

Developmentally Supportive Positioning Policy for Preterm Low Birth Weight Infants in a Tertiary Care Neonatal Unit: A Quality Improvement Initiative

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Objective: To improve developmentally supportive positioning practices by 50% in neonates weighing <1800 g, admitted in a neonatal intensive care unit over 6 months. **Methods:** Infant Position Assessment Tool (IPAT) scores were used for assessment of the ideal position. Proportion of neonates with IPAT score ≥ 8 and improvement of average IPAT score were the process and the outcome measures, respectively. At baseline, 16.6% of infants had optimum position. After root cause analysis, interventions were done in multiple Plan-Do-Study-Act (PDSA) cycles of educational sessions, positioning audits, use of low-cost nesting aids, and training of mothers. **Results:** Over 21 weeks, 74 neonates were observed at 714 opportunities. Over 6 months, mean (SD) IPAT score improved from 3.4 (1.4) to 9.2 (2.8). Optimum positioning was maintained in 83.3% neonates during sustenance phase. **Conclusions:** Low-cost interventions, awareness regarding standards of optimum positioning and involvement of primary caregiver can effectively improve infant positioning practices.

Keywords: Conformational position, Infant Positioning Assessment Tool (IPAT), Nursing care, Posture, Outcome.

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In developmental supportive care (DSC), positioning is the most important strategy that affects physiological stability and reduces stress [1]. Optimum positioning improves sleep, reduces pain, decreases apnea/desaturation episodes, improves thermal regulation, skin integrity and neurobehavioral organization [2,3]. Several studies have documented beneficial effects of supportive positioning interventions including reduction in musculoskeletal abnormalities and better neuromotor outcomes [4,5]. Frequent position changes with the use of 'nesting' or 'conformational positioner' have shown to improve the postural regulation with maintenance of optimum position [6,7].

The awareness of neonatal caregivers regarding infant positioning is scanty [8]. Improvement of practices were documented after educational training, positioning audits and policy formation [9]. This quality improvement (QI) initiative was undertaken to improve the developmentally supportive positioning practices in low birth weight neonates.

METHODS

Our neonatal intensive care unit (NICU) is a 24-bedded

level-III unit with >2500 deliveries/year and >100 admission/month. The nurse: patient ratio is 1:1 for neonates on ventilator, 2:1 for sick neonates and 4:1 for relatively stable infants. The concept of DSC in our unit was limited to the routine use of a shoulder roll only. On a cross-sectional review of practice, over 80% admitted neonates at our center were found in unacceptable positions, supine with retracted shoulders/extremities (93.4%), undue neck flexion (70%) and excessive hip abduction due to oversized diaper (100%).

We aimed to improve developmentally supportive positioning practices by 50% in neonates weighing <1800 g admitted in the NICU over 6 months (April, 2019-September, 2019). This QI initiative was based on point-of-care quality initiative (POCQI) model [10]. Ethical clearance was obtained from Institute Ethics Committee.

Infant positioning assessment tool (IPAT; Philips Children's Medical Ventures), validated by several studies [11-14] was used to improve the positioning practices. Eligible neonates (birthweight <1800 g) were scored by a team of 'Positioning proponents (PP)', once in every shift and an average daily score was assigned to each baby. Proportion of neonates with average IPAT

score ≥ 8 was taken as the process measure. Improvement in mean IPAT scores was the outcome measure.

Baseline phase (4 weeks): In this phase, the applicability of IPAT score was validated in 6 neonates at 30 opportunities. A team of two doctors and six nurses identified as PP, were trained in developmentally supportive positioning practices and IPAT scoring. Mean (SD) IPAT score was 3.4 (1.4) and proportion of neonates with mean IPAT ≥ 8 was 16.6%. Potential causes of improper positioning identified through root cause analysis (**Fig. 1**) included lack of knowledge/skills, unavailability of positioning aids, high patient load, respiratory support, multiple infusions and non-availability of measurement tool.

Intervention phase: After baseline phase, Plan-Do-Study-Act (PDSA) cycles (**Web Fig. 1**) were used for interventions. IPAT was introduced and one-to-one teaching, hands-on demonstration-cum-practice session and assessment of nurses and residents were started. Data were recorded in excel sheet and plotted on run chart weekly. To prevent bias, average score was disclosed weekly.

