



Challenges in Neonatal Physical Therapy: A Case Study of Lavanya's Developmental Care

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Introduction:

The care of premature infants remains a significant challenge in neonatology, requiring a multidisciplinary approach to address complex medical needs and support optimal developmental outcomes. This comprehensive case study delves into the intricate journey of Lavanya, a premature infant born at 23 weeks' gestation, weighing 570 grams. Lavanya's case is emblematic of the myriad medical complications and developmental challenges faced by extremely preterm infants and underscores the critical role of integrated care in promoting survival and long-term well-being.

Lavanya's neonatal course was characterized by a multitude of medical complexities, including maternal complications such as Group B Streptococcus infection and preterm labor, necessitating intensive medical interventions from the moment of birth. In the delivery room, resuscitative efforts were initiated promptly, including intubation, positive pressure ventilation, and surfactant administration, followed by transfer to the Neonatal Intensive Care Unit (NICU) for ongoing management.

Throughout her hospitalization, Lavanya encountered a plethora of medical challenges, including severe bronchopulmonary dysplasia (BPD), pulmonary interstitial emphysema, a large patent ductus arteriosus (PDA) requiring surgical ligation, hyperbilirubinemia, supravulvar pulmonic stenosis, and multiple episodes of sepsis with various pathogens, including meningitis and methicillin-resistant Staphylococcus aureus (MRSA) infection. The management of these complications demanded a coordinated effort from a diverse team of healthcare professionals, encompassing neonatologists, nurses, respiratory therapists, and surgical specialists.

Furthermore, Lavanya's developmental care needs were addressed through early intervention strategies, particularly in the realm of physical therapy. From the earliest days of life, Lavanya's physical therapist meticulously assessed her sensory sensitivities, motor responses, and stress cues, tailoring interventions to promote comfort, facilitate self-calming behaviors, and optimize musculoskeletal development. Family-centered care played a pivotal role in Lavanya's journey, with her parents actively engaged in learning developmental care techniques and participating in kangaroo care sessions under the guidance of the healthcare team.

Despite the formidable challenges posed by Lavanya's medical and developmental complexities, her story exemplifies resilience and the transformative power of comprehensive neonatal care. Through meticulous medical management, developmental support, and family involvement, Lavanya ultimately thrived, achieving milestones such as weaning off respiratory support and transitioning to home care.

This case study underscores the importance of a holistic approach to neonatal care, integrating medical interventions, developmental support, and family involvement to optimize outcomes for extremely preterm infants like Lavanya.

Lavanya was born at 23 3/7 weeks' gestation with a birth weight of 570 g to a married 30-year-old G2P2 mother who had good prenatal care. Maternal complications included Group B Streptococcus, bleeding at 22 weeks, and preterm labor at 23 3/7 weeks, at which time she was dilated and contracting. The infant was born via vaginal breech delivery with Apgar scores of 4 at 1 minute and 7 at 5 minutes. Resuscitative efforts in the delivery room included intubation, positive pressure ventilation, and surfactant. Lavanya was transported to the NICU, where she was placed on conventional ventilator, and UA and UV lines were placed. Phototherapy was initiated because of bruising. Because of worsening respiratory status, Lavanya was placed on HFOV, which she received for 33 days before she was able to wean to CMV. She was able to be extubated and placed on CPAP after 2 months on the conventional ventilator. After 2 weeks on CPAP, Lavanya was weaned to a nasal cannula, but had to be reintubated and placed on mechanical ventilation 2 weeks later because of sepsis. Lavanya was extubated and placed on nasal cannula 2 weeks later. She was finally weaned off all respiratory support at 143 days of life.



Lavanya's hospital course was complicated by severe BPD, pulmonary interstitial emphysema, large PDA requiring surgical ligation, hyperbilirubinemia, mild supravulvar pulmonic stenosis, and multiple bouts of sepsis, including meningitis, pseudomonas tracheitis, methicillin-resistant *Staphylococcus aureus* (MRSA), and pneumonia.

Pain Management :

Pain management was initiated on Lavanya's first day of life with the administration of morphine. She continued to receive morphine until day of life 34 when a tapered wean was completed. Morphine was restarted on day of life 120 when she required reintubation and mechanical ventilation. Lavanya was weaned off morphine slowly beginning day of life 133 and ending on day of life 143. She tolerated this weaning process well, and neonatal abstinence scores were followed closely for any adverse response to withdrawal. Throughout her hospitalization, Lavanya was assessed for pain by all staff. Pain assessments were also performed by the physical therapist and documented in the chart after each interaction with the therapist. Physical Therapy Services Lavanya was referred for physical therapy services at 2 weeks of life (25 weeks' postconceptional age). The physical therapist reviewed Lavanya's history by thoroughly reading her medical chart and discussing Lavanya's status with her nurse. Lavanya's nurse reported that she was very restless and became irritable with hands-on care. The physical therapist observed Lavanya in her isolette before, during, and after caregiving activities. At this time Lavanya was intubated, requiring HFOV, and was under phototherapy. She demonstrated increased extensor posturing of her head, trunk, and extremities and jerky restless movements prior to care. Sensitivity to sound and light were also noted. Lavanya had very low tolerance to handling and position changes during care. Her stress signs included color changes, increased heart rate, oxygen desaturation, and motor stress signs of arching of head and trunk and extension of extremities. Lavanya was unable to effectively utilize any self-calming behaviors and was difficult to calm with external supports. She did respond to facilitated tucking and firm touch when provided long enough for her to relax and settle into the position. After care she was pale and exhausted.

