Flowchart for the Nurses' role in monitoring and targeting oxygen saturation levels in preterm neonates on nasal prongs

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This flow chart summarises nursing actions and is to be used in conjunction with the full evidence-based practice guideline (available from the author) and appropriate staff education and training.

Background

Hypoxia contributes to over a million preventable deaths in low resource settings annually[1]. Malawi has the highest rates of preterm births at 18.1 per 100 live births globally [2], contributing to respiratory illnesses 3. Preterm is defined as babies born alive before 37 weeks of gestation are completed[2]. In context like Malawi or similar settings in Africa where gestational age is often not confirmed any infant born weighing less than 1500g may be considered as a preterm[4].

Oxygen therapy is one of the most a common therapies used in the preterm neonates[5]. Continuous pulse oximetry allows the timely detection of hypoxia and hyperoxia, measures monitor oxygen saturation and aids in titration of oxygen to within target levels[5,6]. Maintaining oxygen saturations between 90%-95% minimizes complications (neurodevelopmental, cerebral palsy respiratory and visual impairments)5 and reduces neonatal mortality[2].

In low resource settings, hypoxia and hyperoxia are not well recognized or managed due to lack of knowledge, missing guidelines, inappropriate equipment, shortage of staff and other resources[5]. Evidence globally indicates that implementation of guidelines on oxygen saturation targets in preterm neonates and small newborn reduces complications [7].

Purpose of this guideline

The Evidence Based Practice Guideline (EBPG) aims to prevent hypoxia and avoid hyperoxia in preterm neonates who are receiving oxygen therapy via nasal prongs. Specific objectives are:

- To establish oxygen saturation target levels of between >90-95% to prevent complications for preterm neonates.
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Assess patient and Check O_2 saturations

Below and equal 90% | **Within Therapeutic range: > 90-95%** | **Above 95%**

B1

Increase O_2 therapy to 1L/min
- Target O_2 saturation levels >90-95%.
- Set alarm limits at 89-95%
- Explain to caregiver benefits and dangers of suboptimal O_2 therapy and what to observe/report
- Reassess patient along with O_2 saturation levels after 2 mins 5 mins, then every 15 mins for 1 hour then hourly for 4 hours
- If O_2 saturation >90% de-escalate to A1
- If O_2 saturation level <90% escalate to B2

A1

Maintain O_2 therapy at 0.5L/min
- Explain to caregiver benefits and dangers of O_2 therapy and what to observe/report
- Set alarm limits at 89-95%
- Reassess patient along with O_2 saturation levels first 15 mins for 1 hour. Then 1 hourly first 4 hours then 4 hourly for24 hours
- If <90% escalate to B1
- If >95% de-escalate to C1
- Still >90-95% de-escalate to A2

C1

Reduce O_2 therapy flow
- Target O_2 saturation levels >90-95%
- Educate caregiver on dangers of O_2 saturation levels >95%
- Reassess patient along with O_2 saturation levels 4 hourly
- If >90-95% escalate to A1
- If <90% escalate to B1
- Still >95% keep on room air de-escalate and wean
- Set alarm limits to 100%

B2
- **Trouble shoot**(D1) within 1 min
- Promptly escalate to doctor
- Titrate the O_2 flow to maximum 1L/min
- Maintain O_2 target levels of >90-95%
- Reassess patient along with O_2 saturation levels at 2 min, at 5 min
- If >90% de-escalate to A1
- If <90% escalate to B3

A2

Wean/de-escalate
- Disrupt O_2 for 15 min
- If O_2 saturation levels >95%, adjust alarm limits to 89-100%
- Keep on room air
- 4 hourly patient reassessments along with O_2 saturation levels for 24 hours
- If < 90% escalate to B1
- If >95% wean /de-escalate

STOP
- Continue essential nursing care on 0_2(D2)
- Refer for O_2 therapy complications screening

B3

Escalate
- Administer $O_2$2L/M via face mask.
- Explain to parent/caregiver dangers of hypoxia
- Prepare for CPAP

STOP
- Use CPAP/COIN/NEST Guidelines
- Use emergency nursing care

STOP
- Continue essential nursing care on 0_2(D2)
- Refer for O_2 therapy complications screening

PRETERM NEONATE O_2 SATURATION CHART

SPO2 measured by pulse oximetry	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Preterm neonates on oxygen via *nasal prongs*	UNSAFE						SAFE							UNSAFE		
Preterm neonates on *room air*	UNSAFE											SAFE				

D2

ESSENTIAL NURSING CARE WHILE ON OXYGEN THERAPY
1. Saturation monitoring using pulse oximetry
2. Ensure nasal prongs are secured
3. Assess skin and perfusion under saturation probe
4. Record DROP (desaturation, respiration, observations, patient assessment) and time & date for each step in the process
5. Provide regular updates to caregivers

D1

HOW TO TROUBLE SHOOT
1. **Assess patient**: for secretions, nasal prongs displacement, respiratory distress, abdominal distension, skin and perfusion under pulse oximetry probe.
2. **Check oxygen equipment:** check oxygen flow, power source, oxygen level in cylinder, leaks in the tubes and connectors.
3. **Check pulse oximeter:** Check appropriateness of probe size, position, light on the diode, battery life and wave pattern

References: *[1] Clinton Health Access Initiatives (2020). Oxygen Therapy https://www.clintonhealthaccess.org/our-programs/oxygen/ [2] WHO (2018). Preterm Births. 19 Feb, 2018 https://www.who.int/news-room/fact-sheets/detail/preterm-birth [3] The Royal Children Hospital Melbourne (2020). Oxygen saturation SpO2 level targeting in neonates. https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Oxygen_Saturation_SpO2_Level_Targeting_Premature_Neonates/ [4].Visser, L., et al (2012). Guideline for the prevention, screening and treatment of retinopathy of prematurity (ROP). South African Medical Journal, 103(2), 116-125. doi:10.7196/SAMJ.6305 [5].WHO (2016). Oxygen Therapy for Children WHO: Manual for Health Care Workers. Geneva https://apps.who.int/iris/bitstream/handle/10665/204584/9789241549554_eng.pdf?sequence=1 [6].WHO (2020). Standards for improving the quality of care for small and sick newborns in health facilities https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/newborn-health/preterm-and-low-birth-weight [7].Finer, N., & Leone, T. (2009). Oxygen saturation monitoring for the preterm infant: the evidence basis for current practice. Pediatric research, 65(4), 375–380. https://doi.org/10.1203/PDR.0b013e318199386a*

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