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Chapter 4. ROP prevention, screening and treatment programmes

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ABSTRACT

India is home to largest number of preterm births and neonates at risk of developing retinopathy of prematurity. Being a large heterogenous country, different approaches including training of local ophthalmologists, tele-screening by ophthalmic technicians carrying wide-angle retinal cameras and use of low-cost retinal cameras by neonatal unit healthcare providers are being tested to expand the coverage of screening.

Infrastructure for facility-based neonatal care has received a tremendous boost over the last few years in India. Over 600 well-equipped Special Newborn Care Units (SNCUs) at district-level hospitals and over 2000 newborn stabilization units (NBSU) at sub-district health facilities have been set up across the states.[1] These SNCUs are providing care to thousands of neonates across India. It is estimated that about 110,000 preterm neonates survive each year in India and many are therefore at risk of ROP.[2] However, due to lack of an adequate number of ophthalmologists trained in retinal examination, most preterm neonates, particularly those born and cared for in peripheral district hospitals, are either not screened at all or do not complete screening for ROP. Furthermore, review of data from the SNCUs reveals wide variation in rates of survival to discharge amongst preterm infants, as well as wide variation in incidence of morbidities (e.g. neonatal sepsis) and exposure to interventions (e.g. days in oxygen).[1] In the absence of adequate monitoring of important healthcare processes and outcomes, the health facilities can become a fertile ground for the emergence of blindness due to ROP. This is corroborated by the increasing number of infants with stage 4 and 5 ROP being seen by the ophthalmologists. Among 354 neonates referred to a national referral hospital, 115 (35.5%) had stage 5 ROP in both the eyes.[3] The epidemic of ROP in India and other middle-income countries is because of higher proportion of preterm births, improving survival of preterm neonates due to wider coverage of facility-based neonatal care, lack of adequate number of trained neonatal healthcare providers, equipment and policies to prevent exposure to risk factors of ROP, inadequate number of trained ophthalmologists and lack or inconsistent application of ROP screening programs.[4,5]

Lack of ophthalmologists trained to screen for ROP has hampered the efforts to increase coverage of screening. In the cohort of 115 neonates with stage 5 ROP mentioned above, 109 (89.8%) were never screened for ROP.[3] The mean delay to the first ophthalmic examination was about 6 months. Once severe ROP is detected, providing treatment is an even more daunting task due to the lack of ophthalmologists trained in performing retinal laser ablation. Families frequently need to travel thousands of kilometres to find a health facility which can offer laser ablative therapy. Different approaches have been used in India to surmount this challenge. To build capacity in screening and treatment of ROP, tertiary care referral centres are providing in-service training to ophthalmologists in screening (in district level hospitals) and

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treatment (in Medical Colleges).[6] Another approach to screening of ROP has used a wide-angle retinal camera which is transported by ophthalmic technicians to neonatal units in different cities where images are captured and transmitted to an expert ophthalmologist who reviews the images and decides about the need of treatment.[7] Initially started in the state of Karnataka in 2008, this tele-screening approach is now being tested and adopted by many other states. The availability of low-cost retinal cameras in the near future has the potential to mitigate this demand-supply gap.[8] A mixed model which uses ophthalmologists, paediatricians, nurses and ophthalmic technicians based on their availability is the way forward to increase coverage of ROP screening in a heterogenous country like India.

Lack of uniform screening guidelines can hamper the roll out of an effective public health program to prevent blindness due to ROP. The Government of India has published recommendations for selecting neonates for screening.[9] Due to evidence of the occurrence of ROP in heavier and more mature preterm neonates compared with high-income countries,[10] the Indian guidelines recommend screening of neonates born at less than 34 weeks of gestation and, if gestation is not known, of neonates born with weight less than 2000 g.[9] In addition, neonates born at 35–36 weeks of gestation also need to be screened if exposed to risk factors of ROP. These guidelines, while increasing the sensitivity of screening programs, also greatly increase the number of preterm neonates needing eye examination as most of premature neonates are born after 32 weeks of gestation. It is expected that as the quality of neonatal care improves, relatively mature preterm neonates can be spared from the screening net.[11] Currently the national SNCU database does not capture information about ROP screening and treatment.[12] It is necessary to collect these data in order to monitor coverage and quality, and to identify which babies develop disease-requiring treatment to refine the ROP screening guidelines. Additional data are also required on the number of neonates eligible for ROP screening and the proportion screened within the recommended timeframe; the proportion of neonates who need treatment and the proportion treated within the recommended timeframe.[13]

ROP is not only amongst the commonest causes of acquired blindness in children but also an excellent indicator of the quality of care provided to preterm neonates in a health-facility. Risk factors of ROP identified in studies from low- and middle-income countries include oxygen therapy, systemic sepsis, poor weight gain and exposure to blood products.[14–18] Therefore, interventions aimed at reducing ROP are likely to impact many aspects of neonatal healthcare resulting in improved rates of intact neonatal survival without abnormal neurological outcomes. It is anticipated that with capacity building in ROP screening, the number of neonates needing treatment will initially increase. However, parallel to increasing the ROP screening coverage, quality improvement initiatives are needed to reduce the risk of developing severe ROP.

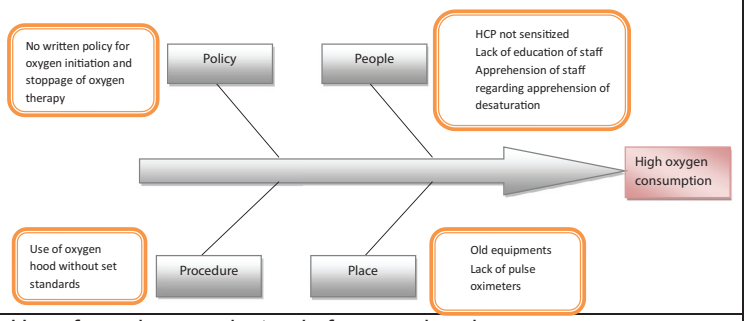
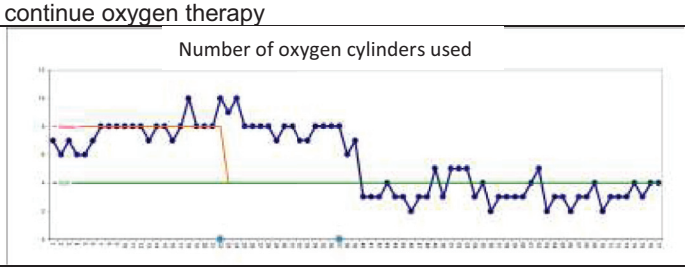
Aim statement	To decrease oxygen consumption in SNCU Sehore from 8-10 cylinders/day to 3-4 cylinders/ day over a timeline of 8 weeks.
Target group	Neonates admitted in SNCU
Improvement method	Potential barriers limiting optimal oxygen usage in the target group evaluated using fish bone analysis and process flow chart. Change ideas tested in sequential plan-do-study-act (PDSA) cycles.
Analysis of problem	
Change ideas tested	Use of nasal prongs instead of oxygen hood Regular monitoring of oxygen saturation and assessing need to continue oxygen therapy
Effect of change idea	
Result	Number of neonates on oxygen therapy was reduced and oxygen requirement was decreased from 8 cylinders/day to 3-4 cylinders/day thus saving nearly US$ 1000 per SNCU each year

Fig. 1 – Example of a quality improvement project.

Table 1 – Measures to prevent blindness due to retinopathy of prematurity.

	Short-term measures (1–3 years)	Medium-term (4–7 years)
Prevention of ROP	Increasing coverage of antenatal steroids.	Research in use of drugs for prevention of ROP (e.g. propranolol)
	Provision of adequate number of compressed air points, air-oxygen blenders and pulse oximeters as essential equipment in special care neonatal units.	Infrastructure to monitor and report healthcare processes and health outcomes including ROP risk factors, screening and treatment
	Increasing use of non-invasive ventilation and surfactant	
	National policy on safe use of oxygen in neonates	
	Infection prevention practices including hand-washing and antibiotic use stewardship	
	Promotion of use of human milk	
Screening for ROP	Training district ophthalmologists in indirect ophthalmoscopy	Use of low-cost retinal camera by paediatricians, nurses or ophthalmic technicians in areas where ophthalmologists are not available
	Public-private partnership for ROP screening	
Treatment of ROP	Training ophthalmologists in retinal laser ablation at medical colleges	Research in short- and long-term effect of anti-VEGF drugs especially in developing country scenario with higher incidence of asphyxia and intrauterine growth restriction.
	Equipping and operationalizing a treatment hub to provide services to 3–5 SNCUs	
	Incorporation of ROP-related outcomes in national level SNCU database	

A gradual reduction in the incidence of severe ROP despite improving survival of very premature neonates has already been reported by tertiary care referral hospitals of India.[11] There is a need to take this culture of quality monitoring and improvement to peripheral health facilities. The most important quality improvement intervention which reduces the incidence of severe ROP is regulating oxygen use.[19] Assessment of the need of oxygen at admission to the neonatal unit, monitoring oxygen saturation and titrating oxygen concentration to reach the target saturation are important interventions. Implementation of these evidence-based practices needs not only national guidelines and training of health care providers but also a healthcare structure with an adequate number of pulse oximeters and oxygen-air blenders.

Several quality improvement projects are being carried out in India with an aim to improve neonatal care.[20] A quality improvement initiative being conducted in Madhya Pradesh has evaluated the adequacy of health structure and knowledge, skills, and practices of healthcare providers in preventing exposure to risk factors for ROP. Based on this assessment a preterm neonate learning package has been developed and implemented in different SNCUs. Healthcare provider teams at these SNCUs have been trained in identifying and prioritizing health problems, making quality improvement teams, setting aims of improvement, analysing reasons for the problems and then testing change ideas to bring about improvement. These quality improvement projects, which have a bottom-up approach, have been successful in reducing exposure of neonates to oxygen and antibiotics, reducing the incidence of hypothermia on admission, initiating enteral feeds earlier after admission, and increasing the use of human breast milk (Fig. 1). In addition, many small, single centre studies have reported improvement in the care delivery and experience. For example, Mehta et al. reported an increase in ROP screening rate from 10.7% to 87.3% by training neonatal nurses, counselling parents, fixing the day, time and place of counselling and screening, assigning a ROP nurse, and improved documentation.[21] Other studies report a decrease in patient waiting time in a ROP clinic by improving the workflow[22] and an increase in the proportion of time neonates spend in the target oxygen saturation range from 65.9% to 76.5%. This was achieved by implementing an oxygen use policy and feedback about performance in adhering to the target range to healthcare providers.[23]

Prematurity is the most important risk factor for ROP and the incidence of prematurity in India is higher than many other regions of the world.[24] Coupled with increasing survival of preterm neonates with the expansion of facility-based care, India will be the biggest contributor to the global pool of children blind due to ROP unless concerted efforts are made. Understanding the epidemiology of prematurity, decreasing preventable preterm births from iatrogenic causes, improving the coverage of antenatal steroids and improving the quality of golden hour care are needed to prevent sight-threatening ROP (Table 1).

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