Physical Therapy Goals Physical therapy goals at this time were as follows:

1. To decrease environmental stress
2. To promote calming behaviors
3. To promote flexed postures for calming and optimal body alignment for musculoskeletal development
4. To assist family and caregivers in identifying and responding to Lavanya's cues
5. To provide education to the family regarding developmentally supportive care Suggestions included: 1. Minimizing environmental stimulation by covering her isolette and shading her eyes from bright lights, alerting people to keep noise levels down around her bedside with a sign, and education 2. Pacing care activities, providing rest breaks with facilitated tucking, using slow movements and firm touch 3. Positioning in flexion in a deep nest and varying positions between prone, side-lying, and supine as tolerated 4. Allowing for hands to head and grasping, and offering the pacifier for self-calming Lavanya's mother visited every day and the physical therapist was able to meet with her to discuss Lavanya's status and suggestions to support her development. Together, they looked at Lavanya's cues and discussed strategies for calming and bonding. Lavanya's father visited in the evening, and her mother shared the suggestions for developmentally supportive care with him. For the next 2 months Lavanya continued to be an extremely fragile, critically ill infant with high respiratory requirements, surgical ligation of her PDA, and episodes of sepsis. Physical therapists continued to observe Lavanya and adjust her developmental care plan as appropriate. At 10 weeks of age (33 weeks' PCA), Lavanya was able to wean from HFOV to the conventional ventilator. She continued to have low tolerance for handling, but was easier to console with the pacifier and firm touch/containment in flexion. She also demonstrated attempts at self-calming with hand-to-head, grasping, and foot-bracing behaviors. The physical therapist continued to work with the nursing staff and Lavanya's family to develop care plans to promote self-calming, optimal positioning, and tolerance to caregiving activities. At this time Lavanya's parents were practicing kangaroo care and holding Lavanya daily (Fig. 4.26). The physical therapist was able to provide suggestions for positioning Lavanya during kangaroo care. Lavanya made slow improvements medically, and at 36 weeks' PCA she still required mechanical ventilation. Her tolerance to handling and position changes was improving. She was able to maintain a quiet, alert state using her pacifier and containment for support. Even with external supports she had limited tolerance for visual or social stimulation. Lavanya was very sensitive to light and sound in the environment. Physical therapy examination revealed increased flexor posturing in her lower extremities, with full passive range of motion. She held her upper extremities in scapular retraction, shoulder abduction, and external rotation. Lavanya had antigravity movement of her extremities through limited range of motion with jerky, tremulous quality of movement. She still frequently moved into extension rather than flexion. Despite the use of a gel pillow, the time spent on HFOV had left Lavanya with flattening of the lateral sides of her head, or dolichocephaly. She held her head in extension with shortening of her capital and neck extensors. Tightness in her thoracic, lumbar, and sacral areas was also noted.

Goals for Lavanya included

1. Maintaining a quiet alert state for increasing duration of time
2. Improved ability to self-calm
3. Neutral head alignment with decreased tightness in cervical spine
4. Increased flexibility in lumbosacral spine
5. Decreased tightness in scapulae and shoulders
6. Increased antigravity flexion movement
7. An additional goal was for Lavanya's family and caregivers to be independent in positioning and developmentally supportive activities. The therapist continued to work with Lavanya's family and nurses in reading her cues and progressing handling and social interactions to her tolerance. The therapist also provided positioning suggestions to promote midline alignment, flexion, and shoulder protraction. Gentle mobilization to her spine was provided, starting in the lumbosacral area and slowly moving proximally over the course of several weeks, based on Lavanya's response. Over the next month, Lavanya was weaned off the ventilator to CPAP and then to nasal cannula. She had one setback in her respiratory stability because of sepsis, but was able to be weaned off all support by 43 weeks' PCA. The therapist continued to work on the previously stated goals until time of discharge to home.

Concerns at the time of discharge included:

1. Sensitivity to light and sound
2. Limited tolerance to handling
3. Limited range of motion in cervical spine and shoulders
4. Delayed postural responses.

Her strengths were robust and defined behavioral states, improved ability to self-calm, and greater availability for social interactions. She was able to visually fix on an object and track it to the left and right. Her parents were able to read Lavanya's behavioral cues and respond appropriately. Suggestions for home were provided to her parents, who were able to demonstrate independence in performing these activities. Lavanya was discharged to home at 45 weeks' PCA without any respiratory support and taking all feedings by bottle. Follow-up services included ophthalmology, special babies clinic (neonatal follow-up), cardiology, and early intervention services.

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