A Focused Ethnographic Study of Nurses' Role in an Early Mobilization Program in the Pediatric Intensive Care Unit

by
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DISSERTATION
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Dedication

I dedicate this dissertation to the interdisciplinary team who implemented PICU UP! in the Pediatric Intensive Care Unit. Thank you for your dedication to improving patient outcomes and for sharing your expertise. I also want to dedicate this dissertation to the nurses who participated in this study. Thank you for all the work you do for our patients and families in the PICU and for sharing your experiences and perspectives in this study.

I want to share this accomplishment and my deep gratitude to my husband, Vivek, for the million ways you have shown your support during this marathon of a race. There have been so many highs and lows that we have experienced over the last five years and I just want to say thank you for sticking it out with me and for always making my dreams, your dreams. You have always been my anchor and the calm through all of the chaos. Thank you for loving me and for believing in me, even when I didn't. You forever model what it means to pursue your dreams. Thank you to the pieces of my heart, Arya and Amara, for making me a mom, for teaching me how to be patient and reminding me just how precious these first years of life are. I'm so happy I've been able to be here with you, and for watching you grow and learn. I can't wait to see what the world has in store for you. You all are why I do what I do. You push me to be a better person, parent and partner. I love you all too much.

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presence in my life. To Voni, Chris and Mark, so much has changed but thank you for believing in me.

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Acknowledgement of Previously Published Materials

This section is in acknowledgement that Chapter Two of this dissertation packet, Barriers and Facilitators to Early Mobilization in the Paediatric Intensive Care Unit: A Scoping Literature Review, appears in the following Nursing in Critical Care, in the citation referenced below.

Noone, C. E., Franck, L. S., Staveski, S. L., & Rehm, R. S. (2023). Barriers and facilitators to early mobilization programmes in the paediatric intensive care unit: A scoping literature review. *Nursing in Critical Care,* https://doi.org/10.1111/nicc.12891

Adviser's Statement

This article-based dissertation was designed by Chelsea Noone and completed with the mentorship of myself, her primary PhD adviser, and the other dissertation committee members. I and the other committee members are co-authors on the already published article (Chapter 2). This article and the other manuscripts included in this dissertation were primarily authored by Ms. Noone. I and the other committee members provided feedback on her written products and supervised revisions of the written manuscripts until we deemed them ready for submission for publication. In addition, I supervised the scientific aspects of her dissertation research. Ms. Noone collected and analyzed the data under my guidance. The work in this article-based dissertation is comparable to chapter-based dissertations I have also supervised, and the study from which it was drawn was a complete research project. The already published article and two additional manuscripts demonstrate that the work is now ready for the publication peer review process.

A Focused Ethnographic Study of Nurses' Role in an Early Mobilization Program in the Pediatric Intensive Care Unit

Chelsea Noone

Abstract

Early Mobilization (EM) in Pediatric Intensive Care Units (PICU) is safe and feasible, but there are issues preventing the adoption of EM into clinical practice. The objective of this study was to describe the patient safety concerns and how nurses develop strategies to safely deliver EM to their patients. The second objective was to explore, describe and analyze nurses' perceptions of barriers and facilitators to performing EM, and to identify strategies nurses perceive would assist them to overcome barriers and increase adoption of EM within the PICU. This focused ethnographic study included 15 in-depth interviews with 10 PICU nurses. Data were analyzed using thematic analysis. This is a three article-based dissertation. The first article is a scoping review of the literature examining nurses' and family caregivers' perceptions of EM programs in the PICU, and identified the scope of the dissertation study after the gaps in the literature were identified. In the second article, nurses discussed their concerns and for patient safety related to EM and how they developed strategies to overcome patient safety concerns. The third article describes nurses' perceptions of barriers and facilitators to EM in the PICU. The overarching theme that integrated these categories was nurses' commitment to EM because they recognize the benefit and see the positive outcomes. This study demonstrates the importance of thoughtfully considering the burden evidence-based programs have on the nurses who carry out EM. EM activities fall primarily on nursing staff, and organizational structures and resources must be allocated to reliably deliver this essential care. By better understanding the barriers, leaders can analyze and develop strategies to better integrate EM into practice.

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List of Abbreviations

AM, day shift

Admin, administrative

CLS, Child Life Specialist

CRRT, Continuous Renal Replacement Therapy

d/t, due to

Dx, diagnosis

ECMO, Extracorporeal Membrane Oxygenation

EM, early mobility/mobilization

ETT, endotracheal tube

F**xnal**, functional

HCP, healthcare provider

IQR, Interquartile Range

JHH, Johns Hopkins Hospital

LOS, length of stay; (PT/OT/SPL)

MD, Medical Doctor

Mo, month

MV, mechanical ventilation

n, number

NGT, nasogastric tube

NP, Nurse Practitioner

OT, Occupational Therapy

PA, Physician Assistant

PICU, Pediatric Intensive Care Unit

PM, night shift

POPC, Pediatric Overall Performance Category

PT, Physical Therapy

pt, patient

Rehab, rehabilitation team

RN, Registered Nurse

RR, response rate

RT, Respiratory Therapy

SLP, Speech Language Pathology

<, less than

SW, Social Work

vent, ventilation

>=, greater than or equal to

%, percentage

Chapter 1: Introduction

The Intensive Care Unit (ICU) Liberation initiative has gained momentum, focusing on eliminating the harmful effects of pain, agitation/sedation, delirium, immobility and sleep disruption (PADIS) to prevent comorbidities and long-term consequences of ICU admission (Walker & Kudchadkar, 2018; SCCM, 2021). PADIS guidelines provide an evidence-based bundle of interventions to enable implementation of the ICU Liberation principles. Implementation of the ABCDEF (A-F) bundle has demonstrated its effectiveness in reducing hospital death, mechanical ventilation, delirium, ICU readmission and discharge to a long-term care facility for rehabilitation (Pun et al., 2019). The A-F bundle consists of assessing, preventing and managing pain; spontaneous awakening and breathing trials; choice of sedation; delirium assessment, prevention and management; early mobilization (EM) and exercise; and family engagement and empowerment (SCCM, 2021). The value proposition of the A-F bundle aims to improve quality of care by focusing on population health, reducing healthcare costs and improving the experience of care (Barr, 2021; IHI, 2021).

Background & Significance

Despite understanding the ICU Liberation A-F Bundle and its role in quality of care, there has been a limited attempt to understand bundle components in the setting of the Pediatric ICU. It is well understood that nurses play a critical role in EM in the Pediatric ICU (Kudchadkar et al., 2020; Ista et al., 2020). However, the nursing care related to the ICU Liberation bundle, and more specifically, in EM of critically ill children has not been well described. In practice, nurses collaborate with rehabilitation therapists to prioritize mobilization care. They coordinate care with members of the interdisciplinary team and communicate patient or family concerns all while ensuring patient safety throughout the process. However, the specific role nurses play in

mobility care has not well defined in the literature. There is a lack of understanding how nurses embed EM activities into nursing practice given that they play such a pivotal role in ensuring patients receive this care. There is also a lack of understanding nursing care related to EM from a theoretical perspective. In addition, it is important to understand adoption and sustainability efforts which can allow EM to become the standard of care within the PICU. In doing this work, nurses assist patients in achieving and maintaining their health throughout hospitalization and recovery.

Knowledge Gap and Research Question

Early mobilization is a growing trend in Pediatric ICUs. Adult studies have shown that unit culture significantly affects unit adoption of early mobilization (Hodson, 2015; Barber et al., 2015; Holdsworth, 2015; Hodgson, et al., 2018; Parry et al., 2017). There are also PICU-specific cultural components which must be overcome for nurses to embrace EM. Hopkins et al. (2015) discussed the elements which make it extremely difficult to adopt a culture which facilitates EM in the Pediatric ICU. Dimensions of PICU culture which need to shift in order to support EM include conception of safety. Next, they identified the need for detailed physiotherapy assessments and individualized goals based on patient's baseline function, developmental level, admission diagnosis and prognosis. There are significant resources necessary to perform EM and these must be in place to create a mobility culture. Furthermore, there is a need to address medical aspects of care which include the modification of the sedation culture, towards goal directed sedation to prevent oversedation and delirium. Finally, family involvement should be promoted, and bedside staff should be empowered to assist with the adoption, feasibility, and resources necessary to sustain a mobility program and to achieve a mobility culture within the healthcare team within the PICU (Hopkins et al., 2015).

Currently, there is a gap in the research literature describing nurses' experiences with EM, including their attitudes towards and perceptions of these programs. Further, there has been little research to describe PICU nurses' experiences with the implementation of early mobility programs. Early mobility programs have been shown to be safe and feasible (Cuello-Garcia, 2018; Wieczork, 2015; Piva, 2019; Melchers et al., 1999, Hollander et al., 2014; Jacobs, 2001). However, the majority of nurses' concerns around EM are related to patient safety and concern about the risk of device dislodgement and equipment-related concerns (Wieczorek, 2016; Zheng, 2018; Colwell, 2018; Hanna, 2020; Herbsman, 2020; Patel, 2021). How do nurses decide to incorporate early mobility into their standard of care when it is contrary to an instinctual culture of bedrest and immobility which is perceived to promote patient safety? What does it mean to have a mobility culture specific to pediatric patients and the Pediatric ICU? All of these questions will be answered in this dissertation study.

Purpose of the Research Study & Specific Aims

The purpose of the dissertation research was to explore PICU nurses' perspectives of an EM program and to explore how nurses incorporate this care into their practice given the potential risk it presents for patient safety. The goal was to understand the aspects of nursing culture which are necessary in order to achieve an environment where EM is the standard of care in the Pediatric ICU. Further, the goal is also to understand implementation and sustainability efforts that can achieve a culture supportive of EM in the PICU. The specific aims of this study are to:

1. Using in-depth interviews, including open-ended and semi-structured questions, explore nurses' concerns for patient safety while performing EM and how nurses overcome those safety concerns and still choose to participate in EM. The focus of

the interviews is on describing the dimensions of patient safety concerns and how nurses develop strategies to safely deliver EM to their patients.

2. Using in-depth interviews, explore, describe and analyze nurses' perceptions of barriers and facilitators to performing EM, and to identify strategies nurses perceive would assist them to overcome barriers and increase adoption of EM within the PICU.

Plan for Article Based Dissertation

The plan for this article based dissertation will be as follows. The first article is a scoping review of the literature examining nurses' and family caregivers' perceptions of early mobility programs in the PICU. This article was instrumental in identifying the scope of the dissertation study after the gaps in the literature were identified. The following two articles are based on data from the results of this study. The third chapter addresses the first aim of the study and focuses on nurses' concerns for patient safety while performing EM and how nurses overcome those safety concerns and still choose to participate in EM. The fourth chapter addresses the second aim of the study and describes nurses' perceptions of barriers beyond patient safety to EM and strategies nurses identified to enhance adoption of EM in the PICU. In chapter five, a discussion will follow including a synthesis of research findings and analyzing the implications for both clinical practice and future research.

Theoretical Lens

Levine's Model of Conservation forms the rationale for nursing interventions made in the setting of an early mobilization program in the PICU (Levine, 1969; Levine, 1973). Organizational Behavior Management describes the theory behind improvement interventions making early mobilization the standard of care in the PICU (Cunningham & Geller, 2008;

Bucklin et al., 2000). These two theories offer unique lenses by which to frame questions on nursing staff's perceptions of the program, and a way to analyze interventions in an effort to achieve a maintenance stage of the early mobilization program. The role of nurses in mobilization practices must be better understood as their role is essential to champion early mobilization and achieve the culture shift necessary to establish it as a standard in the PICU. These theories informed the investigator in the development of the interview guide and helped to sensitize the researchers during data collection and analysis to issues and links between ideas developed from the data.

Impact

Results will be shared with the study participants and published for other organizations to strengthen and to improve mobility culture in the Pediatric ICU. By exploring and analyzing nurses' and family caregivers' experiences and the process of performing EM, we can understand their perceptions of barriers and facilitators to implementing an EM program in the Pediatric ICU. Then we can appreciate the unique contribution nurses have in the successful implementation of an early mobilization program in the Pediatric ICU including how they think about patient safety and overcome these concerns to incorporate EM into care. In addition, by exploring nurses' perceptions of barriers and facilitators to performing EM, leaders can analyze the barriers and develop strategies to integrate EM into nursing practice. Further, by exploring the implementation and sustainability efforts, we can describe the facets of care that support or impede the implementation of EM, and foster a unit culture which fully incorporates EM in PICU care. This information will be shared in the literature in order to help other organizations foster their culture of mobility. The end goal is to incorporate EM into PICU practice to improve the functional outcomes for PICU survivors. Future studies which may develop following this

work include exploring family and patient experiences with the program in greater depth, as they are also partners in achieving this goal. Additional studies may attempt to further describe the outcomes of EM in the PICU, or test various interventions aimed at improving compliance with the EM program.

References

Barber, E. A., Everard, T., Holland, A. E., Tipping, C., Bradley, S. J., & Hodgson, C. L. (2015). Barriers and facilitators to early mobilisation in intensive care: A qualitative study. *Australian Critical Care: Official Journal of the Confederation of Australian Critical Care Nurses*, *28*(4), 177–183. https://doi.org/10.1016/j.aucc.2014.11.001

Barr, M. (2021). ICU Liberation. Retrieved from https://www.sccm.org/iculiberation

Bucklin, B. R., Alvero, A. M., Dickinson, A. M., Austin, J. & Jackson, A. K. (2000) Industrial-organizational psychology and organizational behavior management. *Journal of Organizational Behavior Management, 20*(2), 27-75, DOI: 10.1300/ J075v20n02_03

Colwell, B. R. L., Williams, C. N., Kelly, S. P., & Ibsen, L. M. (2018). Mobilization therapy in the pediatric intensive care unit: a multidisciplinary quality improvement initiative. *American Journal of Critical Care, 27*(3), 194–203

Cuello-Garcia, C. A., Mai, S. H. C., Simpson, R., et al. (2018). Early mobilization in critically ill children: A systematic review. *The Journal of Pediatrics, 203*, 25–33.e6. https://doi.org/10.1016/j.jpeds.2018.07.037

Cunningham, T. R. & Geller, E. S. (2008). Organizational behavior management in health care: Applications for large-scale improvements in patient safety. In K. Henriksen (Eds.) et. al., *Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 2: Culture and Redesign)*. Agency for Healthcare Research and Quality (US).

Hanna, E. S., Zhao, S., Shannon, C. N., & Betters, K. A. (2020). Changes in provider perceptions regarding early mobility in the PICU. *Pediatric Critical Care Medicine, 21*, e30–e38

Herbsman, J. M., D'Agati, M., Klein, D., O'Donnell, S., Corcoran, J. R., Folks, T. D., & Al-Qaqaa, Y. M. (2020). Early mobilization in the pediatric intensive care unit: A quality

improvement initiative. *Pediatric Quality & Safety*, *5*(1), e256. https://doi.org/10.1097/pq9.0000000000000256

Hodgson, C.L., Capell, E. & Tipping, C.J. (2018). Early mobilization of patients in intensive care: Organization, communication and safety factors that influence translation into clinical practice. *Critical Care 22***,** 77. https://doi.org/10.1186/s13054-018-1998-9

Hodgson, C. L., Bellomo, R., Berney, S., et al. (2015). Early mobilization and recovery in mechanically ventilated patients in the ICU: a bi-national, multi-centre, prospective cohort study. *Critical Care, 19,* 81.

Holdsworth, C., Haines, K. J., Francis, J. J., Marshall, A., O'Connor, D., & Skinner, E. H. (2015). Mobilization of ventilated patients in the intensive care unit: an elicitation study using the theory of planned behavior. *Journal of Critical Care, 30*, 1243–1250.

Hopkins, R. O., Choong, K., Zebuhr, C. A., & Kudchadkar, S. R. (2015). Transforming PICU Culture to Facilitate Early Rehabilitation. *Journal of Pediatric Intensive Care*, *4*(4), 204–211. https://doi.org/10.1055/s-0035-1563547

Hollander S A, Hollander A J, Rizzuto S, Reinhartz O, Maeda K, Rosenthal D N. (2014). An inpatient rehabilitation program utilizing standardized care pathways after paracorporeal ventricular assist device placement in children. *Journal of Heart Lung Transplant,* 33(6):587–592.

Institute of Healthcare Improvement (IHI) (2021). The IHI triple aim. Accessed from http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Ista, E., Scholefield, B. R., Manning, J. C., Harth, I., Gawronski, O., Bartkowska-Śniatkowska, A., Ramelet, A. S., & Kudchadkar, S. R., (2020). Mobilization practices in critically ill

children: A European point prevalence study (EU PARK-PICU). *Critical Care, 24*, 368-380. https://doi.org/10.1186/s13054-020-02988-2

Jacobs, B. R., Salman, B. A., Cotton, R. T., Lyons, K., Brilli, R. J. (2001). Postoperative management of children after single-stage laryngotracheal reconstruction. *Critical Care Medicine,* 29(1), 164–168.

Kudchadkar, S. R., Nelliot, A., Awojoodu, R., Vaidya, D., Traube, C., Walker, T., Needham, D. M., & Prevalence of Acute Rehabilitation for Kids in the PICU (PARK-PICU) Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network (2020). Physical rehabilitation in critically ill children: A multicenter point prevalence study in the United States. *Critical Care Medicine*, *48*(5), 634–644. https://doi.org/10.1097/CCM.0000000000004291

Levine, M. E. (1969). Introduction to clinical nursing. Philadelphia, PA: Davis

Levine, M E. (1973) Adaptation and assessment: A rationale for nursing intervention. *American Journal of Nursing, 6*6(11), 2450-2453.

Melchers, P., Maluck, A., Suhr, L., Scholten, S., & Lehmkuhl, G. (1999). An early onset rehabilitation program for children and adolescents after traumatic brain injury (TBI): methods and first results. *Restorative Neurology and Neuroscience*, *14*(2-3), 153–160.

Parry, S. M., Knight, L. D., Connolly, B., et al. (2017). Factors influencing physical activity and rehabilitation in survivors of critical illness: A systematic review of quantitative and qualitative studies. *Intensive Care Medicine, 43*, 531–42.

Patel, R. V., Redivo, J., Nelliot, A., Eakin, M. N., Wieczorek, B., Quinn, J., Gurses, A. P., Balas, M. C., Needham, D. M., & Kudchadkar, S. R. (2021). Early Mobilization in a PICU: A Qualitative Sustainability Analysis of PICU Up!. *Pediatric Critical Care Medicine: A*

Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies, *22*(4), e233–e242. https://doi.org/10.1097/PCC.0000000000002619

Piva, T. C., Ferrari, R. S., & Schaan, C. W. (2019). Early mobilization protocols for critically ill pediatric patients: Systematic review. Protocolos de mobilização precoce no paciente crítico pediátrico: revisão sistemática. *Revista Brasileira de Terapia Intensiva*, *31*(2), 248–257. https://doi.org/10.5935/0103-507X.20190038

Pun, B. T., Balas, M. C., Barnes-Daly, M. A., Thompson, J. L., Aldrich, J. M., et al. (2019). Caring for critically ill patients with the ABCDEF bundle: Results of the ICU liberation collaborative in over 15,000 adults. *Critical Care Medicine*, *47*(1), 3–14. https://doi.org/10.1097/CCM.0000000000003482

Society of Critical Care Medicine (SCCM) (2021). Multidisciplinary approach to early mobilization in the ICU. Retrieved from https://www.sccm.org/LearnICU/Resources/Multidisciplinary-Approach-to-Early-Mobilization-i

Walker, T. C., & Kudchadkar, S. R. (2018). Early mobilization in the pediatric intensive care unit. *Translational Pediatrics*, *7*(4), 308–313. https://doi.org/10.21037/tp.2018.09.02

Wieczorek, B., Ascenzi, J., Kim, Y., et al. (2016). PICU up!: Impact of a quality improvement intervention to promote early mobilization in critically ill children. *Pediatric Critical Care Medicine*, *17*, e559–e566

Wieczorek, B., Burke, C., Al-Harbi, A., & Kudchadkar, S. R. (2015). Early mobilization in the pediatric intensive care unit: A systematic review. *Journal of Pediatric Intensive Care*, *4*, 129–170. https://doi.org/10.1055/s-0035-1563386

Zheng, K., Sarti, A., Boles, S., Cameron, S., Carlisi, R., Clark, H., Khawaji, A., Awladthani, S., Al-Harbi, S., & Choong, K. (2018). Impressions of Early Mobilization of Critically Ill Children-Clinician, Patient, and Family Perspectives. *Pediatric Critical Care Medicine, 19*(7), e350-e357.

Chapter 2: Scoping Literature Review

Barriers and Facilitators to Early Mobilization in the Paediatric Intensive Care Unit: A Scoping Literature Review

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Barriers and Facilitators to Early Mobilization in the Paediatric Intensive Care Unit: A Scoping Literature Review

Abstract

Background: Early Mobilization (EM) in Paediatric Intensive Care Units (PICU) is safe and feasible. Nurses, patients and family caregivers are integral to EM. Understanding their perspectives are necessary to implement and sustain EM for children in the PICU.

Aim: To identify and critique research literature on the perspectives of nurses, patients and families regarding EM in the PICU.

Methods: For this scoping review, PubMed and EMBASE databases were searched. Included studies reported experiences of PICU nurses, caregivers and patients. Outcomes included feasibility, acceptability, satisfaction, benefits, facilitators, barriers, concerns, comfort with participation, and experiences and knowledge of EM. Exclusion criteria were: studies with preterm infants, other paediatric settings, review articles and editorials, studies of non-mobility interventions or chest physiotherapy alone. Quality assessment tools for qualitative and quantitative designs were used.

Results: Nine studies met the inclusion criteria: 6 quantitative and 3 qualitative studies. Six themes were identified: nurses' responses, concerns about patient risk factors and adverse events, equipment and staffing resources, family/caregivers' responses, patients' perspectives, and overall impact.

Conclusions: Findings demonstrate the importance of an interdisciplinary approach to address cultural, psychological and practical issues with EM. Unvalidated surveys conducted at single time points were used to measure nurses' perspectives. EM presents opportunities and challenges for family caregivers. Patients' experiences of EM are underrepresented in published research.

Relevance to Clinical Practice: Nurses and family caregivers are instrumental in EM in the PICU. Positive attitudes and competence are essential to PICU EM programme's success. Barriers may be minimized when programme benefits are understood.

What is Known About this Topic

- 2022 PANDEM guidelines provide recommendations to address seven domains of care including pain, sedation/agitation, iatrogenic withdrawal, neuromuscular blockade, delirium, PICU environment, and early mobility (EM).
- Nurses, families and caregivers are heavily involved in early mobilization in the PICU. Their perspectives on EM heavily influence its adoption into clinical practice.

What this Paper Adds

- Findings from this review demonstrate the importance of understanding the barriers and facilitators of EM programmes in PICUs from the perspectives of nurses, patients and families to promote successful implementation of EM programmes in PICUs.
- The importance of an interdisciplinary approach to address the cultural, psychological and practical issues with mobility programmes were highlighted in this review.
- Future research should focus on more in-depth review of nurse, patient and family caregiver experiences as well as long term outcomes.

Keywords: Early mobilization, early mobility, pediatric, intensive care, rehabilitation

Introduction

Medicine and technology have advanced over the past several decades resulting in lower mortality rates for patients in the Paediatric Intensive Care Unit (PICU) (Pollack et al., 2014). The acuity of PICU patients has also increased, with over half of PICU patients require mechanical ventilation (Farias et al., 2012) and most medicated with sedatives and analgesics. These medications improve ventilation and patient safety by reducing anxiety, agitation, and pain; but children are often left immobile during the course of treatment (Kudchadkar et al., 2020; Vet et al., 2013;). Heavy sedation and analgesic use, as well as immobility are associated with prolonged mechanical ventilation, longer PICU and hospital length of stay (LOS), delirium, increased mortality rate, drug tolerance, dependence, and increased withdrawal symptoms, development of pressure injury, muscle weakness, and venous thromboembolism (Devlin et al., 2018; Edwards et al. 2012; Houtrow et al., 2014; Taylor, Butt & Ciardulli, 2003). These adverse effects delay recovery and lead to long-term comorbidities, chronic conditions, and functional deficits (Cummins et al., 2019; Curley et al., 2003; Field-Ridley et al., 2016; Harris et al., 2016; Ostermann et al., 2000; Tobias, 2000; Vet et al., 2013; Witmer & Takemoto, 2017). Early mobilization (EM) is defined as mobility and rehabilitation initiated within 48-72 hours of admission. EM is intended to improve patients' functional cognitive or physical outcomes and quality of life by restoring or maintaining the patient's pre-hospitalized or baseline status.

Background

EM is now the standard of care for adult Intensive Care Unit (ICU) patients (NICE, 2009). Intended outcomes of EM programmes include reduced mortality, decreased sedation use and delirium, reduced LOS, reduced hospital costs, and improved functional outcomes (Barber et al., 2015; Engel et al., 2013; Leditschke et al., 2012; Morris et al., 2008; Needham & Korupolu,

2010; Parry et al., 2017; Schweickert et al., 2009; Tipping et al., 2017). Studies in adult ICU settings suggest that successful implementation of EM is complex due to the balance between increasing patient activity and optimal sedation, pain and agitation management. Interdisciplinary team communication, culture, cooperation and training contribute to the success of EM implementation (Bakhru et al., 2015; Gosselink et al., 2008). Major barriers to implementing EM to adult ICU patients include patient and clinician factors (i.e., mechanical ventilation, over-sedation), poor team dynamics and culture, and the physical environment (Barber et al., 2015; Berney et al., 2013; Costa et al., 2017; Harrold et al., 2015; Hodgson et al., 2015; Hodgson et al., 2016, 2018; Holdworth et al., 2015; Parry et al., 2017).

Several systematic reviews demonstrated the safety and feasibility of EM in critically ill children (Cameron et al., 2015; Cuello-Garcia et al., 2018; Piva et al., 2019; Wieczork et al., 2015;). Adverse events related to EM in the PICU are rare and consist of loss of a gastric tube or requiring minor adjustments to oxygen management (Cameron, 2015; Cuello-Garcia et al., 2018; Cui et al., 2017; Hodgson et at., 2018; Piva et al., 2019; Wieczork et al., 2015). Though the efficacy of EM in the PICU has not been definitively established, one quality improvement project demonstrated a reduction in length of stay for both mechanically ventilated and non-mechanically ventilated patients who received EM (Herbsman et al., 2020).

Several studies have reviewed current knowledge, attitudes and practices with respect to rehabilitation in the PICU (Choong et al., 2012; Choong et al., 2013; Choong et al., 2014; Cui et al., 2017). Investigators in these studies have demonstrated ICU healthcare providers often lack understanding of the consequences of immobility (Dubb et al., 2016). PICU healthcare providers overestimate actual safety of mobilizing critically ill patients with devices, and under-estimate the impact on immobility on children's development (Choong et al., 2013; Choong et al., 2014;

Dubb et al., 2016). There is also little agreement on appropriate activities for patients with high acuity. While the lack of guidelines were previously reported as barrier to mobilizing PICU patients, this has been recently addressed by the Society of Critical Care Medicine who included EM in the new 2022 Clinical Practice Guidelines (Choong et al., 2013; Choong et al., 2014; Smith et al., 2022). Previous guidelines focused more on identification and diagnosis of these conditions rather than on monitoring while this revised version of the guidelines are more evidence-based focusing on pediatric-specific literature. The guidelines underscore the importance of nonpharmacologic interventions and family involvement to enhance comfort, care and outcomes. These PANDEM guidelines provide recommendations to address seven domains of care including pain, sedation/agitation, iatrogenic withdrawal, neuromuscular blockade, delirium, PICU environment, and early mobility (Smith et al., 2022).

A recent study demonstrated the prevalence of rehabilitation services of PICUs in the United States (PARK-PICU, Kudchadkar et al., 2020). This study collected data on the timing of rehabilitation consultation, patient mobility, safety events, and barriers to mobility. The study found that 19% of patients were not mobilized during their PICU stay. Notably, nurses most commonly facilitated mobilization (67%) either alone, with family or other hospital staff. Physical Therapists (PT) or Occupational Therapists (OT) provided mobility 35% of the time. Families provided mobilization alone 12% of the time (Kudchadkar et al., 2020). Another study conducted in Europe demonstrated similar findings (Ista et al., 2020).

Attitudes were also found to be influential in paediatric EM. One study in the United States. found that 30% of nurses thought it was safe to mobilize intubated patients (Betters et al., 2017). Others have suggested that greater exposure to EM protocols increases use of EM. Ortmann & Dey's (2019) found that after implementation of a protocol to hold intubated

patients, the initial resistance from nurses diminished. By the end of the study, patients were frequently held beyond the protocol time, and the programme extended to other populations not included initially included in the study. Nurses reported seeing benefits of EM with family caregivers who had improved moods after holding their infants which benefitted the patients and led nurses to encourage holding of infants beyond the study's protocol (Ortmann & Dey, 2019). Given that nurses, families and caregivers are heavily involved in early mobilization in the PICU, their perspectives on rehabilitation services heavily influence adoption of early mobilization into clinical practice and sets the context for this review.

Aims

The objectives of this scoping review were to identify and critique the research literature on perspectives of nurses, patients and families regarding EM in the PICU. Understanding the barriers and facilitators of EM programmes in PICUs from the perspectives of nurses, patients and families can promote successful implementation of EM programmes by anticipating challenges and identifying the factors necessary to cultivate a culture of EM in the care of critically ill children in the PICU.

Design And Methods

This scoping review was performed according to guidelines of Arksey and O'Malley (2005). A scoping review includes broad topics with multiple study designs and identifies gaps to guide future research. Databases searched included PubMed and EMBASE and hand searching of relevant articles were also conducted. Search terms for each database are described in Tables 1 and 2. The Cochrane Data Extraction form was used (Higgin & Deeks, 2011) and results were uploaded to Covidence software (Veritas Health Innovation, Melbourne, Australia).

Themes were discussed and agreed upon until consensus between the two authors reached consensus (CN and LF).

Inclusion and Exclusion Criteria

Study selection was based on study population, intervention, and outcome measures. Study population and participants included PICU nurses, parents/caregivers, and patients reporting their experiences with EM. If a study included perceptions of the healthcare team, those data were also extracted; however, to be included in the review, the study had to address nurses' perceptions. Outcomes measured included knowledge and experiences with EM, perceptions of feasibility, acceptability, satisfaction, benefits, facilitators, barriers, concerns, or comfort level with participation. Additional inclusion criteria were: PICU setting, English language, publication in last ten years, peer-reviewed, and full text articles. Exclusion criteria were: preterm infants, other paediatric setting, studies not including nurses, or those with specific patient populations. Additional exclusion criteria were reviews and editorials, and studies focused on non-mobility interventions or chest physiotherapy alone. Studies were selected based on eligibility criteria. One author screened all articles from title and abstract screening and the full-text screen of all included studies (CN). The second author reviewed the full-text screen of those studies (LF), and consensus was reached about all included studies based on eligibility.

There is no consensus regarding exclusion of studies in a scoping review based on study quality. Pham (2014) asserts that no study should be excluded from scoping reviews due to quality, and a quality assessment should be performed. Therefore, no studies were excluded based on quality.

Critical Appraisal of Studies

Qualitative research was evaluated using the Standards for Reporting Qualitative Research (SRQR) method which focuses on critique of methodological rigour (O'Brien et al., 2014). Observational studies were evaluated using National Heart, Lung and Blood Institute (NHLBI) Quality Assessment Tool for Observational Cohort Studies focuses on methodological flaws including internal validity and risk of bias (NIH, 2021). The first author appraised the quality of the included studies and obtained validation from the second author until consensus was reached (CN and LF).

Results

Characteristics of Included Studies

Nine studies were identified to met the inclusion and exclusion criteria. See Figure 1 for studies identified through the search strategy and rationale for excluded studies. Table 3 provides a description of the characteristics of the studies.

Nurses were surveyed in six studies and were the primary healthcare providers whose perspectives reported (Betters et al., 2017; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Parents' perspectives were examined in four studies (Colwell et al., 2019; Parisien et al., 2016; Wieczorek et al., 2016; Zheng et al., 2018), and three studies investigated patient perspectives (Colwell et al., 2018; Wieczorek et al., 2016; Zheng et al., 2018). Perspectives on EM were the primary objectives in six studies (Colwell et al., 2019; Hanna et al., 2020; Herbsman et al., 2020; Parisien et al., 2016; Patel et al., 2021; Zheng et al., 2018;) and secondary objectives in three studies (Betters et al., 2017; Colwell et al., 2018; Wieczorek et al., 2016). All studies took place in PICUs, and included settings with cardiac patients in three studies (Colwell et al., 2018; Colwell et al., 2019; Hanna et al., 2020).

Two studies did not describe the specific PICU patient population (Parisien et al., 2016; Zheng et al., 2018).

Main Themes

Results from the nine studies were organised into six themes: healthcare provider responses, concerns about patient risk factors and adverse events, equipment and staffing resources, family/caregiver responses, patient perspectives, and overall impact of early mobilization programme. Table 4 provides further details of study findings, including subthemes related to barriers and facilitators of EM implementation.

Quality Assessment

Quality assessments of included studies are shown in Table 5 for qualitative studies and Table 6 for observational cohort and cross-sectional studies. Qualitative studies were overall of high quality (Parisien et al., 2016; Patel et al., 2021; Zheng et al., 2018;), and quantitative studies were of moderate quality (Betters et al., 2017; Colwell et al., 2018; Colwell et al., 2019; Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016;).

Themes Identified in this Review

Nurses' Views about EM Implementation

Nurses' views on EM implementation were described in seven studies (Betters et al., 2017; Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Six studies identified barriers to EM in the PICU (Betters et al., 2017; Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016; Zheng et al., 2018). Safety was a focus area in three of the research studies (Betters et al., 2017; Hanna et al., 2020; Zheng et al., 2018). Two of these studies collected data pre and post implementation of an EM programme and reported a statistically significant reduction in

nurses' safety concerns post-implementation compared to pre-implementation (Betters et al., 2017; Hanna et al., 2020). One study (Patel et al., 2021) shared nurses long-term perceptions of their EM programme. They reported the programme improved communication between the teams overall, but cultural and procedural changes were necessary to support the programme (Patel et al., 2021).

Three studies identified lack of priority and standardized procedures (Colwell et al., 2018; Wieczorek et al., 2016; Zheng et al., 2018) as a barrier to EM in the PICU. Three different studies identified lack of resources and support (e.g. time, champions or staff) as barriers to EM (Colwell et al., 2018; Hanna et al., 2020; Zheng et al., 2018). Care coordination was a barrier to EM in three studies (Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016). One study cited lack of training and education as a barrier to EM (Herbsman et al., 2020). These results demonstrate the significant role that safety, lack of priority, resources/support, and care coordination are for nurses when mobilizing patients.

Facilitators to EM were discussed in four studies (Hanna et al., 2020; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Awareness of the evidence and positive morale were identified as facilitators of EM in two studies (Patel et al., 2021; Zheng et al., 2018). Availability of resources, including medical criteria and examples of appropriate mobility activities, were identified in two studies (Patel et al., 2021; Wieczorek et al., 2016). One study identified a collaborative team environment to facilitate EM (Zheng et al., 2018). Another study analysed specific nurse characteristics that facilitated EM. Nurses with more experience, those with adult nursing experience, and those with greater exposure to EM programmes were less likely to perceive barriers to EM (Hanna et al., 2020). Communication, care coordination and culture also have a significant influence on the success of such a programme.

Concerns about Patient Risk Factors Potential for Adverse Events

Patient factors and conditions were identified as barriers to mobility activities in seven studies (Betters et al., 2017; Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2017). Lines, tubes, drains and equipment attached to the patient detailed these safety concerns in two studies (Hanna et al., 2020; Herbsman et al., 2020). Patient's agitation and sedation state were identified as barriers in two studies (Herbsman et al., 2020; Patel et al., 2021). The number of actual adverse events which occurred during mobility events were collected in two studies and neither study identified any adverse events related to mobility activities (Betters et al., 2017; Wieczorek et al., 2016). Finally lack of patient motivation was identified as a barrier in one study (Zheng et al., 2017). Overall, patient factors and conditions were often reported as barriers to EM in PICU patients.

Equipment, Staffing and Resources

Equipment or resource limitations were noted as barriers to EM implementation in six studies (Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Four studies reported lack of equipment availability as a barrier to completing mobility activities (Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016). One study specified the types of equipment frequently needed (Hanna et al., 2020), while another noted unfamiliarity with devices as barriers to completing mobility activities (Zheng et al., 2018). The same study noted that over time, nurses became more familiar with the equipment (Zheng et al., 2018). Resource limitations were reported as staffing issues as another concern in four studies (Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021; Wieczorek et al., 2016). Staff needed for mobility activities included

PT, OT, and nurses; and was of bigger concern to day shift workers as opposed to night shift staff members (Hanna et al., 2020).

Family Caregiver and Patient Perspectives on Early Mobilization

Eight studies reported results on parental experiences with mobilization programmes (Colwell et al., 2018; Colwell et al., 2019; Hanna et al., 2020; Herbsman et al., 2020; Parisien et al., 2016; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Of these, four studies collected data only on parental refusal (Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016), and three collected more in-depth data on barriers to EM (Colwell et al., 2019; Parisien et al., 2016; Zheng et al., 2018). Family caregivers understood the importance of EM, noting that mobilization showed the patient was making clinical improvements, as well as more alertness. It also created a place for them to participate in care (Colwell et al., 2019). Additionally, stress associated with EM could be overcome with more exposure, communication and participation (Colwell et al., 2019; Parisien et al., 2016). Parisien (2016) reported a changing medical plan as a barrier and Zheng (2018) noted the difficulties with interprofessional communication.

Four studies described facilitators to EM reported by parental family caregivers (Colwell et al., 2019; Parisien et al., 2016; Patel et al., 2021; Zheng et al., 2018;). Themes from these studies centered around the benefits of parental education, engagement and satisfaction; perceived benefits to the patient and engagement in research. Two studies described parental praise and satisfaction with EM (Colwell et al., 2019; Patel et al., 2021). Parental participation in care was also important and while noted to be stressful initially, stress was overcome with trust in the team, team engagement, communication and encouragement (Colwell et al., 2019; Parisien

et al., 2016; Zheng et al., 2018). Finally, participating in research and research staff attitude was also found to facilitate EM for parent and family caregivers (Zheng et al., 2018).

Four studies captured patients' experiences with early mobilization (Colwell et al., 2018; Patel et al., 2021; Wieczorek et al., 2016; Zheng et al., 2018). Three of these studies described patient refusal (Colwell et al., 2018; Wieczorek et al., 2016; Zheng et al., 2018). Zheng's (2018) study further explored patient's experiences with EM. The authors identified that lack of patient motivation as a major barrier to EM delivery. This study also reported facilitator themes, including the perceived benefit and healthcare team engagement (Zheng et al., 2018). Patel et al. (2021) reported staff's perceptions of the EM programme as it increased patient satisfaction, though satisfaction scores were not measured directly.

Overall Impact

Six studies reported the overall impact of EM programmes (Colwell et al., 2019; Hanna et al., 2020; Herbsman et al., 2020; Parisien et al., 2016; Patel et al., 2021; Zheng et al., 2018). The perceptions of nurses, patients and family caregivers were that early mobilization activities benefit patients and family caregivers (Colwell et al., 2019; Hanna et al., 2020; Zheng et al., 2018). Several studies focused on the importance of communication between healthcare providers and family members (Colwell et al., 2019; Hanna et al., 2020; Parisien et al., 2016). Herbsman (2020) showed that staff felt more comfortable with EM after implementation of the programme. After receiving training, they were less concerned about line, tube and drain removal, and managing respiratory equipment (Herbsman et al., 2020). Patel et al. (2021) focused on improvements in clinical practice as a result of implementation of the EM programme. Themes included improved communication between care teams, practicing mobility and accessible documentation of mobility goals.

Discussion

In this review, studies reporting the perspectives of nurses, patients, and family caregivers were identified to understand the factors that influenced successful implementation of early mobilization programmes in PICUs. Understanding these perspectives is essential to develop and test interventions that will improve EM implementation and outcomes in PICUs. Nurses, parents and patients are the key individuals to achieving patient mobility in the critical care setting. Studies included in this review identified nurses' concerns regarding EM implementation, safety, lack of priority in clinical care and procedures, lack of resources/support, and care coordination. For families, EM was found to be stressful, they were overwhelmed by the medical equipment involved, and worried about the demands EM placed on their child. Only one study examined the patient experience of EM and responses were limited (Zheng et al., 2018). Overall, and despite concerns and challenges, most nurses and family caregivers recognised the benefits for patients of EM and physical activity.

Previous paediatric studies have shown that EM is safe and feasible with minor or no adverse events (Betters et al., 2017; Cuello-Garcia et al., 2018; Cui et al., 2017; Wieczorek et al., 2016; Zebuhr et al., 2014). Despite this, nurses continue to express concerns about patient safety. For families and caregivers, EM presents opportunities and challenges. The importance of good communication, coaching, and education was underscored and fits into a broader discussion of the importance of parent and nurse partnerships in care. These partnerships are important to provide care to medically complex children (Rennick et al., 2019), and as a universal care model to share decisions and care planning in the PICU (Kokorelias et al. 2019).

Very few studies were found regarding paediatric patients' experiences with EM. While also true in adult literature, one study examined patients experiences with EM in the ICU

(Söderberg et al.,2020). Patients identified three main categories which included “facing the impossible, too demanding situation; struggling successfully on the way back; and need for dedicated supporters.” Participants had faint memories of the beginning of their recovery. They reported strong feelings, both pleasant and unpleasant memories of EM. Participants also described that EM helped them feel more in control, have a willingness to fight, gratitude for being alive and regaining their freedom while recovering in the ICU (Söderberg et al., 2020). PICU survivors experiences could be explored further in future studies.

Results from paediatric and adult literature report consistent barriers to EM and have demonstrated minimal adverse events (Bailey et al., 2007; Berney et al., 2013; Calvo-Ayala et al., 2013; Nydahl et al., 2014; Pohlman et al., 2010). Nurses’ safety concerns remain the most common barrier to delivering EM related to physiologic stability, as well as concern for line and tube integrity in adult ICUs (Costa, 2017; Hodgson, 2018;). Safety concerns, unit culture and oversedation resulted in less mobilization with mechanically ventilated adult patients (Berney et al., 2013; Harrold et al., 2015; Hodgson et al., 2015; Hodgson et al., 2016). These concerns are consistent with those of paediatric nurses which result in hesitation towards mobility care (Colwell et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Wieczorek et al., 2016; Zheng et al., 2018). Basset and colleagues (2012) reported a variety of barriers to EM related factors like resistance to change, lack of resources and equipment, lack of knowledge and process, concerns about sustaining the improvement, and oversedation. In their study, they offered strategies to overcome these barriers (Basset et al., 2015). These strategies could be explored further in the PICU setting.

Of note, unit cultural factors are well reported in adult ICU EM literature (Barber et al., 2015; Hodgson et al., 2015; Holdsworth et al., 2015). PICU culture was described as a barrier to

EM in two studies (Hanna et al., 2020; Patel et al., 2021). However, the cultural aspects of creating a unit supportive of mobility culture remains unclear and should be explored further in the setting of the PICU. It is interesting that fears of adverse events during EM remain despite this not being supported in the literature.

Two additional factors addressed in adult EM research were not addressed in paediatric studies. These factors include education programmes and interdisciplinary rounds (Balas et al., 2013; Basset et al., 2012; Dafoe et al., 2015). Future research could explore the role of education and interdisciplinary rounds in PICU EM. Patel (2021) and Gupta (2021) discussed the importance of mobility simulations in the adoption of mobility culture. Gupta (2021) described the importance of in-situ simulations to address safety and the development of a checklist and pathway to address potential adverse events related to EM in the PICU.

Limitations and Strengths of this Review

The search strategy for this review was limited to two databases and did not include gray literature. While there are some benefits to grey literature such as reducing publication bias, study quality is reduced because of the lack of peer-review. This scoping review aimed for transparency and rigour in its process, guided Arksey and O'Malley (2005). Additional strengths include the use of standardized quality assessment tools. Quality assessments were performed on included studies using the NHLBI and SRQR Quality Assessment Tools (NIH, 2020; O'Brien et al., 2014) methods for quantitative and qualitative studies, respectively. Multiple reviewers on this scoping review enhanced the quality of the review.

Implications of this Review

There are both research and practice implications of this review. Long-term outcomes of EM are less understood in the paediatric compared to adult literature. Understanding these

outcomes would advance PICU practice. Healthcare provider perspectives should be measured and recorded using more robust data collection techniques with repeated measures. There are opportunities to measure participant compliance, exposure and the influence of previous experiences with mobility on the likelihood to implement EM. There were issues with data collection methods identified from this review. The majority of data was collected at a single time point as compared to several different time points, which allows for robust data collection. Patients' experience with EM in the PICU are underrepresented in the literature. The family's role in EM has been better studied and documented, but there are still gaps in our knowledge. For these reasons, it is critical to understand the family's perspective from a broader sample including gender, socioeconomic, racial, educational background and marital status.

There are also significant practice implications of this review. This review was conducted to understand the barriers to implementing EM programmes in order to facilitate problem solving and to address these issues as programmes become established in the PICU. This review demonstrates how instrumental nurses and families are to EM in the PICU. It is important to obtain nurses' and family caregivers' engagement for these programmes to be successful. Nurses must be competent and comfortable using EM equipment and to understand the body mechanics necessary to safely carry out EM activities. There is the potential for the dislodgement of lines, tubes and drains during mobility activities so it is important to have strong safety measures in place in order to secure devices and to avoid their dislodgement. Finally, the partnership between family caregivers and nurses carrying out EM activities is essential and their relationship must be built on good communication and collaboration. Barriers to EM may be minimized when benefits to EM are well understood, staff are able to safely practice EM activities, and when patients, family caregivers and nurses experience the positive outcomes of their work.

Conclusion

Evidence supports the safety and feasibility of EM in the PICU. There are similar concerns for safety and resources among adult and paediatric healthcare providers, family caregivers and patients who are engaged in EM. There are limitations in understanding the facilitators to EM. Nurses' experiences should be further explored given the importance of their role in conducting mobility activities including the challenges and resources necessary to conduct this work. Research has been limited in data collection methods, using either simple, unvalidated surveys or taken at a single time to measure healthcare professionals' perspectives. Patient's experiences with EM is significantly underrepresented and should be studied carefully. The experiences of family caregivers from diverse backgrounds should be investigated. In order to achieve a unit culture where eligible patients receive EM, it is imperative to understand and address the barriers and facilitators to conducting EM. Nurses and families are instrumental in EM in the Paediatric ICU and their perceived barriers must be addressed to achieve a mobility culture on the unit. Therefore, benefits to EM should be clearly described to both staff and family caregivers and staff should be competent and comfortable carrying out EM activities.

References

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a Methodological Framework. *International Journal of Social Research Methodology,8,* 19–32. doi: 10.1080/1364557032000119616

Bailey, P., Thomsen, G. E., Spuhler, V. J., Blair, R., Jewkes, J., Bezdjian, L., Veale, K., Rodriquez, L., & Hopkins, R. O. (2007). Early activity is feasible and safe in respiratory failure patients. *Critical Care Medicine*, *35*(1), 139–145. https://doi.org/10.1097/01.CCM.0000251130.69568.87

Bakhru, R. N., Wiebe, D. J., McWilliams, D. J., Spuhler, V. J., & Schweickert, W. D. (2015). An environmental scan for early mobilization practices in U.S. ICUs. *Critical Care Medicine*, *43*(11), 2360–2369. https://doi.org/10.1097/CCM.0000000000001262

Balas, M. C., Burke, W. J., Gannon, D., Cohen, M. Z., Colburn, L., Bevil, C., Franz, D., Olsen, K. M., Ely, E. W., & Vasilevskis, E. E. (2013). Implementing the awakening and breathing coordination, delirium monitoring/management, and early exercise/mobility bundle into everyday care: opportunities, challenges, and lessons learned for implementing the ICU Pain, Agitation, and Delirium Guidelines. *Critical Care Medicine*, *41*(9 Suppl 1), S116–S127. https://doi.org/10.1097/CCM.0b013e3182a17064

Barber, E. A., Everard, T., Holland, A. E., Tipping, C., Bradley, S. J., & Hodgson, C. L. (2015). Barriers and facilitators to early mobilisation in intensive care: A qualitative study. *Australian Critical Care: Official Journal of the Confederation of Australian Critical Care Nurses*, *28*(4), 177–183. https://doi.org/10.1016/j.aucc.2014.11.001

Bassett, R., Adams, K. M., Danesh, V., Groat, P. M., Haugen, A., Kiewel, A., Small, C., Van-Leuven, M., Venus, S., & Ely, E. W. (2015). Rethinking critical care: decreasing

sedation, increasing delirium monitoring, and increasing patient mobility. *Joint Commission Journal on Quality and Patient Safety*, *41*(2), 62–74. https://doi.org/10.1016/s1553-7250(15)41010-4

Bassett, R. D., Vollman, K. M., Brandwene, L., & Murray, T. (2012). Integrating a multidisciplinary mobility programme into intensive care practice (IMMPTP): A multicentre collaborative. *Intensive & Critical Care Nursing*, *28*(2), 88–97. https://doi.org/10.1016/j.iccn.2011.12.001

Berney, S. C., Harrold, M., Webb, S. A., Seppelt, I., Patman, S., Thomas, P. J., & Denehy, L. (2013). Intensive care unit mobility practices in Australia and New Zealand: A point prevalence study. *Critical Care and Resuscitation: Journal of the Australasian Academy of Critical Care Medicine*, *15*(4), 260–265.

Betters, K. A., Hebbar, K. B., Farthing, D., et al. (2017). Development and implementation of an early mobility program for mechanically ventilated pediatric patients. *Journal of Critical Care*, *41*, 303-308.

Bakhru, R. N., Wiebe, D. J., McWilliams, D. J., Spuhler, V. J., & Schweickert, W. D. (2015). An environmental scan for early mobilization practices in U.S. ICUs. *Critical Care Medicine*, *43*(11), 2360–2369. https://doi.org/10.1097/CCM.0000000000001262

Calvo-Ayala, E., Khan, B. A., Farber, M. O., Ely, E. W., & Boustani, M. A. (2013). Interventions to improve the physical function of ICU survivors: A systematic review. *Chest*, *144*(5), 1469–1480. https://doi.org/10.1378/chest.13-0779

Cameron, S., Ball, I., Cepinskas, G., Choong, K., Doherty, T. J., Ellis, C. G., Martin, C. M., Mele, T. S., Sharpe, M., Shoemaker, J. K., & Fraser, D. D. (2015). Early mobilization in

the critical care unit: A review of adult and pediatric literature. *Journal of Critical Care, 30*(4), 664–672. https://doi.org/10.1016/j.jcrc.2015.03.032

Choong, K., Koo, K. K., Clark, H., et al. (2013). Early mobilization in critically ill children: A survey of Canadian practice. *Critical Care Medicine, 41*(7), 1745–1753.

Choong, K., Foster, G., Fraser, D. D., et al. (2014). Acute rehabilitation practices in critically ill children: A multicenter study. *Pediatric Critical Care Medicine, 15*(6): e270–e279.

Choong, K., Tran, N., Clark, H., Cupido, C., & Corsi, D. J. (2012). Acute rehabilitation in critically ill children. *Journal of Pediatric Intensive Care*, *1*(4), 183–192. https://doi.org/10.3233/PIC-12031

Colwell, B. R. L., Williams, C. N., Kelly, S. P., & Ibsen, L. M. (2018). Mobilization therapy in the pediatric intensive care unit: A multidisciplinary quality improvement initiative. *American Journal of Critical Care, 27*(3), 194–203

Colwell, B. R. L., Olufs, E., Zuckerman, K., Kelly, S. P., Ibsen, L. M., & Williams, C. N. (2019). PICU early mobilization and impact on parent stress. *Hospital Pediatrics, 9*(4), 265-272. doi: https://doi.org/10.1542/hpeds.2018-0155

Costa, D. K., White, M. R., Ginier, E., et al. (2017). Identifying barriers to delivering the awakening and breathing coordination, delirium, and early exercise/mobility bundle to minimize adverse outcomes for mechanically ventilated patients: A systematic review. *Chest, 152*, 304–311.

Covidence systematic review software (2021). Veritas Health Innovation: Melbourne, Australia. Available at www.covidence.org

Cuello-Garcia, C. A., Mai, S. H. C., Simpson, R., et al. (2018). Early mobilization in critically ill children: A systematic review. *Journal of Pediatrics, 203*, 25–33.e6

Cui, L. R., LaPorte, M., Civitello, M., et al. (2017). Physical and occupational therapy utilization in a pediatric intensive care unit. *Journal of Critical Care, 40*, 15–20

Cummins, K. A., Watters, R., & Leming-Lee, T. (2019).Reducing pressure injuries in the pediatric intensive care unit. *Nursing Clinic of North America, 54*, 127–140

Curley, M. A., Quigley, S. M., & Lin, M. (2003). Pressure ulcers in pediatric intensive care: Incidence and associated factors. *Pediatric Critical Care Medicine, 4*, 284–290

Dafoe, S., Chapman, M. J., Edwards, S., & Stiller, K. (2015). Overcoming barriers to the mobilisation of patients in an intensive care unit. *Anaesthesia and Intensive Care, 43*(6), 719–727. https://doi.org/10.1177/0310057X1504300609

Devlin, J. W., Skrobik, Y., Gélinas, C., et al. (2018). Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Critical Care Medicine, 46*, e825–e873

Dubb, R., Nydahl, P., Hermes, C., et al. (2016). Barriers and strategies for early mobilization of patients in intensive care units. *Annals of American Thoracic Society,13*(5), 724– 730.

Edwards, J. D., Houtrow, A. J., Vasilevskis, E., et al. (2012). Chronic conditions among children admitted to U.S. pediatric intensive care units: Their prevalence and impact on risk for mortality and prolonged length of stay. *Critical Care Medicine, 40*, 2196–2203

Engel, H. J., Tatebe, S., Alonzo, P. B., Mustille, R. L., & Rivera, M. J. (2013). Physical therapist-established intensive care unit early mobilization program: Quality improvement project for critical care at the University of California San Francisco Medical Center. *Physical Therapy*, *93*(7), 975–985. https://doi.org/10.2522/ptj.20110420

Farias, J. A., Fernández, A., Monteverde, E., Flores, J. C., … & Latin-American Group for Mechanical Ventilation in Children (2012). Mechanical ventilation in pediatric intensive

care units during the season for acute lower respiratory infection: a multicenter study. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *13*(2), 158–164. https://doi.org/10.1097/PCC.0b013e3182257b82

Field-Ridley, A., Dharmar, M., Steinhorn, D., et al. (2016). ICU-acquired weakness is associated with differences in clinical outcomes in critically ill children. *Pediatric Critical Care Medicine, 17*, 53–57

Gosselink, R., Bott, J., Johnson, M., et al. (2008). Physiotherapy for adult patients with critical illness: recommendations of the European respiratory society and European society of intensive care medicine task force on physiotherapy for critically ill patients. *Intensive Care Medicine, 34*, 1188–1199.

Gupta, N., Sones, A., Powell, M., Robbins, J., Wilson, S., Hill, A., Thomas, C., Ledbetter, S., Schmidtke, A. G., Rutledge, C., & Hayes, L. (2020). Quality improvement methodology to optimize safe early mobility in a pediatric intensive care unit. *Pediatric Quality & Safety*, *6*(1), e369. https://doi.org/10.1097/pq9.0000000000000369

Hanna, E. S., Zhao, S., Shannon, C. N., & Betters, K. A. (2020). Changes in provider perceptions regarding early mobility in the PICU. *Pediatric Critical Care Medicine, 21,* e30–e38

Harris, J., Ramelet, A. S., van Dijk, M., Pokorna, P., Wielenga, J., Tume, L., Tibboel, D., & Ista, E. (2016). Clinical recommendations for pain, sedation, withdrawal and delirium assessment in critically ill infants and children: an ESPNIC position statement for healthcare professionals. *Intensive Care Medicine*, *42*(6), 972–986. https://doi.org/10.1007/s00134-016-4344-1

Harrold, M. E., Salisbury, L. G., Webb, S. A., Allison, G. T., et al. (2015). Early mobilisation in intensive care units in Australia and Scotland: a prospective, observational cohort study examining mobilisation practices and barriers. *Critical Care, 19,* 336. doi: 10.1186/s13054-015-1033-3.

Herbsman, J. M., D'Agati, M., Klein, D., O'Donnell, S., Corcoran, J. R., Folks, T. D., & Al-Qaqaa, Y. M. (2020). Early mobilization in the pediatric intensive care unit: A quality improvement initiative. *Pediatric Quality & Safety*, *5*(1), e256. https://doi.org/10.1097/pq9.0000000000000256

Higgins, J. P. T. & Deeks, J. J. (2011). Chapter 7: Selecting studies and collecting data. In J. P.T. Higgins & J. J. Deeks (Eds.). Cochrane Handbook for Systematic Reviews of Interventions. Retrieved from https://handbook-5-1.cochrane.org/chapter_7/7_selecting_studies_and_collecting_data.htm

Hodgson, C.L., Capell, E. & Tipping, C.J. (2018). Early mobilization of patients in intensive care: Organization, communication and safety factors that influence translation into clinical practice. *Critical Care 22***,** 77. https://doi.org/10.1186/s13054-018-1998-9

Hodgson, C. L., Bailey, M., Bellomo R, et al. (2016). A binational multicenter pilot feasibility randomized controlled trial of early goal-directed mobilization in the ICU. *Critical Care Medicine, 44,* 1145–1152.

Hodgson, C. L., Bellomo, R., Berney, S., et al. (2015). Early mobilization and recovery in mechanically ventilated patients in the ICU: a bi-national, multi-centre, prospective cohort study. *Critical Care, 19,* 81.

Holdsworth, C., Haines, K. J., Francis, J. J., Marshall, A., O'Connor, D., & Skinner, E. H. (2015). Mobilization of ventilated patients in the intensive care unit: an elicitation study using the theory of planned behavior. *Journal of Critical Care, 30*, 1243–1250.

Houtrow, A. J., Larson, K., Olson, L. M., et al. (2014). Changing trends of childhood disability, 2001–2011. *Pediatrics, 134*, 530–538

Ista, E., Scholefield, B. R., Manning, J. C., Harth, I., & Gawronski, Bartkowska-Śniatkowska A., Ramelet, A. S., Kudchadkar, S. R., (2020). Mobilization practices in critically ill children: A European point prevalence study (EU PARK-PICU). *Critical Care, 24*, 368-380. https://doi.org/10.1186/s13054-020-02988-2

Kokorelias, K. M., Gignac, M. A. M., Naglie, G. *et al.* (2019). Towards a universal model of family centered care: A scoping review. *BMC Health Services Reserves* 19**,** 564. https://doi.org/10.1186/s12913-019-4394-5

Kudchadkar, S. R., Nelliot, A., Awojoodu, R., Vaidya, D., Traube, C., Walker, T., Needham, D. M., & Prevalence of Acute Rehabilitation for Kids in the PICU (PARK-PICU) Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network (2020). Physical rehabilitation in critically ill children: A multicenter point prevalence study in the United States. *Critical Care Medicine*, *48*(5), 634–644. https://doi.org/10.1097/CCM.0000000000004291

Leditschke, I. A., Green, M., Irvine, J., Bissett, B., & Mitchell, I. A. (2012). What are the barriers to mobilizing intensive care patients?. *Cardiopulmonary physical therapy journal*, *23*(1), 26–29.

Morris, P. E., Goad, A., Thompson, C., et al. (2008). Early intensive care unit mobility therapy in the treatment of acute respiratory failure. *Critical Care Medicine*, *36*, 2238–2243

Needham, D. M. & Korupolu, R. (2010). Rehabilitation quality improvement in an intensive care unit setting: Implementation of a quality improvement model. *Top Stroke Rehabilitation, 17*, 271–281.

National Heart, Lung and Blood Institute (NIH) (2021). Study quality assessment tools. Retrieved from https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools

NICE Guidelines (2009). Rehabilitation after critical illness in adults. Retrieved from https://www.nice.org.uk/guidance/cg83.

Nydahl, P., Ruhl, A. P., Bartoszek, G., Dubb, R., Filipovic, S., Flohr, H. J., Kaltwasser, A., Mende, H., Rothaug, O., Schuchhardt, D., Schwabbauer, N., & Needham, D. M. (2014). Early mobilization of mechanically ventilated patients: A 1-day point-prevalence study in Germany. *Critical Care Medicine, 42*(5), 1178–1186. https://doi.org/10.1097/CCM.0000000000000149

O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine, 89*(9). Doi: 10.1097/A CM.0000000000000388

Ortmann, L. & Dey, A. (2019). Early mobilization of infants intubated for acute respiratory failure. *Critical Care Nurse, 39*(6), 47-52. doi: 10.4037/ccn2019231

Ostermann, M. E., Keenan, S. P., Seiferling, R. A., & Sibbald, W. J. (2000). Sedation in the intensive care unit: A systematic review. *JAMA*, *283*(11), 1451–1459. https://doi.org/10.1001/jama.283.11.1451

Parisien, R.B., Gillanders, K., Hennessy, E., Herterich, L.B., Saunders, K.J., Lati, J., Dos Santos, S., Hassall, A., & O'Brien, K.K. (2016). Experiences of four parents with physical

therapy and early mobility of their children in a pediatric critical care unit: A case series. *Journal of Pediatric Rehabilitation Medicine, 9(2),* 159-68 .

Parry, S. M., Knight, L. D., Connolly, B., et al. (2017). Factors influencing physical activity and rehabilitation in survivors of critical illness: A systematic review of quantitative and qualitative studies. *Intensive Care Medicine, 43,* 531–42.

Patel, R. V., Redivo, J., Nelliot, A., Eakin, M. N., Wieczorek, B., Quinn, J., Gurses, A. P., Balas, M. C., Needham, D. M., & Kudchadkar, S. R. (2021). Early mobilization in a PICU: A qualitative sustainability analysis of PICU Up!. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *22*(4), e233–e242. https://doi.org/10.1097/PCC.0000000000002619

Pham, M. T., Rajić, A., Greig, J. D., Sargeant, J. M., Papadopoulos, A., & McEwen, S. A. (2014). A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. *Research Synthesis Methods*, *5*(4), 371–385. https://doi.org/10.1002/jrsm.1123

Piva, T. C., Ferrari, R. S., & Schaan, C. W. (2019). Early mobilization protocols for critically ill pediatric patients: Systematic review. Protocolos de mobilização precoce no paciente crítico pediátrico: revisão sistemática. *Revista Brasileira de Terapia Intensiva*, *31*(2), 248–257. https://doi.org/10.5935/0103-507X.20190038

Pohlman, M. C., Schweickert, W. D., Pohlman, A. S., et al. (2010). Feasibility of physical and occupational therapy beginning from initiation of mechanical ventilation. *Critical Care Medicine*; 38, 2089–2094.

Pollack, M. M., Holubkov, R., Funai, T., et al (2014). Eunice Kennedy Shriver National Institute of Child Health and Human Development Collaborative Pediatric Critical Care Research Network. Pediatric intensive care outcomes: development of new morbidities during pediatric critical care. *Pediatric Critical Care Medicine, 15*(9), 821–827.

Rennick, J. E., St-Sauveur, I., Knox, A. M. *et al.* (2019). Exploring the experiences of parent caregivers of children with chronic medical complexity during pediatric intensive care unit hospitalization: An interpretive descriptive study. *BMC Pediatrics, 19*, 272. https://doi.org/10.1186/s12887-019-1634-0

Schweickert, W.D., Pohlman, M. C., Pohlman, A. S., et al. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: A randomised controlled trial. *Lancet, 373*, 1874–1882

Smith, H., Besunder, J. B., Betters, K. A., Johnson, P. N., Srinivasan, V., Stormorken, A., Farrington, E., Golianu, B., Godshall, A. J., Acinelli, L., Almgren, C., Bailey, C. H., Boyd, J. M., Cisco, M. J., Damian, M., deAlmeida, M. L., Fehr, J., Fenton, K. E., Gilliland, F., Grant, M., … Berkenbosch, J. W. (2022). 2022 Society of Critical Care Medicine Clinical Practice Guidelines on Prevention and Management of Pain, Agitation, Neuromuscular Blockade, and Delirium in Critically Ill Pediatric Patients With Consideration of the ICU Environment and Early Mobility. *Pediatric Critical Care Medicine*, *23*(2), e74–e110. https://doi.org/10.1097/PCC.0000000000002873

Söderberg, A., Karlsson, V., Ahlberg, B. M., Johansson, A., & Thelandersson, A. (2022). From fear to fight: Patients experiences of early mobilization in intensive care. A qualitative interview study. *Physiotherapy Theory and Practice, 38*(6), 750-758. DOI: 10.1080/09593985.2020.1799460

Taylor, A., Butt, W., & Ciardulli, M. (2003). The functional outcome and quality of life of children after admission to an intensive care unit. *Intensive Care Medicine, 29*, 795–800

Tipping, C. J., Harrold, M., Holland, A., Romero, L., Nisbet, T., & Hodgson, C. L. (2017). The effects of active mobilisation and rehabilitation in ICU on mortality and function: A systematic review. *Intensive Care Medicine*, *43*(2), 171–183. https://doi.org/10.1007/s00134-016-4612-0

Tobias, J. D. (2000). Tolerance, withdrawal, and physical dependency after long-term sedation and analgesia of children in the pediatric intensive care unit. *Critical Care Medicine*, *28*(6), 2122–2132. https://doi.org/10.1097/00003246-200006000-00079

Vet, N. J., Ista, E., de Wildt, S. N., van Dijk, M., Tibboel, D., & de Hoog, M. (2013). Optimal sedation in pediatric intensive care patients: A systematic review. *Intensive Care Medicine*, *39*(9), 1524–34.

Wieczorek, B., Ascenzi, J., Kim, Y., et al. (2016). PICU up!: Impact of a quality improvement intervention to promote early mobilization in critically ill children. *Pediatric Critical Care Medicine, 17*, e559–e566

Wieczorek, B., Burke, C., Al-Harbi, A., & Kudchadkar, S. R. (2015). Early mobilization in the pediatric intensive care unit: A systematic review. *Journal of Pediatric Intensive Care, 4*, 129–170. https://doi.org/10.1055/s-0035-1563386

Witmer, C. M. & Takemoto, C. M. (2017). Pediatric hospital acquired venous thromboembolism. *Front Pediatrics, 5*, 198.

Zebuhr, C., Sinha, A., Skillman, H., & Buckvold, S. (2014). Active rehabilitation in a pediatric extracorporeal membrane oxygenation patient. *PM & R: The Journal of Injury, Function, and Rehabilitation*, *6*(5), 456–460. https://doi.org/10.1016/j.pmrj.2013.11.005

Zheng, K., Sarti, A., Boles, S., Cameron, S., Carlisi, R. et al. (2018). Impressions of early mobilization of critically ill children-clinician, patient, and family perspectives. *Pediatric Critical Care Medicine, 19*(7), e350-e357.

Table 2.1: PubMed Search Strategy. Date of Search: July 11, 2021

#	Searches	Results
1	(“PICU” OR “ICU” OR “Intensive Care” OR “Critical Care") OR ("Critical Care"[Mesh] OR "Intensive Care Units"[Mesh])	408,782
2	(“Infant” OR “Child” OR “Pediatrics”) OR (“Infant”[MeSH] OR “Child”[MeSH] OR “Pediatrics”[MeSH])	2,962,572
3	("Early Ambulation"[Mesh] OR (Accelerated Ambulation) OR (Ambulation Early) OR (Early Mobilization))	12,601
4	"Exercise Therapy"[Mesh] OR (Therap∗ Exercise∗) OR (Rehabilitation Exercise∗) OR ("Exercise"[Mesh] OR (Exercise∗) OR (Physical Activit∗) OR (Exercise∗ Physical) OR (Acute Exercise∗) OR (Exercise∗ Isometric) OR (Exercise∗ Aerobic) OR (Exercise∗ Training∗)	34,120
6	((((("PICU" OR "ICU" OR "Intensive Care" OR "Critical Care") OR ("Critical Care"[Mesh] OR "Intensive Care Units"[Mesh])) AND (("Infant" OR "Child" OR "Pediatrics") OR ("Infant"[MeSH] OR "Child"[MeSH] OR "Pediatrics"[MeSH]))) AND (("Early Ambulation"[Mesh] OR (Accelerated Ambulation) OR (Ambulation Early) OR (Early Mobilization)))) OR (("Early Ambulation"[Mesh] OR (Accelerated Ambulation) OR (Ambulation Early) OR (Early Mobilization))	12,601
7	((((("PICU" OR "ICU" OR "Intensive Care" OR "Critical Care") OR ("Critical Care"[Mesh] OR "Intensive Care Units"[Mesh])) AND (("Infant" OR "Child" OR "Pediatrics") OR ("Infant"[MeSH] OR "Child"[MeSH] OR "Pediatrics"[MeSH]))) AND (("Early Ambulation"[Mesh] OR (Accelerated Ambulation) OR (Ambulation Early) OR (Early Mobilization)))) OR (("Early Ambulation"[Mesh] OR (Accelerated Ambulation) OR (Ambulation Early) OR (Early Mobilization)) Filter: Full text, in the last 10 years, English, Child: birth – 18 years, Humans	511

Table 2.2: Embase Search: Date of Search July 11, 2021

#	**Searches**	**Results**
1	‘infant’/exp OR ‘infant’ OR ‘child’/exp OR ‘child’ OR ’pediatrics’/exp OR ‘pediatrics’	3,755,070
2	‘picu’ OR ‘icu’ OR ‘intensive care’ OR ‘critical care’	776,766
3	“early ambulation” OR “early mobilization” OR “exercise” OR “physical activit*” OR “exercise training”	719,419
4	#1 AND #2 AND #3	1,947
5	#4 AND [English]/lim AND [2010-2020]/py AND 'human'/de AND ([adolescent]/lim OR [child]/lim OR [infant]/lim) AND 'article'/it	404

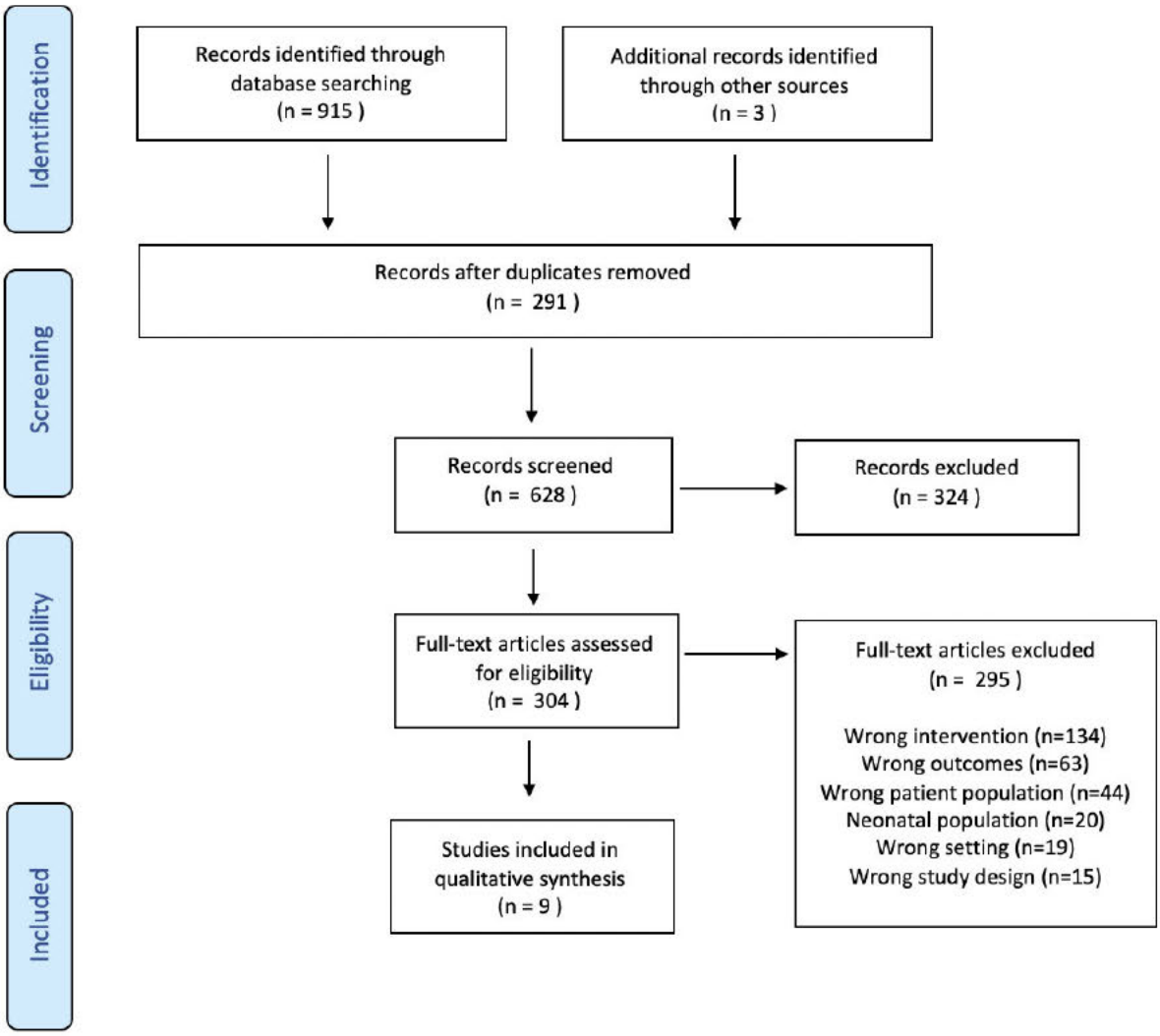

Figure 2.1: Flow Diagram

Table 2.3: Characteristics of Individual Studies

Author Year Country	Purpose	Perspective as Research Objective	Study Design Methods & Procedures	Sample / Setting	Outcome Measures
Parisien (2016) Canada	To conduct a preliminary investigation into parents' experiences of physical therapy and EM	Primary	Qualitative case study series of four cases using semi-structured interviews. 2 researchers conducted independent interviews in 6wk period, field notes & demographics survey. Data Collection: Multiple timepoints Thematic analysis	PICU not described Family members: English-speaking, children < 36 months, had undergone surgery, and received at least one EM physical therapy intervention while intubated in the PICU	Experiences of families with regard to early mobilization and physical therapy
Wieczorek (2016) United States	To evaluate a structured, interdisciplinary EM and progressive mobility protocol for all critically ill children	Secondary	Quantitative observational study. Likert-like survey, voluntary and anonymous, was sent to collect general feedback and ongoing barriers to mobilization Data Collection: Single timepoint	40-bed PICU academic tertiary care. Med/surg Healthcare Providers: Entire PICU staff	Frequency and reasons that activities were stopped Barriers to activities Mobilization related adverse effects (inadvertent extubation or line removal)
Betters (2017) United States	To describe the creation and initiation of the EM protocol and to elaborate on the barriers associated with implementation	Secondary	Quantitative, observational, cross-sectional study where staff survey was sent to RNs & RTs prior to implementation. Survey repeated 2 years later to assess changes in staff perceptions Data Collection: Single timepoint	36-bed PICU academic children's hospital. Med/surg Healthcare Providers: RTs and RNs	Adverse events Change in staff perceptions of EM
Colwell (2018) United States	To implement a standardized EM protocol and to improve mobilization of patients. Complications and barriers were collected.	Secondary	Quantitative, observational, cross-sectional study. Preliminary survey focused on perceptions and barriers to mobilization. Post-survey (6 months after): Attendings conducted biweekly rounds & collected perceived barriers to mobilization Data Collection: Single timepoint	20-bed PICU, urban academic tertiary children's hospital. Combined med/surg and cardiac Healthcare Providers: RNs	Adverse events [Defined by: desaturation requiring escalation of therapy, unplanned extubation, removal of medical equipment (art line, CVC) and falls] Perceived barriers to mobilization
Zheng (2018) Canada	To understand pt, family caregiver and clinical impressions of EM, barriers and facilitators to implementation, and use of in-bed cycling for mobilization	Primary	Qualitative, semi-structured, interviews conducted by 2 investigators prior to d/c home; share experience and impressions of EM and in-bed cycling using interview guides. All codes agreed upon by at least 2 coders. Data Collection: Multiple timepoints Triangulation & thematic analysis	12 bed PICU Healthcare Providers, Family Members & Patients: MDs, RNs, PT, F, and patients >=8yr who were enrolled in wEECYCLE	Discipline Provider's, RNs', family member's and patient's perceptions of EM

Author Year Country	Purpose	Perspective as Research Objective	Study Design Methods & Procedures	Sample / Setting	Outcome Measures
Colwell (2019) United States	To evaluate parent stress related to mobilization therapies to further explore parent refusal of therapies and whether educational interventions to reduce parent stress could be used to decrease the refusal of therapies in future studies	Primary	Quantitative, observational, cross-sectional study. Self-administered survey followed by retrospective chart review of 120 parent/child dyads Data Collection: Single timepoint 4 parts: mobilization survey, parental stressor scale, perceived stress scale & demographic questionnaire Identified parent/child; discussed with RN/MD; packets distributed to parents and collected within 24 hr	Combined med/surg and cardiac Family Members: Inclusion: admitted over 13 weeks in 2016; >= 1 night in PICU, aged 0-17 years, English/Spanish, present at bedside. Exclusion: families of patients on bedrest orders or death was imminent; not legal guardians; not proficient in writing or speaking English/ Spanish; child abuse/neglect	Mobilization survey: 7 Likert-like questions, 3 subscales of "person involved," "movement activity," and "parent worry;" included a question on communication; 3 greatest concerns & 3 most positive aspects; 1 open ended Movement activity subscale: parental stress related to activity Parent worry subscale: parent worry associated with movement (pain & discomfort, difficulty breathing, equipment concerns) Likert-like Demographics Questionnaire
Hanna (2020) United States	To describe challenges in EM in an academic children's hospital after implementing EM protocols, to analyse shifts in provider perception to determine changes in PICU culture and identify remaining barriers.	Primary	Quantitative, observational, cross-sectional study. Survey of PICU providers; Likert-like scale questionnaire on barriers to EM categorized into systems-based barriers, provider concerns and patient factors Data Collection: Multiple timepoints - Distributed to staff 1 month prior; 6 months into implementation and 6 months after implementation,	24-bed PICU and 18 bed Cardiac ICU academic children's hospital Faculty and fellows, NPs, PAs, RNs, PTs, OTs, RTs, SLPs and ECMO team. Excluded residents and students, lack of continuity in the PICU and exposure to EM protocol	Discipline, years of experience, previous adult ICU experience, timing of shiftwork Perceived barriers to goal mobilization
Herbsman (2020) United States	To improve the rate of early mobilization to 80%. Removing barriers to mobilization	Primary	Data Collection: Multiple timepoints Survey to identify perceived barriers to mobilization distributed pre- and post-intervention	12-bed PICU in an academic medical center in an urban environment with inpatient and outpatient rehabilitation affiliates Patients >=18mo, admitted btwn 12/16/15-12/15/16; excluded: too critically ill to be mobilized during PICU stay, or missing data	% of patients with PT, OT, SLP and activity orders PICU and Hospital LOS Number of ventilator days Percentage of patients discharged home (Disposition) Barriers Survey

Author Year Country	Purpose	Perspective as Research Objective	Study Design Methods & Procedures	Sample / Setting	Outcome Measures
Patel (2021) United States	To identify staff-reported factors that influenced PICU Up! implementation and the perceived facilitators and barriers that affect the sustainability of the early mobility initiative	Primary	Staff involved in facilitating early mobilization, including those who designed and implemented the PICU Up! programme. Purposive sampling performed to collect perspectives across disciplines Data Collection: Single timepoint, but longitudinal Telephone interviews conducted by a researcher independent of the PICU. Audiotapes recorded and transcribed. Transcripts reviewed with 2 researcher who helped identify themes and revise interview guide. Data collected until saturation, COREQ checklist was followed. Thematic analysis performed. Independent review of transcripts and developed codebook performed by 4 researchers. Dedoose software used, consensus reached by all researchers.	Setting not described Clinical profession (RN, NP, MD, RT, PT, OT, SLP, CLS, SW)	Years working in healthcare Years working in JHH PICU Years involved in PICU UP! programme Factors influencing implementation process Staff perceptions of PICU UP! programme How improvements were integrated into the programme

% percentage; >=, greater than or equal to; btwn, between; CLS, Child Life Specialist; COREQ, Consolidated Criteria for Reporting Qualitative Studies; d/c, discharge; ECMO, Extracorporeal Membrane Oxygenation, EM, Early Mobility; F, Family; ICU, Intensive Care Unit; JHH, Johns Hopkins Hospital; LOS, length of stay; Med/Surg, Medical/Surgical; pt, patient; <, less than;; MD, Medical Doctor; NP, Nurse Practitioner; OT, Occupational Therapy; PA, Physician Assistant, PICU, Pediatric Intensive Care Unit; PT, Physical Therapy; RN, Registered Nurse; RT, Respiratory Therapy; SLP, Speech Language Pathology; SW, Social Work; wk, week

Table 2.4: Individual Study Results

Author (Date)	Participants, response rate	HCP Responses Responses by Profession, if applicable	Patient & Risk Factors for Adverse Events	Equipment & Resources	Patient / Parental Responses	Perceived Impact & Commentary
Parisien (2016)	3 mothers, 1 father; all were white, highly educated, employed and married/ partnered Children were 1mo-6mo, all girls: 3 had congenital heart issue, 1 pt was emergently admitted for surgery				**Environmental factors:** equipment -changing medical plan & scans/procedures prevent holding -gained familiarity with lines/tubes, protocols and hospital routine -**U**npredictable schedule and care coordination to impact EM **Awareness of physical therapist and health care professional (HCP) roles:** all felt PT as liaison in care -differing perceptions of EM within the team **Communication among parents and HCPs:** influenced by type, amount and quality of communication -gaps and need for improved interprofessional communication **Parental participation in their child's EM:** feeling powerless -participation reduced anxiety -facilitators: education, encouragement and PT's initiative	Overall: overwhelm and intimidating
Wieczorek (2016)	95 Staff completed feedback questionnaire: (58% RNs)	Procedures (test/study/surgery) (n=10) Medical team not sensitive to demands of bedside caregivers 95% 'levels' of activity were helpful 73% pocket card, helpful	Patient condition (n=11) No adverse events (unplanned extubations or line displacements) No events aborted d/t instability	Lack of equipment (appropriate seating devices, positioning materials) (n=22) 68% had support to increase activity (PT, OT) Inadequate staffing	Child refused (n=3) Parent refused (n=3)	

Author (Date)	Participants, response rate	HCP Responses Responses by Profession, if applicable	Patient & Risk Factors for Adverse Events	Equipment & Resources	Patient / Parental Responses	Perceived Impact & Commentary
Betters (2017)	88 responded, 80% RNs & 20% RTs	63% agreed or strongly agreed: "It is safe for intubated patients to be mobilized" 66% disagreed or strongly disagreed: "It is in the best interest of intubated patients to remain on total bed rest."	No serious adverse events – 2 pts desat & required minor vent changes, able to complete EM activity; 1 NGT displaced			
Colwell (2018)	RN encounters analysed n=103	Timing of admission (11%) n=11	Dx/severity of illness (48%) n=48	Medical equipment-related concerns (30%) n=31	Parent refusal (10%) n=10 Pt refusal (3%) n=3	
Colwell (2019)	Women (83%), white (71%), 1st PICU admission (73%); normal fxnal status @ baseline (78%), median hospital LOS 2 days, median PICU LOS 1 day; acute admits (33%), non-complex chronic (13%), complex chronic conditions (54%); intubated 24% at time of survey				Total Parent Mobilization Stress Score significantly associated with: ($p < 0.05$) -Lower baseline functional status (POPC >=3 vs POPC 1 or 2) -Increased parent education (college or graduate education vs lower education) -Child moved by individuals other than the RN (RN compared with PICU staff, parent or child independently) -More strenuous activity (standing/ walking vs turning/repositioning) Sources of mobilization stress: 1. Medical equipment (79%) 2. Subjective pain/fragility (75%) 3. Perceived dyspnea (24%) Parent reported positives of mobilization: 1. Clinical improvement (70%) 2. Parental participation (46%) 3. Increased alertness (38%) 1) Mobilization was a beneficial 2) Parental stress could be overcome with communication 3) 55% praised mobilization activities and/or staff 4) 16% expressed concerns about discomfort, parent/ child stress and/or type of mobilization activity Sources: alarms, lines, equipment, disease and/or patient-specific concerns	32% of comments on importance of communication and staff as "encouraging," "kind" and "detailed" explanations 11% had recommendations on improving communication on mobilization

Author (Date)	Participants, response rate	HCP Responses Responses by Profession, if applicable	Patient & Risk Factors for Adverse Events	Equipment & Resources	Patient / Parental Responses	Perceived Impact & Commentary
Hanna (2020)	44% RR (n=148/338), 54% RNs (13 partial)	Difficulty coordinating (70%) RNs: Difficulty coordinating (61% PMs vs 81% AMs p<0.001) Significantly decreased postimplementation: Safety concerns (p<0.01) No champion (p<0.01) Not a priority (p<0.01) Lack of support/culture (p<0.01) No admin support (p<0.01)	Too unstable (83%) Clinical status: Instability (82% pre, vs 79% post p=0.63) Oversedated (p<0.01) Delirious (p<0.01) Organ support: Catheter/device dislodgement (88% pre, to 27% post) (p<0.01) ECMO (p<0.01) ETT (p<0.01) CRRT (p<0.01) Providers with ICU experience, less likely to report head injury, sedation, instability, agitations, delirium, inadequate pain control as barrier (odds ratio 0.92 [CI 0.85-0.99 p=0.03) Adult experience RNs, less likely to report barriers: Devices/catheters (78% of those with adult ICU experience vs 91% of those without adult ICU experience; p = 0.03) ETTs (57% vs 83%; p = 0.001) ECMO (59% vs 81%; p = 0.004) CRRT (49% vs 71%; p = 0.009) Comparing AM v PM RNs felt ETT as barrier (68% PM vs 33% AM p=0.004)	Not enough staff (77%) RNs: lack of staffing (82%) Lack of equipment was top concern (60%) Lack of staff was a bigger concern on days vs nights (61% PMs vs 84% AMs p=0.03) Equipment Limitations: Tumble form chair (47%, n=64) Neurologic chair (37%, n=50) Feeder chair (23% n=31) Tilt table (23% n=31)	Parental concerns (p<0.01)	Post: "Overall, I found that mobilization positively impacted by patients." 90% (n=119) agreed or strongly agreed; 4% disagreed or strongly disagreed 33 comments 45% (n=15) enthusiasm about progress/ impact 55% (n=18) emphasized concerns 56% resource limitations Other comments: difficulty with communications, coordination, and lack of support

Author (Date)	Participants, response rate	HCP Responses Responses by Profession, if applicable	Patient & Risk Factors for Adverse Events	Equipment & Resources	Patient / Parental Responses	Perceived Impact & Commentary
Herbsman (2020)	Pre-intervention 80% of staff (n=51) completed survey 53% RNs 20% rehab 12% RTs 16% MDs 82% AM shift 16% PM shift Post intervention 73% of staff (n=43) completed survey 58% RNs 28% rehab 7% RTs 7% MDs 84% AM shift	Too much coordination needed (Pre, Post) Non-MV patients (15%, 14%) MV patients (35%, 33%) Lack of training/education (Pre, Post) Non-MV patients (13%, 12%) MV patients (31%, 17%)	Too many lines/drains (Pre, Post) Non-MV patients (19%, 21%) MV patients (39%, 29%) Patient agitated, confused, delirious (Pre, Post) Non-MV patients (15%, 17%) MV patients (18%, 21%)	Lack of resources (time, staff) (Pre, Post) Non-MV patients (46%, 45%) MV patients (45%, 64%) Appropriate equipment not available (Pre, Post) Non-MV patients (19%, 14%) MV patients (16%, 14%)	Pt/family uncomfortable (Pre, Post) Non-MV patients: (10%, 21%) MV patients: (8%, 19%)	Greatest concerns (Pre, Post) I feel comfortable (22%, 44%) I am not trained (32%, 10%) I am concerned a line or drain ill come out (36%, 28%) I am not able to manage ventilator, fear of self extubation (28%, 36%) Other (12%, 13%)
Patel (2021)	52 staff completed interviews RNs 19 (36%) NP 7 (13%) MD 8 (15%) RT 6 (12%) PT 6 (12%) OT 3 (6%) SLP 1 (2%) CLS 1 (2%) SW 1 (2%) Years working in healthcare, median 10 (6-15.5 IQR) Years working in JHH PICU 5.25 (2-9.25 IQR) Years involved in PICU UP! <1: 6 (12%) 1-2: 11 (21%) >2: 35 (67%)	**Factors Influencing Implementation Process** Cultural and Procedural Changes Normalization of patient routines Setting sedation goals Increased attention to delirium Greater focus on sleep hygiene Implementation Facilitators Interprofessional team champions Starting small with mobility Sharing successes and evidence Clearly defined protocol Generating staff buy-in **Staff Perceptions** Positive Impressions Improved morale in the PICU	**Staff Perceptions of Patient Factors** Barriers and Challenges Patient Safety Inconsistency with the mobility plan Differences in approaches to sedation Heterogeneity in inpatient developmental levels	**Staff Perceptions** Barriers and Challenges Availability of resources	**Staff Perceptions** Positive Impressions Family member and caregiver engagement Patient and Family Satisfaction	Communication between care teams Simulation of mobility Accessible documentation of mobility goals

AM, day shift; admin, administrative; CLS, Child Life Specialist; CRRT, Continuous Renal Replacement Therapy; d/t, due to; Dx, diagnosis; ECMO, Extracorporeal Membrane Oxygenation; EM, early mobility/mobilization; ETT, endotracheal tube; fxnal, functional; HCP, healthcare provider; IQR, Interquartile Range; ; JHH, Johns Hopkins Hospital; LOS, length of stay; (PT/OT/SPL); MD, Medical Doctor; MV, mechanical ventilation; mo, month; n,

number; NGT, nasogastric tube; NP, Nurse Practitioner; OT, Occupational Therapy; PA, Physician Assistant; PICU, Pediatric Intensive Care Unit; PM, night shift; POPC, Pediatric Overall Performance Category; PT, Physical Therapy; pt, patient; rehab, rehabilitation team; RN, Registered Nurse; RR, response rate; RT, Respiratory Therapy; SLP, Speech Language Pathology; <, less than; SW, Social Work; vent, ventilation; >=, greater than or equal to; % percentage

Table 2.5: SRQR: Qualitative Studies

	Title	Abstract	Problem Formulation	Purpose	Qualitative approach	Researcher Characteristics,	Context	Sampling Strategy	Ethical Issues	Data Collection	Units of Study	Data Processing	Data Analysis	Trustworthiness	Synthesis and Interpretation	Links to Empirical Data	Integration with prior work	Limitations	Conflicts of Interest	Funding	Overall
Parisien (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NR	H
Zheng (2018)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NR	H
Patel (2021)	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H

Y, Yes; N, No; NA, Not Applicable; NR, Not Reported; H, High (O'Brien, B. C. et al. 2014)

Table 2.6: Observational Cohort & Cross-Sectional Studies: NHLBI Quality Assessment Tool

	Research question or objective	Population	Rate of eligibility	Subjects recruitment	Sample size justification	Exposure of interest	Timeframe to outcome	Levels of the exposure	Exposure measures	Exposure assessment	Outcome measures	Outcome measures blinded	Loss to follow-up measured	Confounding variables measured	Overall
Wieczorek (2016)	Y	Y	NR	Y	NR	Y	Y	N	Y	N	Y	NA	NA	N	Mo
Betters (2017)	Y	Y	NR	Y	NR	Y	Y	N	Y	N	Y	NA	NA	N	Mo
Colwell (2018)	Y	Y	NR	Y	NA	Y	Y	N	Y	N	Y	NA	NA	N	Mo
Colwell (2019)	Y	Y	NR	Y	NR	NA	Y	N	Y	N	Y	NA	NA	N	Mo
Hanna (2020)	Y	Y	NR	Y	NR	Y	Y	N	Y	Y	Y	NA	NR	N	Mo
Herbsman (2020)	Y	Y	Y	Y	NA	Y	Y	N	Y	N	NR	NR	NA	N	Mo

*Y, Yes; Mo, Moderate; N, No; NA, Not Applicable; NR, Not Reported (NHLBI,2021)

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Chapter 3: Overcoming Patient Safety Concerns

Overcoming Patient Safety Concerns and Integrating Early Mobility into Pediatric Intensive Care Unit Nursing Practice

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Nursing Practice and Early Mobility in the PICU

University of California, San Francisco

Abstract

Purpose: Early Mobilization (EM) in Pediatric Intensive Care Units (PICU) is safe, feasible and improves outcomes for PICU patients, yet patient safety concerns persist among nurses that limits EM adoption. The purpose of this study was to explore how nurses incorporate EM into practice and balance their concerns for patient safety with the benefits of EM.

Design & Methods: This focused ethnographic study included 15 in-depth interviews with 10 PICU nurses. Data were analyzed using thematic analysis.

Results: Findings were found in two major categories which describe the clinical judgement and decision-making of PICU nurses regarding EM. The first major category was nurses' concerns for patient safety. This included patient-level factors: hemodynamic stability, devices attached, patient's overall strength, and risk for falls and size. In the second major category, these safety concerns were overcome by applying a multiple step process which resulted in nurses performing EM despite their concerns. That process included: gaining comfort through experience, performing patient safety checks, working with therapists, learning from adverse events, and understanding existing evidence about the benefits of EM.

Conclusions: The overarching theme was nurses' determination to preserve patient safety while ensuring patients could receive the benefits of EM. This theme describes the decisions, behaviors and processes that nurses enact to become more comfortable with EM despite their concerns for patient safety and potential adverse events while performing mobility activities.

Practice Implications: Creating opportunities for nurses to participate in EM may increase their willingness to overcome safety concerns and engage in these activities.

Keywords: Pediatric critical care, early mobilization, rehabilitation, nursing practice

Highlights:

- This study included 15 interviews with 10 nurses.
- This article focuses on nurses' concerns around patient safety and how nurses overcame those concerns and participated in EM in the PICU.
- When nurses were trained to perform EM and worked closely with therapists they were more comfortable with implementing EM.
- Future research should gather perceptions of EM from the interdisciplinary team and a more nurses.
- Future research may also explore how champions address barriers by providing real time feedback and education while reinforcing patient safety.

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The author thanks the participants for their generosity, time, energy and trust.

Introduction

The Intensive Care Unit (ICU) Liberation initiative has gained momentum, focusing on eliminating the harmful effects of pain, agitation/sedation, delirium, immobility and sleep disruption (PADIS) to prevent comorbidities and long-term consequences of adult ICU admission (Walker & Kudchadkar, 2018; Smith et al., 2022). The PADIS guidelines provide an evidence-based bundle of interventions to enable implementation of the ICU Liberation principles. This bundle, labeled ABCDEF (A-F) (Barr, 2021), has demonstrated its effectiveness in reducing hospital death, mechanical ventilation, delirium, ICU readmission and discharge to a long-term care facility in adult populations (Pun et al., 2019). The A-F bundle consists of: A) assessing, preventing and managing pain; B) spontaneous awakening and breathing trials; C) choice of sedation; D) delirium assessment, prevention and management; E) early mobilization (EM) and exercise; and F) family engagement and empowerment (Smith et al., 2022;). The objective is to improve quality of care, reduce healthcare costs and improve the experience of care (Barr, 2021; Institute of Healthcare Improvement, 2022).

Background

There have been limited attempts to examine implementation of the ICU Liberation A-F Bundle components in the Pediatric Intensive Care Unit (PICU) to reduce pediatric PADIS. Nursing care related to the A-F bundle, and specifically, EM, in the PICU has not been well described in literature. EM is a daily, progressive physical activity for physiologically stable patients. Therapies usually begin with bed level exercises, then progress to sitting in bed. After that, patients will transfer to a chair and then advance to standing and walking (Krupp et al., 2022). In practice, nurses collaborate with rehabilitation therapists to prioritize mobilization care. Rehabilitation therapists include Occupational Therapists (OT), Physical Therapists (PT), and

Speech-Language Pathologists (SLP). Nurses also coordinate care with members of the interdisciplinary team and communicate with patients and address family concerns all while ensuring patient safety (Lebet et al., 2021).

A possible explanation for the lack of adoption of the ICU Liberation A-F bundle in the PICU includes that the guidelines are challenging and complex. The protocols often require thorough assessment of patient stability, mobility status and requires a team to safely implement. Quality improvement EM programs have included standardized EM protocols in PICUs (Wieczorek et al., 2016; Betters et al., 2017; Colwell et al., 2018) and have explored strategies to overcome barriers to EM (Herbsman et al., 2020). However, these programs have not been adopted widely and there is limited research on nurses' unique contributions to EM in the PICU.

Nurses working in critical care environments have an essential role in applying EM practices for ICU patients (Kudchadkar et al., 2020; Ista et al., 2020; Hoyer et al., 2015). Nurses spend more time with patients than any other healthcare providers and are key liaisons between the patient and other members of the healthcare team (Lebet et al., 2021). Multiple studies have described nurses' perceptions of barriers and facilitators to EM, but it is not well understood how those factors play into clinical decision-making around EM in the PICU (Noone et al., 2023).

Clinical decision making is referred to as clinical judgment, decision making or clinical reasoning; it is clearly defined as, "A choice made by a practitioner from a number of alternatives" (Hancock & Durham, 2007, p. 16). Moreover, nurses' roles and responsibilities may broaden with EM especially when mobilization practices are nurse-initiated (Stolldorf, et al. 2018). EM may make decision-making more difficult and caring for the patient more complex (Maharmeh et al., 2016). The more complex the patient and decision-making, the more difficult tasks are to complete and the higher likelihood an incorrect decision could be made (Corcoran,

1986; Tanner et al., 1987). Nurses care for complex patients and make care decisions quickly and accurately while dealing with unstable, seriously ill patients, and sometimes, with a lack of resources (Maharmeh et al., 2016). This places a great responsibility on ICU nurses. Nurses work in environments where they are juggling multiple demands including time pressures, as well as unpredictable and complex situations (Maharmeh et al., 2016) and more experienced nurses are better able to safely manage the multiple demands (Banning, 2007; Benner, 1984, 1987).

Knowledge Gap and Purpose

Researchers suggest that adverse events related to EM that threaten patient safety are rare and there are very few events documented in the literature and the most common of these events include the loss of a gastric tube and minor adjustments to oxygen management (Wieczorek et al., 2016; Zheng et al., 2018; Colwell et at., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021). Despite this, the majority of PICU nurses' reported concerns for EM are related to patient safety (Cuello-Garcia et al., 2018; Hodgson et al., 2018; Piva et al., 2019; Wieczork et al., 2015; Cameron et al., 2015; Cui et al., 2017). There is a gap in research on nurses' clinical decision making around EM and further exploration of their concerns for patient safety is needed (Noone et al., 2023). The purpose of this research is to explore how nurses incorporate EM into their clinical decision making, given the potential risk it presents for patient safety, and how they create an environment where EM is the standard of care.

Methods

Study Design

This study used focused ethnography to explore and analyze PICU nurses' experiences with an EM program. In accordance with focused ethnography, the objectives of this research study were problem-focused, context-specific and were focused on a community's perspectives

in specific situations, as opposed to a general study of a culture (Hammersley, 2006; Muecke, 1994; Knoblach, 2005; Jones & Smith, 2017; Holloway & Wheeler, 2010). The context of this study was focused on the culture around EM in the PICU from the perspectives of nurses. Fundamental components of focused ethnography include being open to discoveries in the field and a systematic approach to data collection, primarily through interviews, in addition to observation and recording of fieldnotes. The ethnographic method is flexible and creative, interpretive, reflexive and constructivist and there is a continuous process for recording fieldnotes that allows researchers to be present with their hosts (Knoblach, 2005; Whitehead, 2004; Geertz, 1973). These ethnographic principles were upheld during data collection and analysis throughout the study.

Setting

RNs were recruited from the PICU of a quarternary healthcare organization on the west coast that serves medically and socially complex patients. The healthcare organization has Magnet designation (American Nurses Credentialing Center, 2022), and is a center of excellence. The PICU is a 32-bed unit that serves both medical and surgical patients and has 24-hour in-house intensivist service. Three medical teams support the unit, and providers include attendings, fellows, residents, and nurse practitioners. Approximately 150 nurses work in this PICU and there is no designated PT or OT in the unit. The PICU was awarded Beacon Status from the American Association of Critical Care Nurses (2022) demonstrating their commitment to nursng excellence. This site was selected based on its implementation of an EM protocol approximately a year and a half prior to data collection and was the first author's place of employment, thus facilitating participant exposure to EM and researcher access.

PICU UP! EM Program

The EM program was created by an interdisciplinary team based on the PICU Up! program (Wieczorek et al., 2016). An interdiscplinary team of stakeholders developed a pathway and planned the implementation of the program 15 months prior to initiation. The PICU Up! program has 4 levels of mobility based on medical criteria. Each level has corresponding mobility activities and frequencies defined to guide the practice. Inclusion criteria are patients admitted to the PICU including patients on vasopressors, with a new tracheostomy, and patients with stable Extracorporeal Membrane Oxygenation (ECMO) flows and support. Exclusion criteria included open chest or abdomen, external ventricular drain not cleared by neurosurgery, orders specifying alternative activities, unstable fractures or unstable ECMO cannulas. The program was initiated in January 2021 in the PICU after education including criteria specifying when to pause or stop mobility activties, how to perform safety checks prior to mobitliy actitivies, developmentally appropriate activities and bed-level range of motion activities. This program was integrated into the electronic health record and mobility cards are placed outside patients rooms.

Participants

Nurses were recruited to participate in formal interveiews based on eligibility criteria and interest. Eligibility criteria included registered nurses (RNs) with a minimum of 1 year in the PICU and with exposure to the PICU UP! EM protocol.

Data Collection

The institutional review boards of the authors' university and the study hospital site approved this study. Informed consent was obtained from participating nurses prior to data collection after they were screened for eligibility. Data were collected from June through August

of 2022. Data collection consisted of the first author conducting formal and informal interviews and observations. Formal interviews with PICU nurses included open-ended and semi-structured questions and explored nurses' perceptions about the value of EM, how EM is incorporated into daily care, and care-giving routines for EM activities. Family caregivers' experiences with EM were explored in this study through formal observations of mobility events and informal interviews that occurred during observations. These data will be discussed in a future article.

The focus of this article is on data collected from formal interviews with nurse participants, particularly their safety concerns for EM. Data collection and analysis for this topic are described in this article and exclude data collected through observations of mobility events and through informal interviews. Other topics identified through formal interviews with nurses include barriers and facilitators of EM beyond safety concerns, and data and analysis for this topic will be discussed in a future article.

Interviews were scheduled at a mutually agreed upon date and time when participants were recruited for the study. Interviews were conducted using an interview guide and interviews were conducted virtually (Zoom©, Version 5.11.6.9890) in a private setting. Participants were sent reminders of the interview date and time via email. A sample of interview guide questions is referenced in Table 1. Field notes and memos were written directly following interviews to improve the interview guide, hone interview skills and to reflect on the interview. Interviews were audio recorded using a recording device and were professionally transcribed using an encrypted third-party service. All transcripts of audio recordings were read in their entirety while listening to the audio tape as soon as they were transcribed to ensure accuracy.

Data Analysis

Fifteen semi-structured interviews were conducted and included ten nurses. Ten were initial interviews and five were follow-up interviews which were conducted to clarify and expand upon participants' points and to perform member checking of preliminary analysis. Microsoft Word (2019) and Excel (2019) were used by the researchers in memoing, coding and data analysis. All forms of data were uploaded into ATLAS.ti Software (2022) for coding and data analysis. Data were triangulated and analyzed using Braun & Clarke's (2006) methods for thematic analysis.

Braun & Clarke's (2006) thematic analysis is flexible and compatible with the constructivist methodology as the researcher plays an active role in identifying patterns/themes and in reporting them to readers (Taylor & Ussher, 2001). The approach consists of a six phase framework. These phases include: becoming familiar with the data, generating initial codes, searching for themes, reviewing themes, defining themes and then writing up results (Braun & Clarke, 2006). DeSantis & Ugarriza (2000) provided further guidance on the development of themes from codes. Codes were grouped into categories and further manipulated into major categories which were linked to develop the overarching theme (DeSantis & Ugarriza, 2000). Themes are abstract, patterned, and represent some level of meaning within the data set which captures something important in relation to the research question (Braun & Clarke, 2006). Once a theme was established, rich descriptions were developed to provide the reader with the meaning of the theme (Taylor & Ussher, 2001).

Data collection and analysis were conducted simultaneously. Transcripts were coded and compared across nurse participants, then codes were grouped and developed into categories. Categories were combined, expanded upon to be developed into major categories and

manipulated to develop themes consistent with the data. Throughout this process, memos were written for each participant (CN) and across each theme with data to support research findings (CN & RR). Findings were shared with informants and discussed with the research team (all authors). Throughout data collection and analysis, the first and senior authors met weekly or biweekly to discuss analysis.

The authors maintained rigor through reflexivity, attention to interaction quality and through triangulation of data. The first author approached reflexivity using various techniques including journaling and memoing. The first author explored personal and professional responses of participants in a research journal while engaging in the study. The authors used memos to identify and test the researcher's experiences as a PICU clinician against data collected in the study. The author also used follow up questions, clarifications and member checking.

Results

The sample included 10 PICU nurses with 2 -19 years of experience. Nurses' experience in this PICU ranged from 18 months to 14 years. Eight out of ten participants worked 12-hour day shifts. All nurses self-identified as women (n=10). Self-reported race/ethnicities were white (n=6), Asian/Asian American (n=3) and Hispanic (n=1). Participants were highly educated with bachelor's (n=6) and master's (n=4) degrees in nursing. Two participants described themselves as playing a role in the development of the EM program (n=2) and all participants described themselves as participants in the EM program in the PICU. See Table 2 for demographic data.

Major Categories and Overall Theme

There were two major categories reflected in the data which described nurses' clinical judgement and decision making around EM in the PICU. The first major category was nurses' concerns for patient safety. This category included patient-level factors like hemodynamic

stability; devices attached to the patient; and the patient's overall strength, risk for falls and size. The second major category described nurses' process and strategies to overcome safety concerns and become comfortable with EM. The second category included a process of gaining comfort through experience, nurses' contributions to patient safety, working with therapists, learning from adverse events, and understanding existing evidence about the benefits of EM.

The overarching theme that integrated major categories was nurses' determination to preserve patient safety while ensuring patients could receive the benefits of EM. This theme describes the decision-making processes and behaviors that nurses enact to become more comfortable with EM despite their concerns for patient safety and potential adverse events while performing mobility activities.

Nurses described how being comfortable with EM was necessary to perform EM. However, their comfort was complicated because they recognized the importance EM played in their patients' recovery. One nurse stated, "In general, if you're not comfortable, then you probably won't do [EM]. Patient's safety is what nurses are concerned with [and] it's weighing patient safety with mobilization, knowing that [EM] provides better outcomes," (Participant #1). Nurses' discomfort came from concerns around patient safety and those concerns sometimes result in less EM. Nurses also described pushing themselves to perform EM with their patients because they recognized EM was in their patients' best interest and improved their outcomes.

Nursing Concerns for Patient Safety

Patient safety was a central concern and something all participants of this study associated with early mobility. One nurse stated,

> [Safety] is probably the biggest factor in my decision-making. The last thing I want is for something [like] a fall, a line coming out, or for something to happen to the patient. All of

> that is factored into whether or not we turn them [or] how much we turn them. Sometimes it's not if you're going to do something, it's how much you move them. It's whether I decide to keep them in the bed chair, or to get them out of bed. That's a different level of movement and you assess the safety of doing one as opposed to the other. (Participant #6)

Hemodynamic Stability

Nurses reported assessing patient's hemodynamic stability throughout mobility activities. Nurses reported assessing for hemodynamic instability as reflected in their vital signs, shortness of breath or any respiratory distress that developed as a result of mobility activities. Presence of these factors or a significant increase or decrease may be criteria for a nurse to stop and reassess the appropriateness of the activity as described in the mobility protocol. Nurses described being acutely aware and responsive to patients' hemodynamic stability during mobility activities. One nurse said,

> A patient who was pretty sick, who every time I turn them and their vital signs start to not look good, that is a huge factor for how safety weighs in. They are showing me they are too unstable to turn. (Participant #4)

Devices Attached

Nurses also reported the devices attached to patients significantly affected planning for EM activities. Devices included the invasive venous catheters, tubes and drains attached to the patient and represent the level of intervention necessary to stabilize the patient in the PICU. Nurses described weighing the consequences of lost devices when planning for EM. Their concern increased if a lost device meant a patient's clinical status could rapidly deteriorate or if it meant the need for an invasive procedure to replace the lost device. For this reason, monitoring

equipment, for example, was seen as less important and easily replaceable. One nurse described her approach and said,

> A patient with a trach, make sure it's an established trach, not a fresh trach. Then how many other lines do they have? Is it a central line, or is it a peripheral intravenous catheter (PIV)? What do they have running through their lines? Sometimes if it's just a couple of intravenous (IV) fluids with something that can be paused [or detached], I put them in the parents' arms and then hook everything back up. That's a little bit harder with the central line. Then, can you easily pop them off the vent? For some patients, they're okay to pop off the vent quickly to untangle or move. There's other [patients] that you can't do that [with]. It's a lot of situational awareness. Sometimes if their parents are really involved, they [are] a wealth of information and advocates for what to do. (Participant #5)

Artificial airways were the most commonly reported devices nurses were concerned with dislodging, but tracheostomies were reported as less of a barrier to mobilization as opposed to a patient with an endotracheal tube. Some nurses discussed critical airways; ones that are unstable, not well-secured or stabilized; as a particular concern because of the difficulty in replacement. These devices made nurses less willing to move patients outside the bed due to their fear for the integrity of the devices. During observations, artificial airways were seen as a barrier to mobilization. However, nurses were able to have an additional nurse or RT at the bedside and therefore felt comfortable enough to mobilize their patients. Activities often included standing with support, dangling legs in bed, being held in parents' arms, or assisting patients up to chair position while in bed.

Patient's Overall Strength, Risk for Falls and Size

Nurses expressed concerns over the patient's overall strength, risk for falls and size during EM. Nurses described incorporating assessments of these factors into their care. One said,

> If they're someone who can bridge, I know that they're going to be a little bit stronger than someone who [can only] roll back and forth. If they lift their head on their own and lift up their arms and legs that is helpful and shows me, 'Alright, you're ready to sit up, and we can do this with relatively few people.' But if you've been a dead weight, I'm going to need a lot of people and support. You're not going be able to sit up or dangle for too long. You [may] go right back down, so I'll need someone to help guide the movement. (Participant #9)

When patients had weakness, nurses developed mobility plans to include safe handling of equipment and often additional personnel to safely provide mobility care. Some nurses described a patient's pain status and structural integrity following a traumatic event or surgery, as a deterrent to mobility. Most often patients described as neurosurgical or trauma patients had structural limitations and significant pain, making EM difficult. One nurse said,

> We had a kid who [was] neurologically intact and developmentally appropriate. They had an accident happen, but musculoskeletal-wise, they're easier to move with stable vital signs. I can move them around with two people, somebody watching the tube and somebody moving. But other kids, like a trauma [patients], you need to be careful how you move them. Every once in a while, you have a kid that winces when you touch them. We had this kid who was in a car accident, and the whole top of his head had no bone there, his brain was exposed. You had to give him Ketamine before you did anything

because he was so uncomfortable and in a ton of pain. He was really hard to turn because he had a bone flap. (Participant #5)

Overall, nurses' concerns for patient safety while carrying out EM were a result of performing these activities earlier in patients' disease processes and hospitalization, while they were still attached to invasive devices, potentially experiencing hemodynamic instability, and generalized weakness. Further, while the program created medical criteria for particular mobility activities, nurses also frequently described going beyond what was expected in order to achieve the greatest level of mobility the patient would tolerate at that time, based on their clinical-decision making and nursing judgement at that time. While the factors described above did present patient safety concerns to nurses, they also demonstrated a fair amount of autonomy while carrying out mobility activities. Nurses described turns occurring most often, followed by sitting in chair position, or being held for infants and toddlers. Nurses described being able to make these determinations about appropriate activities for the patients by using the mobility cards at the bedside, but by also using their clinical judgement and determining what patients could tolerate. While carrying out such activities, nurses described the strategies they used to overcome their patient safety concerns and participate in EM.

Strategies to Overcome Safety Concerns and Build Comfort in EM

While nurses had significant concerns around patient safety, they also discussed overcoming those concerns and engaging in EM activities. They described a process of becoming more comfortable with EM through a variety of means.

Comfort through Experience

Nurses reported becoming comfortable with early mobility primarily through gaining direct experience with planning and executing EM. Nurses reported practicing EM often. They

described working as a team during these activities, and, over time, playing larger roles in mobility care. Nurses reported becoming invested in EM as their comfort grew. One nurse described,

> I think the more support at first then you build your confidence through experience, you get better. [You learn] there's a lot of things that are forward-thinking. When you haven't done it, and you're not comfortable with each sequence, you don't know [how] to troubleshoot potential problems beforehand. So you're going to want more hands-on deck. I'm more comfortable because I've done this a bunch, but there are also patient-specific comforts too, little nuances. Our patients are dynamic and of course mobility depends on so many factors. The bigger the patient, or the floppier they are, that's much harder. [You have to] consider lines and tubes, you have to plan for that stuff. It's getting from point A to F, but needing to do BCDE first to make it smooth and safe. It's practicing and learning the process by doing it. (Participant #9)

While they reflected on their careers and the EM protocol, nurses discussed how performing mobility activities made them more comfortable. Nurses described thinking about and practicing various sequences and learning about how patients' factors, such as the intricacies of their lines and tubes, created unique opportunities to gain experience. Another nurse described,

> [That's] just experience, [and an] assessment of the situation. I've got myself into situations in the past and been like, 'I wish I had one more person here.' Then it also depends on the equipment that you need or what you are planning to accomplish with the patient. Meaning the bigger the event, the more people I'm going to need at the bedside. Or if it's the first time I'm sitting them out of bed for months, they're not going to have the

> strength to do it themselves. You have to have one person in front of them and one person on the side and one person you know there, just in case. (Participant #6)

Nurses reported assessing stability of the patient and advocating to get additional personnel at the bedside, especially if it was a new activity. Nurses described being concerned in those situations if they weren't sure how the patient would respond. Depending on the complexity of the activity at hand, nurses reported using more staff to ensure the mobility event occurred safely.

Patient Safety Checks

Nurses described their role in EM as being the person who closely monitored the patient and created a safe environment throughout the activity. They described thoroughly monitoring devices to ensure adequate securement and stability throughout EM activities. One nurse described the process of evaluating the patient's condition and performing safety checks prior to EM activities. The participant said,

> We look at vitals, medications, vasoactives, and are constantly assessing safety. If there's instability, or if we're needing more ventilator or vasoactive support [our mobility plan may change]. We'll still do mobility, but it won't be to the extent we might have done otherwise. But safety is always the number one concern, we wouldn't go for it if it wasn't safe. Part of that is intuition. If I'm getting the patient to their feet, I like to have PT and OT come evaluate the patient to see how stable they are, even if it's over kill. If there are any neurologic or gait alterations, I like to have at least another person there [to help]. I do a couple inch move test before we actually go anywhere to make sure we're not pulling anything. Then I always need somebody to have an [extra] hand no matter what, [then] we know we are doing this safely. (Participant #8)

Nurses were involved in establishing the mobility plan, directing care and communicating everyone's role so the mobility activity is safe and effective for the patient. Safety checks were performed to ensure devices are not lost during activities.

Working with Therapists

Nurses had many positive experiences with rehabilitation therapy colleagues and gratitude for their support with EM in the PICU. Nurses attributed much of the success of the EM protocol to being able to closely work with and learn from respiratory therapy (RT), PT, OT and SLP. Nurses described the role of PT and OT as essential but also reflected on their own contribution to EM when the rehab team was not there to support mobility activities. One nurse said,

> I think PT and OT can give specific details and set goals because it is their specialty. They're a big factor in mobility because it's their realm and they know what is best or what needs to be done for the patient. We as nurses talk about mobility and know the general sense of mobility and what needs to be done. That's not what we went to school for, they're the specialists. (Participant #4)

Nurses described a very close collaboration with the rehabilitation team particularly when going from one stage of rehabilitation to the next, and honoring therapists' unique role in designing patient specific plans of care. Nurses shared that nurses often assumed more responsibility with mobility care as they became more comfortable with their patients' specific mobility plans. Nurses also shared that much of the work was performed by nurses with RTs supporting respiratory devices. Another nurse said,

> I feel like RTs have been very good and cooperative with it [mobilization]. The RTs are like, 'Oh yeah, we do this in NICU every day, it's a normal thing.' And so the RTs have

not been resistant at all, they are just the opposite. They say ‘Oh yeah, 100%. We can get her up right away. Let's go.’ (Participant #3)

There were many references to how well the rehabilation team supported EM. Nurses often described the close collaboration between themselves and members of the rehab team as a result of the implementation of the EM protocol.

Adverse Events Influence Nurses

Nurses viewed adverse events as stemming from moving patients earlier in a patient’s hospitalization, while they are still attached to invasive devices. Nurses described how these devices were viewed as barriers to mobilization. One nurse said,

> The health care team wants to mobilize patients as often and early as possible. It's usually the nurses who'll advocate for the patients because they're at the bedside and know what the patient can tolerate and cannot. [Especially] with our very critically ill patients. The ones on ECMO are usually the ones the team tries to get us to ambulate. Nurses are a bit hesitant, especially when it's never been done. (Participant #2)

Nurses felt they were uniquely qualified to observe a patient’s ability to mobilize because of their proximity to the patients. They also reported viewing themselves as advocates for their patients. Throughout this study, only two participants reported having any adverse events occur while they performed EM, and one nurse experienced two adverse events. One adverse event was a decannulation of a patient with a tracheostomy and the other was an unplanned self-extubation of a patient (Participant #7). The nurse said,

> My first unplanned extubation was probably in my first couple of months after coming off orientation, and unfortunately, it was a patient who was known to decannulate. He had just a very difficult stoma site that was notoriously large. I had to explain to mom

> what happened, that wasn't very fun. After that, I was like, 'Do I really want to do all this with them? This bad thing happened last time, so maybe we'll just keep things easy today and worry about it another time.' I'm probably way more aggressive with watching the tubes and watching the line [as a result of that event]. It was like you make that mistake once and you never have to make it again. (Participant #7)

All nurses described the risk of adverse events and fear of adverse events as a result of EM. Some of these fears came from their own experiences, others learned about these events from colleagues. This nurse discussed how she learned about two adverse events from colleagues and how those events influenced her practice. The nurse said,

> I had a long term patient on ECMO who rolled over and kinked her cannula. She had a stroke and now she's [neurologically devastated]. She was the one that was [previously] fully mobile. I think a kid that I had helped move had an HD line ripped out of his leg, not while I was there but another time. That's safety, safety, safety and really focusing on what you're doing. I do a couple inch or couple of foot move test, before going anywhere, to make sure nothing is pulling. I do that so I know I won't pull anything. You really have to focus, it's the safety part of the safety checks. (Participant #8)

Adverse events, while they did not happen frequently, serve as learning opportunities and influence nurses' practice. For those who experience these events, they serve as formative memories for nurses who learn to avoid them in the future. Nurses reported becoming more thorough in their safety checks or more vocal in developing safe plans with participants of mobility activities. For others who learn about these events after the fact, adverse events reinforce the importance of safety checks and the need to consistently incorporate them into nursing practice.

Understanding the Evidence

Nearly half of nurses discussed their knowledge of the literature and how resources for the program, adapted from the evidence, have increased their acceptance and comfort with the EM protocol overall. One nurse described,

> I think just having in writing some guidelines [to be able to] coordinate possible activities takes out a lot of the guesswork. Knowing that it's an evidence-based program also reassures me. It's like knowing, 'Okay, this is evidence-based and studied, and there is data on the safety of this and the benefit of this.' I think [that has] helped everybody be more willing to know what to do and where to start. I've found a lot of use referring to the medical criteria based in the mobility levels. I've been able to correlate the activities found on the cards [for my patients]. On many occasions, I've referred the teams to the cards to advocate for my patients' mobility. I've had a surgeon say, 'They probably can't get out of bed.' [I replied], 'We can do things with them. Here's their mobility level, and possible activities that we could try.' (Participant #7)

In this situation, the nurse described using evidence and evidence based resources to convince others that EM can be safe and will benefit PICU patients. She even advocated to a consulting provider to ensure her patient received the benefits of EM. Nurses often described being confident in performing EM because they understand the evidence supporting the protocol both in its safety and the benefit the patient will receive as a result of performing EM. They discussed their confidence in the safety of the EM program, and described their ability to select the patient's activity level and appropriate activities based on bedside resource cards. These cards include medical criteria for different mobility levels which have corresponding activities

based on the patient's acuity. The levels and cards were based on published literature and revised based on this PICU's needs (Wieczorek et al., 2016).

Overarching Theme: Nurses' Determination to Preserve Patient Safety while Performing EM

Nurses also described that their support for performing the program was based on their understanding that EM improved patient outcomes. Overall, nurses described having a good understanding of the development and safety of the program, but also how the patients would benefit from receiving EM as described in the unit protocol. Nurses were committed to EM because they recognize the benefit and positive outcomes of EM. They were willing to develop strategies to overcome patient safety concerns. The following quote demonstrates this sentiment. One nurse said,

> [EM] is one step in the right direction [for our patients]. It's something that is a non-pharmaceutical and nursing-led that can be really impactful on the health and well-being of our patients. So because of that I would say yes, I'm pretty invested in it for our patients. (Participant #7)

Another nurse described how safety had to be overcome in order for patients to receive the benefits of EM and why it was important to deliver EM despite the risk it posed to patient safety. The nurse said,

> When you work with really sick kids with devices that can be tenuous and that can be really stressful. I think that having a healthy respect for the criticalness of the children we take care of and the risks. We try to feel as comfortable with the stability of what we can control and the securement of devices… Ultimately, my goal is to get all these kids out of there. [And] all the kids I take care of, I want

> them to have a good quality of life. I want my kids to leave [the PICU] and be as mobile, or as independent as they possibly can. That's why we have the program. I think that's why mobility drives our care. (Participant #8)

While there are other benefits that nurses identify, this quote demonstrates the importance nurses place on understanding the long-term outcomes and benefits patients experience from receiving EM in the PICU. This knowledge helps them overcome their concerns around patient safety and focus on creating a safe environment for EM in the PICU.

Discussion

The purpose of this study was to explore PICU nurses' perspectives of an early mobility protocol, and to explore how nurses incorporate EM into their practice despite the risk it presents to patient safety. This focused, ethnographic study in the PICU included in-depth interviews with ten nurses. Five follow up interviews were conducted to clarify points and provide member checking. Observations of mobility activities included informal interviews with patients and families who participated in mobility activities, and is the focus of another article. Thematic analysis was used to develop codes, categories, major categories and themes from the findings. Two major categories reflected in the data included nurses' concerns for patient safety and a process of becoming more comfortable with early mobility. These categories were combined and analyzed to develop the overarching theme which included nursing strategies to preserve patient safety during early mobility. This theme describes the decisions, behaviors and processes that nurses incorporate into their practice to become comfortable with EM despite their concerns for patient safety and adverse events. Nurses considered patient level risk factors contributed to their concerns for patient safety. They described becoming more comfortable with EM through

experiential knowledge, by working with therapists, through their experience with or knowledge of adverse events, and by understanding the evidence that supported the implementation of the EM program and the outcomes patients experience from performing EM in the ICU.

In this study, the authors validated the findings of previous PICU studies describing nurses' contribution to EM. Previous researchers have demonstrated that nurses are instrumental in carrying out in EM in the PICU and that the perceived barrier of patient safety concerns may be overcome as nurses practice EM activities (Noone et al., 2023; Kudchadkar et al., 2020; Ista et al., 2020). The current study extends our understanding of how patient safety concerns affected PICU nurses' thinking about EM.

Adult ICU EM studies provided information on barriers to EM and validate nurses' concerns for patient safety. These studies report the need to protect patient safety throughout EM and charge nurses to provide maximum care to protect patient safety during EM activities (Linke et al., 2020; Cameron et al., 2015). Our participants expressed similar sentiments. Authors of other adult studies described a culture of deeply sedating patients and coma as major barriers to EM (Babazadeh et al., 2021; Hodgson et al., 2016). Our findings were not consistent with these results, as no participants discussed deeper levels of sedation as a patient level barrier in our population. Authors of adult studies also reported obesity and painful EM procedures in mechanically ventilated patients as barriers (Babazadeh et al., 2021). Other authors reported mechanical ventilation, ETT, the fear of unwanted loss of tubes or catheters as barriers to EM (Dubb et al., 2016). We similarly found size, presence of artificial airway, mechanical ventilation and concern for tube or catheter dislodgement as patient safety concerns and barriers to EM in the PICU population.

Clinical Decision Making Around EM

Nurse decision-making around incorporating EM into clinical practice has not been well-described in the literature. Authors from only one study have described the clinical decision-making process for EM by adult critical care nurses (Krupp et al., 2022). Krupp et al. (2022) identified nursing values and priorities including improving patient outcomes, maintaining safety, and the need for nurse competence to carry out EM. These authors described factors that were necessary for EM to provide quality care for highly acute patients (Krupp et al., 2022). These factors included purpose-related functions (i.e., situational awareness, a goal to prevent complications), object related processes (i.e., handoff communication, coordination time) and physical objects (i.e., monitoring or mobility equipment, staff). Our participants were similarly concerned with patient outcomes, safety, competence and resource allocation to safely carry out EM with PICU patients, as well.

Findings from prior studies on clinical decision-making by critical care nurses were consistent with our findings. A qualitative study on critical care nurses' decision making, found nurses use many sources of information to make decisions (Maharmeh et al., 2016). Examples of information included experience, knowledge, stories about their patients and advice from their colleagues and doctors. Decision-making has been described as an ongoing process that matured as participants learned from experience and developed intuitive decision-making (Maharmeh et al., 2016). Adult critical care nurses also reported specific qualities they gain by working in their environment which made them entitled to a greater degree of autonomy than nurses have when working outside of the ICU, and also described themselves as advocates for their patients (Maharmeh et al., 2016). These factors were noted to aid participants make decisions about EM in our study.

In our study we also described a decision making process to overcome patient safety concerns and fears by actively participating in EM. While our participants did not attribute their autonomy to working in the PICU explicitly, this could also be a factor in PICU nursing practice. Instead, nurses in our study described planning and carrying out mobility activities based on medical criteria. They also were provided with criteria of when to pause, stop and reassess mobility activities based on signs and symptoms described in the program. Nurses frequently described going beyond those activities described in the bedside cards and were able to articulate exactly when they knew a mobility activity was not appropriate for a patient based on their clinical judgement of how well the patient was tolerating the mobility activities. Nurses used the cards to help them plan mobility activities

EM and Skill Acquisition

There is an extensive body of literature describing how nursing skills are acquired through practice and experience (Banning, 2008; Benner 2005; Ramezani-Bader et al., 2009; Cioffi, 2000). Authors have also described how nurses' experiences impact their clinical decision making (Cioffi, 2001; Bakalis, 2006; Currey et al., 2003; Currey et al., 2006). For Gunnarsson & Stromberg (2009) it is through experience that nurses recognize their patient's health situations and develop action strategies to manage these situations. Our study similarly described how nurses used the EM protocol to make decisions about appropriate mobility activities for their patients based on clinical factors. Nurses developed confidence to perform EM by thoroughly addressing their patient safety concerns. They secured devices, worked with therapists, mobilized the personnel, and performed safety checks to create a safe environment for these activities to occur.

Our study also described how nurses used their clinical judgement and autonomy to carry out EM in the PICU by setting mobility goals with their patients based on medical criteria and then carrying out those mobility plans. The nursing process guides patient-centered care by applying critical thinking to create evidence-based, goal-oriented treatments. In our study, the goal-oriented treatments were to set mobility goals and to carry out EM in order to support patient's long-term recovery, quality of life and overall health outcomes (Cameron et al., 2015; Cuello-Garcia et al., 2018; Herrup et al., 2017; Piva et al., 2019). The nursing process has five sequential steps which include assessment, problem identification or diagnosis, planning, implementation and evaluation (Toney-Butler & