

# Use of Infant Positioning Assessment Tool (IPAT) for Assessment and Intervention in Preterm Infants with Low Birth Weight - A Scoping Review

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**Abstract:** *The infants born before 37 weeks of gestation are termed as preterm infants. As there is an interruption in their intrauterine growth, they are vulnerable population and requires advanced medical intervention. These infants require support to facilitate and maintain intrauterine posture and hence therapeutic positioning plays an important role. Infant Positioning Assessment Tool (IPAT) is a tool which provides the pictorial representation of infant positioning along with nesting rolls. **Objective:** The study was conducted to find the scientific evidence of Infant Positioning Assessment Tool (IPAT) on the position of the preterm infants. **Methodology:** The scoping review was carried out in June 2022 using search engine such as PubMed, Google Scholar, Academia, CINHAL Plus and Science Direct. The search was limited from year 2011-2021. The selection process of the studies was based primarily on analysis of the titles and abstract, followed by the analysis of full text of selected articles, based on inclusion criteria. **Results:** A total of 30 studies were reviewed, out of which 20 met the criteria. It was found that when the IPAT been a pictorial tool was very convenient to use in NICU. The nurses, resident doctors and caregivers were able to position the infant appropriately within the nesting roll and infants were able to maintain midline orientation. Due to proper positioning, the infants were able to maintain their vitals, neurobehavioral status, and motor activity. **Conclusion:** As IPAT is a pictorial tool, it was easily adapted and integrated by NICU staff. It is a valid, reliable, and useful tool. As it encourages the midline orientation, preterm infants can maintain their vitals, neurobehavior and motor activity.*

**Keywords:** preterm infants, low birth weight, positioning, IPAT, nesting roll, neurobehaviour, NICU, motor activity.

## 1. Introduction

Infants born less than 37 weeks of gestation are considered as preterm and are particularly vulnerable population as there is an interruption with their uterine growth and are exposed to external environment other than womb very early leading to immature organs. Hence, they require technologically advanced medical intervention, as well as highly specialized nursing care in order to survive.<sup>1,2</sup>

Developmental supportive care (DSC) model is been used in NICU which uses method such as positioning, swaddling, KMC, massage, NNS, breastfeeding, topical anesthetic.<sup>2,3</sup>

The infant requires support to facilitate and maintain the intra uterine posture.<sup>2</sup> In NICU therapeutic positioning which is referred as developmental or supportive positioning is an excellent example of how evolving knowledge and advances in technology drive changes in developmental clinical practice as well as one of the earliest interventions for preterm infants in the NICU. It influences neuromotor, musculoskeletal development, brain development, physiological function, and stability of preterm infant.<sup>3,4</sup>

The occupational Therapist play an important role in NICU as they use their knowledge of gestational age development and developmental milestones to position the infant appropriately and provide needed support to meet goal.<sup>5</sup>

Secure therapeutic positioning can be obtained through nesting as it provides appropriate boundaries and support promoting physiological flexion, midline orientation without overextending the baby's head and neck, improves curved

limb position and reduction of sudden movements as well as immobility of the arms and legs.<sup>5,6,7</sup>

The IPAT was developed by Coughlin, Lohman and Gibbins between 2007-2010 at Children's Medical Ventures (part of the Philips Corporation).<sup>5,8</sup>

The Infant Positioning Assessment Tool (IPAT) is a reliable, easy to use pictorial directory of appropriate positioning for preterm infants. Objective and measurable assessments of infant positioning is warranted to improve consistency in nursing practice; which affects neonatal developmental outcomes. Using the IPAT tool, paired with one-to-one bedside education can improve positioning consistency across shift and experience.<sup>8,9</sup>

The research developed the tool with three goals for use:

- 1) As a reference and educational tool for use
- 2) As an evaluation instrument
- 3) As a method of standardization.<sup>3,4</sup>

The IPAT has 6 different elements which evaluates posture at the head, neck, shoulders, hands, hips, knees/ankles/feet. A two-point scoring system is used with a score of:

- 2-appropriate positioning
- 1-acceptable alternative positioning
- 0-unacceptable positioning.

A full score of 12 is indicative of perfect positioning, 9 to 12 indicates acceptable as it is accommodating for the asymmetry of positioning often needed when technology interfaces are present and a score of 8 or lower indicates need for positioning.<sup>8,9</sup>

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Coughlin et al; (2010) established content validity of the tool using research evidence and opinion of clinical experts and developmental care researchers.

