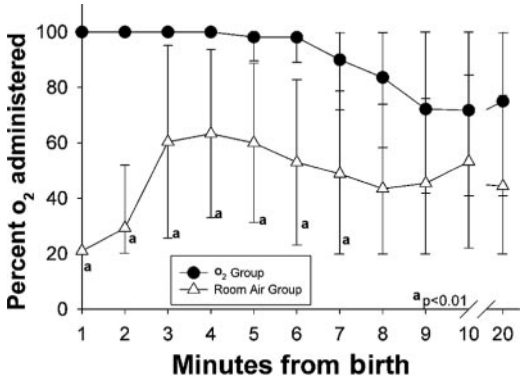

FIGURE 3
Mean level of oxygen administered at each minute of life. Bars represent SD.

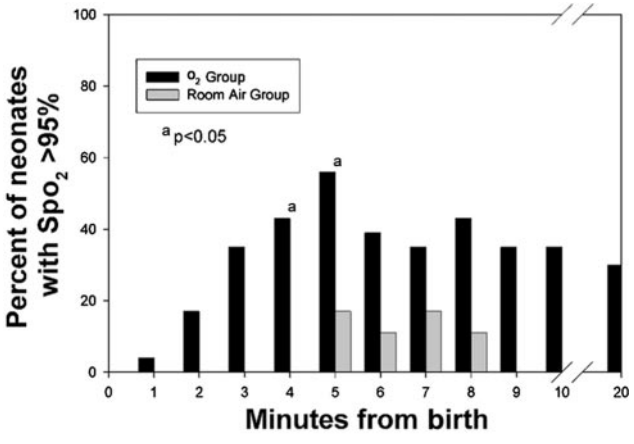

FIGURE 5
Proportion of patients with Spo_2 of >95% at each minute of life.

TABLE 3 **Secondary Outcomes**

	Room Air ($n = 18$)	100% Oxygen ($n = 23$)	*P*
Death, *n* (%)	1 (6)	1 (4)	.95
Grade III–IV IVH, *n* (%)	2 (11)	0	.55
Oxygen therapy at adjusted age of 36 wk, *n* (%)	7 (39)	3 (13)	.13
Isolated gastrointestinal perforation, *n* (%)	1 (8)	2 (9)	.9
Duration of intubation, median ± SD, d	2 ± 16.8	1 ± 13.3	.51
Duration of NCPAP therapy, mean ± SD, d	11 ± 13	12 ± 16	.47
Pneumothorax, *n* (%)	0	3 (13)	.48

IVH indicates intraventricular hemorrhage; NCPAP, nasal continuous positive airway pressure.

than pure oxygen. We hypothesized that the best F_{IO_2} for resuscitation might not be the extremes of either 21% or 100% and that a targeted approach might be most successful. We chose our S_{PO_2} targets on the basis of the best available pulse oximeter data from observations of term and near term infants who did not require active resuscitation at birth. We thought that the trajectory of increasing S_{PO_2} after birth in nonresuscitated newborn infants would be the best available model to mimic during resuscitation.

The S_{PO_2} of a fetus in relatively stable condition is ~50%[35,36] but may be less at the time of birth. The transition to higher S_{PO_2} after birth has been observed by several investigators, mostly evaluating term nonresuscitated neonates. House et al[37] studied 100 newborn infants (weight: 850–5230 g) delivered vaginally or through cesarean section. The average arterial oxygen saturation was 59% at 1 minute, 68% at 2 minutes, 82% at 5 minutes, and 90% at 15 minutes. Toth et al[38] studied 50 healthy, vaginally delivered, newborn infants and compared the S_{PO_2} values from preductal and postductal sites. Two minutes after birth, the mean preductal S_{PO_2} was 73% (range: 44%–95%) and the mean postductal S_{PO_2} was 67% (range: 34%–93%). S_{PO_2} levels of >95% were reached after 12 minutes (range: 2–55 minutes) for preductal values and after 14 minutes (range: 3–55 minutes) for postductal values.[38] More recently, Kamlin et al[26] reported S_{PO_2} values in the first minutes after birth in healthy nonresuscitated neonates. The median level at 3 minutes was 76% (interquartile range: 64%–87%). At 5 minutes of life, the median level was 80% (interquartile range: 40%–95%). This study demonstrated that infants of <37 weeks who did not receive resuscitation required 4.4 minutes to achieve S_{PO_2} of 75% and 7.3 minutes to achieve S_{PO_2} of 90%.

The targets we chose for adjustment of delivered F_{IO_2} in the study group were near the median levels for nonresuscitated neonates. These were the lowest levels we felt comfortable allowing with this new approach to adjusting delivered F_{IO_2}. We were unable to meet these targets in any resuscitated infants with room air used as the initial gas. It may be argued that these targets were too high and we failed to accomplish resuscitation with room air because we set the wrong targets. If our study population were similar to the populations used in the observational studies, with the median as the target, then by definition 50% of the infants would not achieve the target. In our study population, however, 100% of the infants failed to meet the target with room air as the resuscitating gas. The actual S_{PO_2} levels that are too high or too low for preterm neonates, and therefore unsafe, are not known. After the transitional period, most NICUs set upper and lower S_{PO_2} limits for infants receiving oxygen therapy. Although neonatologists would likely agree on the need for setting such limits, agreement among units on any actual number is doubtful.

One could question whether allowing a longer interval before such rescue would have resulted in spontaneously improving S_{PO_2} values. We think that this is unlikely; 1 infant in the room air group was not given oxygen until 7 minutes of life because the team was not certain that the oximeter was functioning. The infant did not have bradycardia and seemed to be in otherwise stable condition. This infant's S_{PO_2} values remained below 50% until the F_{IO_2} was increased, at which point the S_{PO_2} rapidly increased.

The need for a blender in the delivery area for the resuscitation of preterm infants highlights the potential for error, in that the team needs to check the actual blender setting before the beginning of any resuscitation, adding another variable to resuscitation preparation and management. We have experienced the situation in which a nonstudy infant who was thought to be receiving 100% was actually receiving room air. Another possible hazard in resuscitation with room air is the perceived need to compensate for low S_{PO_2} by increasing ventilation, leading to possible volutrauma or barotrauma.[39]

We postulate that the persistently low initial S_{PO_2} values we observed during room air resuscitation of very preterm neonates may be related to the lack of adaptation of the pulmonary vasculature at birth in the absence of supplemental oxygen. Therefore, we think that the low S_{PO_2} values probably reflect a fetal circulation with right-to-left shunting at the ductal and foraminal levels, secondary to continuing pulmonary vasoconstriction. The gradient between preductal and postductal S_{PO_2} values in preterm neonates may be larger and persist longer than reported by Mariani et al[28] for the term population. We speculate that there are different sensitivities of the pulmonary circulation to oxygen in preterm infants and term infants, and we think that this mechanism requires additional study in relevant animal models. In addition, although we did not observe any significant difference in intrauterine growth retardation between the groups, there were fewer such cases in the room air group, and fetal distress and/or hypoxia in utero, as may occur in infants with intrauterine growth retardation, may actually encourage this physiologic response and require oxygen to reduce the elevated pulmonary vascular pressures at birth.

The rate of PPV in our population was high, although cord blood gas values on average did not suggest that the infants were compromised before delivery. We think that this finding reflects the increased difficulties that preterm infants have with the transition to neonatal life, compared with term neonates. Our rate of PPV might be higher than previously thought because of the objective nature of our video review of the resuscitations and

because we did not rely on recall to document resuscitation events.

Preliminary data from a recent prospective trial by Escrig et al[40] in which extremely low gestational age neonates were randomly assigned to resuscitation with 100% or <40% oxygen showed that both groups achieved the target Spo_2 of 85% at ~8 minutes of age. In view of these observations and our own results, we think that a starting Fio_2 of 30% to 40% is appropriate for resuscitation of preterm neonates. Subsequent adjustment of Fio_2 may be necessary to allow the Spo_2 values to increase slowly to 85% by 7 to 10 minutes of age.

This trial is somewhat limited by the small sample size. However, the uniformity of results from 2 independent centers suggests that the findings were reliable and reproducible. Every resuscitated infant assigned randomly to room air at either site received an increase in Fio_2 to achieve the targeted Spo_2. Our study population included a wide range of gestational ages, from 23 to 32 weeks. Although there may be differences at the extremes of gestational ages, our sample size was not large enough for reliable evaluation of subgroups. The study population of infants of <32 weeks of gestation was consistent with the population of preterm infants for whom the NRP created new recommendations.

The trial was not blinded, by design. In part, this was because of the need for additional personnel in the delivery room. The lack of blinding might have resulted in differential resuscitation, including the possibility that the room air-resuscitated infants received more-aggressive ventilation. However, 31 infants were enrolled at a site that uses continuous video recording linked with analog data on heart rate, Fio_2, inspired pressure, and Spo_2. This method of obtaining data allows for accurate unbiased timing of events and analysis of interventions and physiologic responses. Although the intervention was not blinded, the analysis of data was performed in the most objective way possible. Because of the small size of the trial, we did not perform a prospective power calculation. On the basis of the Spo_2 differences at 3 minutes (55.71 ± 17.3% for the room air group and 87.39 ± 7.57% for the oxygen group), the actual power of the trial was 95%. However, this study did not have adequate power to assess the impact of the intervention on long-term outcomes.

In view of our observations, we recommend that, except for current or future clinical trials, room air should not be used as an initial resuscitating gas for preterm neonates of <32 weeks. Additional studies are required to determine the ideal initial Fio_2 for resuscitation of these infants.

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COURT UPHOLDS SCHOOL BAN ON CELL PHONES

"A ban on cell phones in the nation's largest school system was upheld Tuesday by a state appeals court. New York City's Department of Education passed rules in September 2005 barring students from having their phones in public schools. School officials and Mayor Michael Bloomberg have called the phones a distraction and say they could be used for nefarious purposes, including cheating. Parents say they need to stay in touch with their children in case of emergencies like the terrorist attacks of Sept. 11, 2001. They call the ban irrational and unsafe and say it intrudes on their right to determine what is best for their children. City lawyers argued that education officials had the right to make policy decisions—'the kind government officials make all the time'—about devices students are allowed to have at school."

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Resuscitation of Preterm Neonates by Using Room Air or 100% Oxygen

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