47. Oxygen saturation policy
48. Fluid and electrolyte management
49. Invasive mechanical ventilation
50. Continuous positive airway pressure (CPAP)
51. Nasal intermittent positive pressure ventilation (NIPPV)
52. Heated humidified high flow nasal cannula
53. Other oxygen delivery systems
54. Kangaroo mother care
55. Surfactant replacement therapy
56. Parenteral nutrition
57. Blood component therapy
58. Developmental supportive care
59. Pain assessment and management
60. Umbilical cord blood banking
Oxygen is a drug and oxygen toxicity can have significant adverse effects in preterm infants including bronchopulmonary dysplasia (BPD) and retinopathy of prematurity (ROP). Each NICU should have a policy for targeting oxygen saturation in neonates and implementation of such guidelines has shown reduction in the incidence of severe ROP.¹

What is the evidence on oxygen saturation targeting?
Five major randomized controlled trials, including the (NICHD) SUPPORT Study, the Benefits of Oxygen Saturation Targeting (BOOST II) trial, which covered the UK, Australia and New Zealand, and the Canadian Oxygen Trial (COT) compared two SpO₂ target ranges – low (85–89%) vs. high (91–95%) – in a large number of infants <28 weeks of gestation. The results have been pooled in a meta-analysis (NEOPROM). In total, 4,911 infants with a mean gestation of 26 weeks and mean birth weight of 850 grams were enrolled. The meta-analysis concluded that low SpO₂ target is associated with higher mortality (RR 1.18; 95% CI 1.04–1.34) and higher risk of NEC (RR 1.25; 95% CI 1.05–1.49) but lower risk of ROP (RR 0.74; 95% CI 0.59–0.92).

Implications for practice³:
1. Aim should be to avoid both hypoxia and hyperoxia
2. Oxygen therapy should be administered based on SpO₂ monitoring
3. Target SpO₂ in preterm neonates between 90% and 95%
4. Alarm limits should be set no more than 1% or 2% above or below the chosen target range and should always be ‘on’
5. Alarm delay should not be longer than 20 sec, to ensure that significant events are not missed
Change FiO₂ only in small increments of 1% to 3% to avoid fluctuations in SpO₂. A neonate with history of desaturations with handling or procedures and one with significant desaturation (SpO₂ < 70%) may require greater increments of 5% to 10%.

Fig. 47.1 and Fig. 47.2 depict a step-by-step action plan for a neonate who demonstrates high and low oxygen saturations on pulse oximeter, respectively.
Oxygen Saturation Policy in the NICU

Figure 47.2: Algorithm for low SpO₂ alarm

- **HR 155**
- **SpO₂ 82%**

Look at pulse oximeter:
Is HR and waveform accurate?

- Yes

Check HR and SpO₂
Is the baby breathing?

If no spontaneous efforts, provide stimulation and positive pressure ventilation

SpO₂ > 70% and HR >100/min

FiO₂ by 1-3% and observe. If SpO₂ is not increasing, increase FiO₂ in small steps (1-3%) every min until SpO₂ in target range

**Target SpO₂: 90-95%**
**Alarm limits: 88-95%**

SpO₂ < 70% OR HR < 100/min

Increase FiO₂ by 5-10% until SpO₂ > 85% and HR > 100/min. Once SpO₂ > 85%, increase FiO₂ in small steps (1-3%) every min until SpO₂ > 85%

Investigate the cause of desaturation

1. Rule out airway obstruction
2. Suction mouth/nose or endotracheal tube if secretions noted
3. Reposition head and neck
4. Check if endotracheal tube/ CPAP interface positioned correctly?
5. Is there a change in baby's condition-retractions/tachypnea/apnea?

If FiO₂ requirement is > 10% above baseline, re-evaluate respiratory status
References