- The validity significance of IPAT is 0.27 and interrater reliability is 0.972 according to Cronbach's Alpha.
- Interrater reliability for the IPAT was completed for the nine raters: the IRR interclass correlation for consistency of single measures was 0.797 and for consistency or average measures was 0, 972. The ORR intra class correlation for absolute agreement of single measures was 0.712 and for absolute agreement of average measures was 0.957.9

## 2. Methodology

Inclusion criteria

- 1) Low birth Weight (LBW)
- 2) Preterm infants
- 3) Infants admitted in NICU

Regarding the type of studies, all existing literature of primary or secondary origin (literature reviews, observational, qualitative, quantitative or mixed studies and experimental studies) was included. (Free articles)

## 3. Results

Purpose	No. of articles	Remark
Assessment	7	Increase in score was seen pre and post intervention were seen.
		Improvement in muscle tone, reflexes, sleep pattern, decrease in crying,
		Maintenance of posture and motor performance
		Improvement in sleep, decrease in pain, vital sign, oxygen needs, weight gain, neurological development, musculoskeletal development.
Nurses' education	6	The nurses reported that the IPAT was very handy tool and helped them to do proper positioning of the infants. Through pictorial representation it made easier for them to understand the proper joint wise positioning.
NICU paediatrics resident education	2	Researchers concluded that, in spite of the having detailed knowledge about importance of positioning in neonates, IPAT was useful and a simple tool which made positioning of infant easier.
Mother and relative education	1	Handling of infant became easy, and a confidence was developed among caregivers.

According to Upadhyay Jet al., after taking training sessions and giving hands on training to nurses, senior and junior residents and mothers there was an improvement in IPAT score. These educational sessions were found to be impactful to enhance the knowledge of positioning in short time span. The biggest strength of the study was involvement of mother, as an addition to the concept of family centered approach.<sup>3</sup>

The main aim of Spiker A et al was to increase the developmental positioning proficiency of NICU nurses. Due to proper positioning, it was found that proper energy balance, structural, personal and social integrity was maintained. It was found that there was improvement in IPAT scores once nurses were given with proper education.<sup>1</sup>

Mary Coughlin et al; developed an assessment tool to standardize best practices in neonatal positioning and evaluated its effectiveness in teaching consistent positioning practices.4 independent viewers established the reliability by computing IPAT scores of 5 infants. The validity was based

### Search strategy

The research was carried out in June 2022. The research was carried out using Pubmed, Academia, Science direct, CINHAL Plus, and Google Scholar in order to identify the articles followed by the words contained in the titles, abstracts and descriptors of said articles.

Further MeSH descriptors were used for formulation of research equation. Keywords such as NICU, low birth weight, therapeutic positioning, nesting, motor behaviour, neurobehavioral status, were found. The research of the articles was confined for last 10 years i. e., between 2011 to 2021.

Since the focus of present study was on strategies promoting the importance of positioning and its effect on infants motor and neurobehavioral status. The studies that included infants after first 28 days of life, as well as studies conducted in settings other than NICU and studies which did not estimate the effect of positioning were excluded.

The selection process of the studies was based primarily on analysis of the titles and abstract, followed by the analysis of full text of selected articles, based on inclusion criteria.

on research evidence and opinion from both clinical experts and researches in developmental care.<sup>9</sup>

Lama Charafeddine et al; found by providing proper education and hands on demonstration to nurses and resident doctors, their clinical performance was improved. The educational sessions were conducted with the help of hands-on practice with simulation on manikin, power point presentations from related articles, videos from YouTube. It was found that the preintervention score of resident doctors was more as compared to nurses due to knowledge of medical terms related to positioning were as the post intervention score of nurses was more as compared to residents which showed nurses are more compliant to this type of education.<sup>10, 11</sup>

The students of School of Occupational therapy at University of Indian police conducted a 14-week program on promoting the awareness of positioning among NICU staff using IPAT. They promoted information among nurses using various posters, educating them about the developing

positioning and IPAT administration. It was found that due to proper positioning there was decrease in postural deformities, abnormal movement patterns. It was also seen that there was an improvement in sleep patterns.<sup>5</sup>

