

Quality Improvement Initiative to Improve the Screening Rate of Retinopathy of Prematurity in Outborn Neonatal Intensive Care Graduates

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Objective: To improve the screening rate of Retinopathy of prematurity (ROP) in the outborn neonatal intensive care unit, using the quality improvement method. **Methods:** 40 neonatal nurses, 89 parents from an outborn neonatal intensive care unit of a tertiary-care hospital were included in the study between May 2017 and March 2018. Universal sampling method was used. **Results:** In 345 neonates, ROP screening rate increased from 10.7% in the pre-intervention phase to 45.5% and 87.3% in the intervention and post-intervention phase, respectively. **Conclusion:** Point of care quality improvement (POCQI) method can be effectively used to improve ROP screening rate in outborn neonates.

Keywords: Counselling, Neonatal nurses, Outcome, PDSA.

Retinopathy of prematurity (ROP) is a leading cause of childhood blindness [1,2], and parental sensitization and counselling play a vital role in its prevention. Literature shows that education and counselling of parents regarding ROP has resulted in improved screening and follow-up rates [3]. Similarly, training and education of neonatal nurses can play a major role in prevention and treatment of ROP [1]. However, in the existing public health care delivery system, these two measures have not been effectively implemented.

The Point of care quality improvement model (POCQI) has been designed to build capacity for quality improvement in healthcare facilities [4,5]. In this study, the quality initiative method was used to improve existing screening of ROP by educating neonatal nurses and parents regarding ROP. Using point of care quality improvement methods (POCQI) [5], the existing flow of outborn NICU (neonatal intensive care units) graduates for ROP screening was also modified to increase and sustain the screening rate of ROP.

METHODS

This was a quality improvement study [6] that was done in outborn neonatal intensive care unit (NICU) of a tertiary care centre from May 2017 to March 2018. Ethical clearance was obtained from Institutional Ethics Committee-Human Research (IEC-HR). The study was conducted in three phases, baseline/pre-intervention (two

months), intervention phase (two months) and post-intervention phase/sustenance phase (seven months). A QI team consisting of lead investigator (team leader), co-investigator, nursing in charge NICU, doctor in charge NICU, two neonatal nurses, one senior resident (post MD), one postgraduate student, and one parent of a neonate was constituted. A total of 89 parents (42 in the pre-intervention and 47 in post-intervention phase) and 40 nurses (same group in both phases) were included in the study after taking informed consent. All the nursing staff of the outborn NICU and Step-down area were included in the study (universal sampling). Similarly, all the parents of the high risk neonates who were admitted to outborn NICU and met the inclusion criteria as per the Government of India guidelines for ROP screening [7] were included consecutively in the study after taking informed consent. Data of 345 neonates was analyzed to assess the ROP screening rate.

In the baseline phase, QI team met once a week. This phase dealt with process mapping and collection of baseline data. Process mapping was to understand and document the existing protocol for identification, counselling about ROP and discharge of high risk NICU graduates (*Web Fig. 1*). The baseline data included existing ROP screening rate, knowledge of neonatal nurses regarding ROP using a self-designed questionnaire, awareness regarding ROP among parents of LBW/preterm infants using a self-designed questionnaire. The QI team discussed the bottlenecks in

the existing protocol and barriers in implementing the suggested improvement strategies. A fish bone analysis for various factors determining ROP screening rate was analyzed (*Web Fig. 2*).

The questionnaire for testing the knowledge of nursing staff was a self-administered questionnaire. It had eight factual, closed-ended questions covering various aspects of ROP, like eligibility criteria for screening, risk factors for ROP, age of first screening, etc. Each correct answer was given a score of +1 while wrong answer got 0 (maximum score +8 and minimum 0). It was pretested on four nurses and modified based on their feedback. Likewise, the questionnaire for assessing the awareness of parents was also a self-administered questionnaire. It had four dichotomous (Yes/No) questions and one semi-open ended question. Each Yes was given +1 while No was given 0 (Maximum positive response +5 and minimum 0). It was pre-tested on ten parents and modified accordingly.

ROP screening rate (expressed as %) was defined as number of neonates coming for first ROP screening (at four weeks post-natal age) out of total neonates requiring ROP screening [7]. For the baseline ROP screening rate, retrospective data of 6 months was used (January 2017 to June 2017). In the intervention phase, change ideas that came out of fish bone analysis were introduced into the system. Each change idea was tested using small PDSA (Plan-do-study-act) cycles. Adaptations were made in the change ideas and then they were implemented.

After baseline phase, we concluded that training of nurses and counselling of parents was required. For training of nurses, PDSA cycle was done involving four nurses over a period one week. Training material was prepared by the QI team. Each one of them was trained shift-wise at their place of duty (outborn NICU and step-down area). They were individually explained and written material was given. Posters were displayed at appropriate points. Based on PDSA learnings, changes in the training process and training material were made and implemented on rest of the nursing staff.