PDSA-1: Learning by doing (4 weeks): A schedule and the teaching material were distributed among team members. IPAT print-outs were made available at the bedside. Group teaching, informal bedside and one-to-one teaching, position demonstration on mannequin and baby were continued for next 2 weeks in every nursing shift. Nurses were assessed once weekly for IPAT scoring of five neonates with demonstration of ideal positioning. Additional review sessions were organized for newly-posted residents and nurses. Educational material was shared electronically. Finally, IPAT scoring was made a part of daily nursing care with scoring done in each shift and entered in nursing notes.

PDSA-2: Customized boundary (4 weeks): Preparation of boundaries or 'nesting' with rolled linens was detected as one of the limiting factors due to non-availability of linens and reluctance of nurses for the labour-intensive process of preparing the nest. To resolve this, we prepared customized low-cost, washable and autoclavable, foam based reusable boundaries with covers by the hospital tailor (**Fig. 2**). This intervention decreased the require-ment of linen rolls and significantly reduced the time required for positioning of the neonates without impos-ing an additional burden to prepare nesting, boosting their enthusiasm for improving position. After this intervention, 50% of neonates had an IPAT score ≥ 8 .

Two sick neonates were observed to developed occipital bed sore due to prolonged supine positioning. In order to maintain high IPAT score, nurses were maintaining supine posture with fixed boundaries without changing to lateral/prone positions. An amendment in positioning policy was made with inclusion of compulsory three-hourly position change.

PDSA-3: Appraisal and improvement (12 weeks): In this phase, we started selecting 'PP of the week' and appreciating them with a badge, which further improved the zeal of caregivers. Workshops on DSC with weekly refresher sessions were conducted. Now, positioning became a routine practice amongst the caregivers improving the proportion of neonates with IPAT ≥ 8 to 72.5%.

PDSA-4: Sizing the diapers (4 weeks): Following third PDSA cycle, it was analyzed that position of hips and legs could not be maintained because of oversized diapers. Since small diapers were not a part of hospital supply, we started making customized diapers for preterm with cotton and gauze (**Fig. 3**). After this, the number of

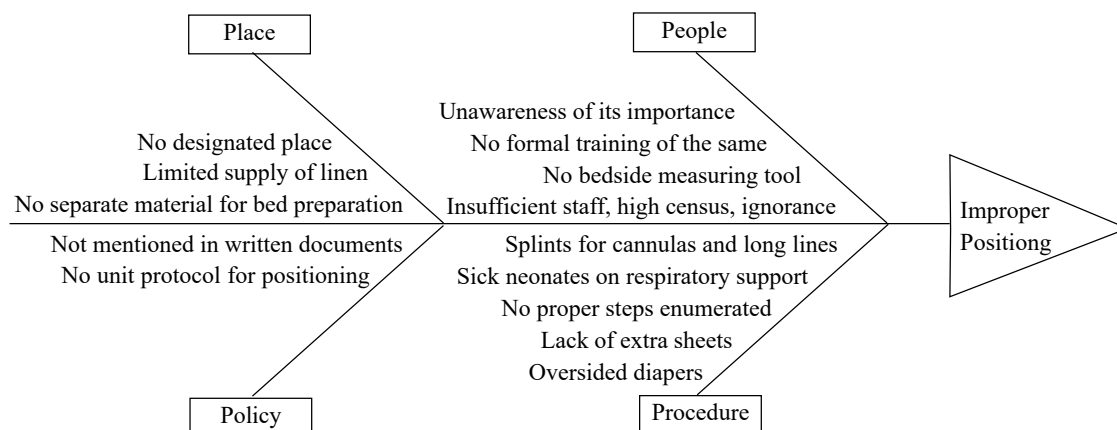


Fig. 1 Root cause analyses: Fish bone diagram for improper positioning.



Fig. 2 Positioning aid for optimum positioning.

neonates with oversized diapers reduced from 74.5-20%.

PDSA-5: Training of mothers (8 weeks): After fourth PDSA cycle there was a visible improvement in positioning practices of the unit. Team analyzed that most of the LBW neonates are shifted to step-down units with their mothers soon after clinical stabilization, and decided to train the mothers. Teaching materials and posters were prepared in the local language. Demonstrations were done using mannequins daily for one week. Every new mother was given a refresher tutorial. Training mainly focussed on preparation of boundaries using easily available home-stuff such as towels and scarfs, preparation of shoulder rolls and its correct placement, difference between improper and proper positions and their long-term implications. 'Position expert' mothers were praised and asked to teach other mothers. Considerable acceptance was noted in their behavior.

RESULTS

Before starting interventions, each PP independently scored 6 neonates at 30 opportunities. Inter-rater reliability was analyzed with interclass correlation coefficient (95% CI) of 0.89 (0.83-0.94) using two-way mixed model, suggesting a strong level of agreement and high reliability of data-recording. For the position data, we calculated the baseline mean using the first 10 data-

points and recalculated the mean whenever a shift in data was identified. In the baseline phase, 18 neonates with mean (SD) birthweight and gestational age of 1230 (265) g and 30.5 (2.6) weeks, respectively were observed over 4 weeks. Mean (SD) IPAT score was 3.4 (1.4) and 16.6% of eligible neonates had IPAT score ≥ 8 .

Throughout this project, 74 neonates were observed at 714 opportunities. Forty-four nurses, 10 senior residents, 15 junior residents and 52 mothers were trained in standard positioning practices. Total 23 teaching sessions were conducted including 12 sessions of hands-on demonstration, 2 institutional workshop and 9 assessment sessions. For training of mothers, 12 teaching sessions and 20 demonstration-cum-hands-on training were conducted.

After first PDSA, mean (SD) IPAT score improved to 5.2 (1.6) with biggest limitation being lack of positioning aids. After third and fourth PDSA, introduction of nesting rolls and appropriate size diapers had significantly improved mean (SD) IPAT score to 9.2 (2.8) with sustenance for next 6 weeks. The chart showed less than expected number of runs signalling for an improved practice. In the last PDSA cycle, the baseline data was recorded again when the baby was shifted to step-down unit with the mother. Baseline mean (SD) IPAT scores of 3.5 (1.3) improved over next 5 weeks to 8.3 (0.2) (**Web Fig. 2**).

DISCUSSION

This short-term QI project aimed to improve the practice of infant positioning. A significant improvement was noted in the proportion of admitted neonates with IPAT score ≥ 8 from the baseline of 16.6-83.3%. In coherence with other projects on position improvement [12-14], nursing teaching and demonstration sessions were found to be most impactful. Inclusion of mothers in the loop was the most important factor for sustenance policy.

Compared to previous reports [12-14], the major difference in this project was the achievement of targeted

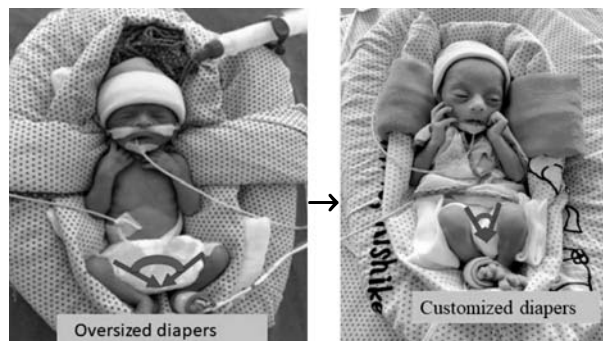


Fig. 3 Customized diapers for extremely low birth weight babies.

WHAT THIS STUDY ADDS?

- Compliance with developmental supportive positioning can be improved by standardizing positioning policy, staff education, low cost interventions to ease the process of positioning, and involvement of primary care giver to ensure long term benefits.

improvement within a short time-span. The quick response was attributed to multiple PDSA cycles, adopting the changes and policy formation in each step. Advent of customized nesting boundary was a cost-effective intervention with minimal consumption of linen. The biggest strength of this project was involvement of mothers as an addition to the concept of family-centred care. The major limitation was that we did not assess long-term developmental outcome.

To conclude, this QI project, using simple cost-effective interventions through multiple PDSA cycles and team effort, led to a considerable improvement in positioning practices of our unit. Involvement of mothers in the project was an important addition for better sustenance.

Ethics clearance: Institutional ethics committee, AIIMS, Rishikesh; AIIMS/IEC/19/698; dated April 12, 2019.

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