A study was conducted at Vimal Jyothi Hospital, Coimbatore to assess the effectiveness of nesting on posture and motor performance among high risk newborn. IPAT was used for assessment for position of infants and motor performance was assessed using Modified Ferrari tool. Using Modified Ferrari tool various motor components were assessed of newborn infants. The results of the study showed that Nesting is effective in maintaining posture and motor performance.<sup>6</sup>

#### 4. Discussion

The application of DSC has been demonstrated to increase neuro developmental outcome, improvement in motor skills and decrease the hospital stay.<sup>3</sup>

DSC leads to energy balance, structural integrity, personal integrity and social integrity as well as it will also lead to development of motor skills and proprioceptive input from surrounding environment.<sup>1</sup>

When the infants were provided with proper therapeutic positioning along with nesting rolls it was seen that structural integrity was maintained by preventing the associated deformities. Personal integrity and energy balance was maintained as it provided adequate sleep and minimal stress was experienced by the preterm infants. As parents were also involved, it improved the social integrity as they were able to see their infants as well position their infants comfortably.<sup>1</sup>

IPAT provides, the standardization for consistent integrative positioning. A significance improvement was noted in the proportion of admitted neonates with IPAT score which indicates that, most preterm infants had an acceptable position and that the body parts were in comfortable alignment.<sup>8,9</sup>

Due to proper positioning, change in vitals, oxygen needs, posture, proper sleep patterns, weight gain, neurodevelopment and musculoskeletal and motor development were seen.<sup>4, 6, 7, 12</sup>

When IPAT was used an outcome measure it was found that there was increase in mean IPAT score after the period of intervention. It has been proved that it can be used as an assessment tool for therapeutic positioning.<sup>5, 13</sup>

During regular therapy sessions, IPAT can be utilized by therapist. It has proving to be helpful for them as well as it gives idea of how each joint should be positioned.<sup>1, 6, 10</sup>

Being a pictorial representation, it would provide informal education to staff along with formal education using skills lab. Implementing a simple tool and bedside education can be an effective and low-cost strategy for facilitating practice change. The IPAT proved to be a useful tool to encourage

nurses to apply learned skills in supporting infant positioning.<sup>1, 8, 10</sup>

The nurse teaching and demonstration sessions were found to be most impactful. Many paediatric residents also found it to be useful a assessment of proper positioning was easy as well as physiological, neurological, motor, musculoskeletal changes were seen.<sup>1, 10, 11, 14</sup>

The training sessions, hands on practice which were conducted proved to be useful as it improved the knowledge for administration of IPAT as well as the competence level among NICU staff. In few set ups various posters were made describing the positive and negative impact of positioning on development of infant, complete assessment of IPAT, how to score and reposition the infant. Inclusion of mothers was the most important factor for sustenance policy. It benefitted family centred program.<sup>1, 10, 11, 14</sup>

No additional cost is required as no specialized equipment or hiring of new staff is required, hence cost effective and it could be tailored to the individual needs of any NICU.<sup>1, 14</sup>

IPAT is proving to be useful in many terms such as

- It provides hands on and bedside education which passes a positive experience on positioning an infant.
- Evaluating practice against an established standard is proving to be motivating.
- Immediate feedback with hands on correction of positioning allowed nurses to see the difference proper positioning can create.
- Nurses were able to witness increased relaxation, reduced respiratory rate, prolonged sleep, self-calming in the properly positioned infants further cementing their desire to position well every time.

Few barriers were also found during many studies such as:

- Though change in IPAT score was seen but it was not possible to meet the targeted score due to complexity and difficulty in changing habits and behaviour over relatively long period of time.
- The shortage of positioning supplies, lack of education and patient factor were some among the barriers of few studies.

Eliminating these few barriers, it is found that IPAT can be used for educational purpose as well as for assessment and measuring the outcome after providing proper positioning.

#### 5. Conclusion

The pictorial representation which is provided by IPAT is most useful tool. The IPAT scoring system can be easily adopted and integrated into educational sessions for NICU staff for positioning the infants in NICU.

The registered nurses require the appropriate tools and necessary education to, provide patient care that is evidence-based and improves outcomes, hence IPAT has proved to be a simple tool and bedside education can be effective and low-cost strategy for facilitating practice change.

IPAT been a valid and reliable tool can be used as a standardised tool for improving and assessing the proper developmental positioning practices in NICU under DSC program. Integrating consistent positioning practices requires standardisation which is provided by the IPAT, which has yielded favourable results.

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