Similarly, for counselling of parents, we conducted PDSA cycle. The method of counselling was demonstrated to the nursing staff. Initially, it was decided that counselling will be done in outborn NICU. This was tested for one week. Feedback was taken and we learned that nursing staff was not able to counsel the parents in the NICU due to the workload. So, place of counselling was shifted to step down area. It was also decided to conduct counselling twice to reinforce the importance of ROP screening (first at the time of transfer to step down and second at the time of discharge).

Two days per week were fixed as days of ROP screening because it helped the QI team keep a track of neonates who required screening and it was more convenient for ophthalmology department, as per their feedback. Guidelines were displayed in the Neonatal high-risk clinic. A neonatal nurse was assigned as ROP nurse so as to supervise the new system, collect feedback from nurses and parents, motivate the staff and monitor the screening rate fortnightly. A separate register for ROP was made in the step-down area. All details of infants that required ROP screening were entered in that register including number of counselling sessions, date of screening and phone number.

Finally, following changes were made in the system: (1) training of neonatal nurses; (2) counselling of parents; (3) fixing the place and time of counselling; (4) fixing the day of ROP screening; (5) pupillary dilation for ROP screening within the same premises; (6) displaying the guidelines for ROP screening in neonatal high risk clinic (NHRC) and on follow-up sheet of neonates; (7) assigning a ROP nurse; and (8) pre-registration of neonates for ROP screening.

Post-intervention/sustenance phase dealt with reinforcement, monitoring, feedback, training of new staff by the ROP nurse. Data for ROP screening rate, knowledge of nurses, and awareness of parents about ROP after the intervention was also collected. QI team meets once in two months to collect feedback from all stakeholders and to make any further changes in the system, if required.

RESULTS

In the pre-intervention phase, there was no uniform counselling, screening and discharge protocol for ROP (*Web Fig. 1*). Knowledge of nurses regarding ROP was deficient (median score of 5 on an 8 point questionnaire). They were not aware about identifying which neonates required ROP screening (*Web Table I*). Parents had poor awareness regarding ROP and hence did not understand the need for screening (median positive response of 1 out of 5 on the questionnaire). Only 2.4% (1/42) parents knew about ROP (*Web Table II*) while 81% (34/42) parents knew about breastfeeding and 64.3% (27/42) knew about Kangaroo mother care. This was because of a pre-existing counselling protocol for breastfeeding and Kangaroo mother care. Baseline ROP screening rate was 10.7% (16/149).

After the intervention, a new protocol for counselling and screening was formed (*Web Fig. 1*). Nursing staff were now aware about ROP (median score of 8 on a 8-point questionnaire); 97.5% nurses correctly answered

WHAT THIS STUDY ADDS?

- In resource-limited settings, simple process flow changes with empowerment of nursing staff and parents can improve quality of care for neonates with ROP.

about the screening criteria of ROP (**Web Table I**). Also, the median positive response of parents on the questionnaire increased to 5 out of 5 and 78.7% (37/47) parents knew about ROP after the intervention (**Web Table II**). ROP screening rate during the period of intervention was 45.5% (21/46).

Web Fig. 3 shows the time-run chart for ROP screening rate in the intervention phase. After training of nursing staff and effective counselling of parents, ROP screening rate started to rise. The two dips in screening rate were handled by change in place of counselling and assigning an ROP nurse (**Web Fig. 3**). ROP screening rate in the post intervention phase was 87.3% (131/150). Screening rate increased from 36% at the start of intervention to 94.7% at the end of post-intervention phase.

DISCUSSION

Parental awareness regarding ROP is crucial to successful ROP screening and follow-up. Vinekar, *et al.* [3] showed that improving awareness of parents can result in improved ROP follow-up rate.

All this could be achieved as the learning points for the nursing staff and counselling points for parents prepared by QI team were made objective and easy to understand and recall. Simplification of the material was possible because of small PDSA (Plan-do-study-act) cycles which were tested in a smaller group of 2-3 nursing staff and parents before implementation.

The limitations of the study include lack of pre-study data, only outborn NICU graduates, unvalidated questionnaires, and a short duration sustenance phase of only seven months.

The existing process flow was re-engineered to form a new process flow. The revised process flow also helped substantially in ensuring effective counselling and prevented any additional workload to the existing nursing work-schedule. The nursing staff also had a sense of empowerment and satisfaction in being able to effectively communicate with the parents about ROP, which may have played a major role in sustaining the changes.

The most important barrier we faced while implementation of a new system was that certain staff

members were rigid to change. This was tackled by motivating them, explaining them the importance of ROP screening and sharing with them the success stories of other QI projects. Inter-departmental coordination was another challenge. This was overcome by including ophthalmology resident and nurse in the team. There active participation improved the coordination.

QI method helped us in significantly improving parental awareness, knowledge of nurses and ROP screening rate in a short interval of time without additional resources and manpower. This shows that small PDSA (Plan-do-study-act) cycles can yield good results within the existing system. Our study proves that point of care quality improvement methods can be successfully used to improve the health care delivery system in a resource-limited setting.

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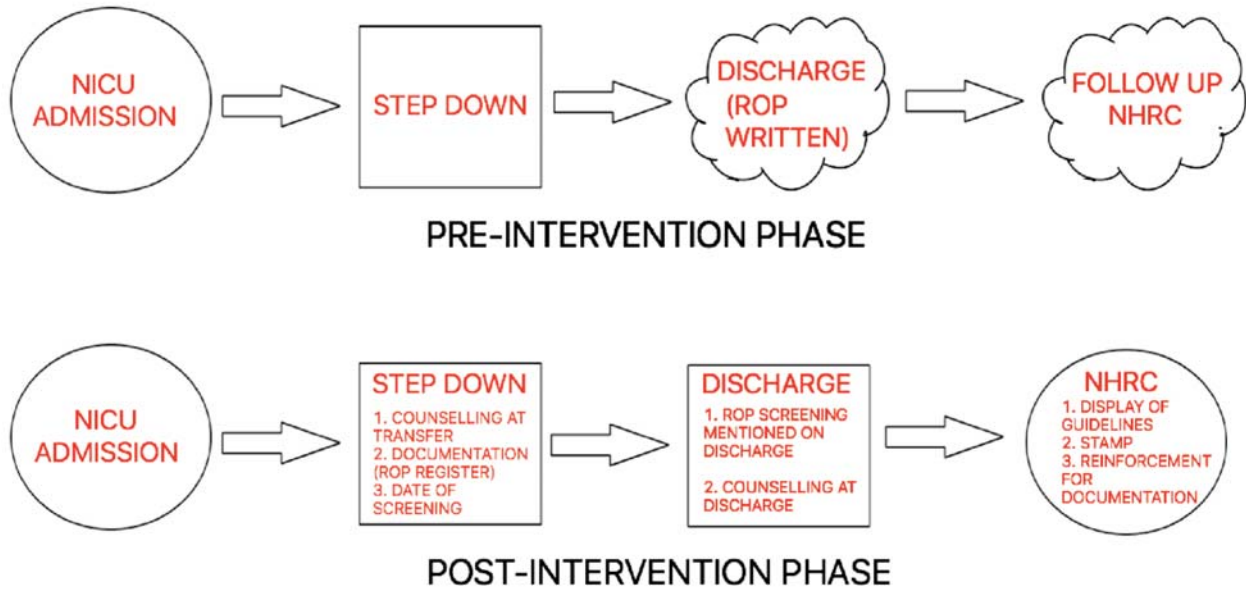
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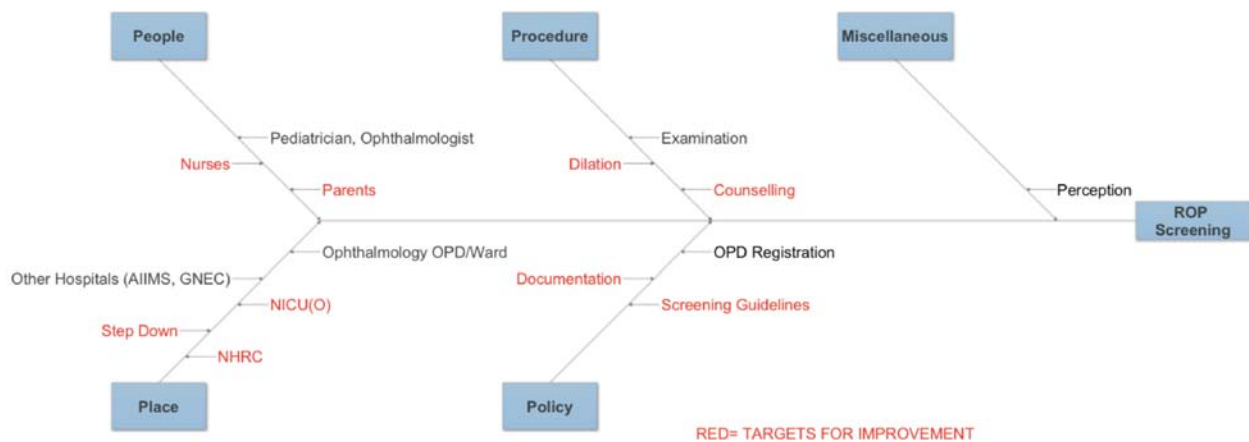
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PROCESS MAPPING

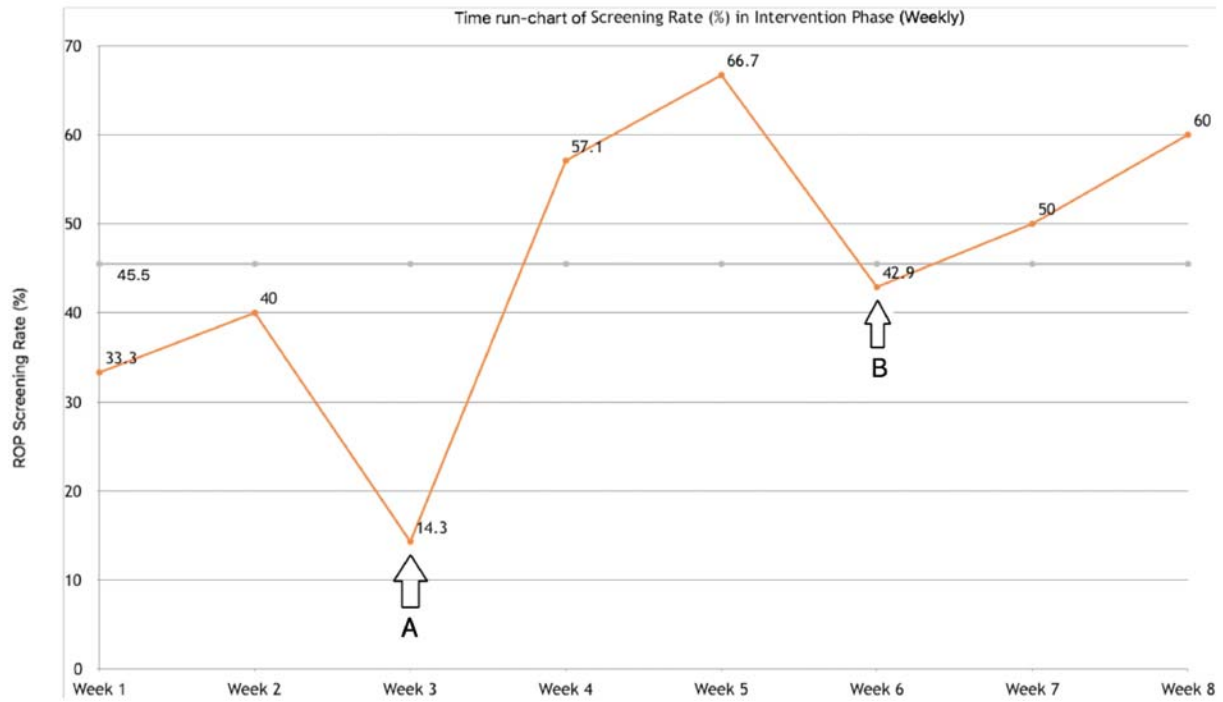


WEB FIG. 1 Process mapping of the quality improvement project for improving screening for retinopathy of prematurity.



FISH BONE ANALYSIS

WEB FIG. 2 Fish bone analysis of the quality improvement project for improving screening for retinopathy of prematurity.



WEB FIG. 3 Effect of training of nursing staff and counselling of parents on screening rate of retinopathy of prematurity. The two dips in screening rate were handled by change in place of counselling (A) and assigning a ROP nurse (B).

WEB TABLE I NURSES PROVIDING CORRECT RESPONSE (*N*=40).

<i>Question</i>	<i>Pre-intervention phases (%)</i>	<i>Post-intervention phases (%)</i>
Recommended level of Oxygen Saturation in Neonates	13 (32.5)	36 (90.0)
ROP affects which organ	35 (87.5)	40 (100.0)
Birth Weight criteria for ROP screening	27 (67.5)	39 (97.5)
Gestational age criteria for ROP screening	10 (25.0)	39 (97.5)
Risk factor For ROP	23 (57.5)	39 (97.5)
Follow-up of ROP screening done at what gestational age	23 (57.5)	40 (100.0)
Treatment of ROP done by	36 (90.0)	40 (100.0)
Treatment modality of choice for ROP	17 (42.5)	40 (100.0)

ROP: Retinopathy of prematurity.

WEB TABLE II PARENTS PROVIDING POSITIVE RESPONSE

<i>Question</i>	<i>Pre-intervention phase (N=42) n (%)</i>	<i>Post intervention phase (N=47) n (%)</i>
Knowledge received about risks in preterm baby	3 (7.1)	39 (83.0)
Counselling received regarding care of preterm baby	6 (14.3)	47 (100.0)
Counselling regarding ROP	1 (2.4)	37 (78.7)
Counselling regarding risk to vision	1 (2.4)	40 (85.1)
Advised to get ROP screening	2 (4.8)	40 (85.1)

ROP: Retinopathy of prematurity.