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Grace Winningham

Children's Mercy Kansas City

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Developmental Intervention Patterns in a Level IV Neonatal Intensive Care Unit (NICU)

Submitting/Presenting Author (must be a trainee): Grace Winningham, MD

Primary Email Address: Gewinningham@cmh.edu

 **Resident/Psychology Intern
Fellow**

Primary Mentor (one name only): Cy Nadler, PhD

Other authors/contributors involved in project: Sarah Nyp, MD; Eugenia Pallotto, MD; Ashley K. Sherman

IRB Number: 17110701

Describe role of Submitting/Presenting Trainee in this project (limit 150 words):

Conceptualized and developed research idea/question, data collection consisting of automated and manual chart review of 449 EMR, planning statistical analyses, conducting analyses with support of biostatistician, interpretation of results.

Background, Objectives/Goal, Methods/Design, Results, Conclusions limited to 500 words

Background: Premature infants are at risk for neurodevelopmental disorders, developmental delays, and behavioral difficulties. There are no evidence-based standards regarding developmental intervention practices or benefits when initiated while the infants are hospitalized in the neonatal intensive care unit (NICU); these developmental interventions including physical therapy, occupational therapy, speech-language therapy, music therapy, and child life. Beyond the lack of evidence-based standards and lack of literature describing the short and long term benefits, there is also a paucity of information on what current NICU-based developmental intervention practices are. Therefore, a thorough descriptive investigation of current developmental intervention practices is necessary to:

- Support future prospective studies evaluating the neurodevelopmental benefits of NICU-based services.
- Standardize protocols for developmental interventions in the NICU.

Objectives/Goal: To provide information in the identified knowledge gap that exists regarding rates and patterns of developmental interventions (physical therapy [PT], occupational therapy [OT], speech/language therapy [SLP], music therapy [MT], and child life [CL]) in high-risk infants in the NICU by retrospectively examining the variables associated with these interventions.

Methods/Design: Electronic records for known high-risk infants (extreme and very preterm; 23 0/7 to 31 6/7 weeks gestation) discharged from our institution's NICU over a 3 year period (January 2014 to June 2017) were manually reviewed to extract demographic and medical variables and therapy patterns.

Results:

Demographic and medical characteristics of the participants (N = 449)

Characteristics	N (%)			
Family				
Primary insurance				
Public	286 (63.7%)			
Private	154 (34.3%)			
Other	9 (2%)			
Primary language				
English	423 (94.2%)			
Spanish	18 (4.0%)			
Other	8 (1.8%)			
Infant				
Race				
Caucasian	252 (56.1%)			
African American	103 (22.9%)			
Hispanic	41 (9.1%)			
Other	39 (8.7%)			
Missing data	14 (3.1%)			
Gender (male)	250 (55.7%)			
Tracheostomy	36 (8.0%)			
Gastrostomy tube	81 (18.0%)			
Intraventricular hemorrhage (grade) ^a				
1	52 (11.6%)			
2	20 (4.5%)			
3-4	14 (3.1%)			
No IVH	354 (78.8%)			
Cystic Periventricular Leukomalacia ^a	12 (2.7%)			
Surgical Necrotizing Enterocolitis ^a	17 (3.9%)			
	Lower Quartile	Upper Quartile	Median	
Length of hospital stay (days)	19.0	100.0	55.0	
Ventilator duration (days) ^{b, c}	4.0	36.5	14.0	
	Minimum	Mean (SD)	Maximum	
Birth weight (kg)	0.34	1.02 (0.40)	2.57	
Gestational Age (weeks)	23	27.5 (2.5)	31.9	
Postmenstrual age at discharge	23.3	41.9 (9.6)	94.7	

^a 2% of data was missing at home institution

^b at home institution

^c 30% of infants (132 patients) were not ventilated

Overall rate of infants receiving developmental interventions in the NICU: Child life (CL) 73.3%; occupational therapy (OT) 64.8%; physical therapy (PT) 40.1%; music therapy (MT) 25.2%; speech-language therapy (SLP) 6.7%. The developmental intervention rates are all significantly different from one another, every p-value is <0.0001 except for CL/OT pair which p-value 0.0006.

The average postmenstrual age (PMA) of initiation varied, from 35.5 weeks (CL) to 53.1 weeks (SLP).

Infants with a tracheostomy or G-tube were more likely to receive any of the interventions (p < 0.05).

Infants with tracheostomy receiving SLP:

 Higher birth weights and longer hospital stays (p < 0.05), irrespective of gestational age

For each intervention, infants receiving the therapy had:

 Longer hospital stays (p < 0.0001).

 Longer duration on ventilators (p < 0.0001).

Intervention pattern was not significantly influenced by IVH, PVL, gestational age, gender, race, or language.

Conclusions: This study reveals varying rates and PMA of initiation of developmental interventions in < 32 week gestation infants. Longer hospital stays and longer ventilator duration were associated with higher rates of interventions. SLP was the least utilized modality and initiated on average at the oldest postmenstrual age, possibly reflecting low provider familiarity with potential SLP benefits.

Standardizing timing of intervention may benefit individual patients by:

- Providing therapies during crucial periods of development

- Providing opportunities for caregiver education.

The limitations of this study include: retrospective analysis conducted at a single academic institution; unmeasured variables related to the infant's care and/or medical complexity that impacted trends in intervention use. Further research on NICU-based developmental intervention trends is needed to demonstrate the benefits of standardized therapy timing.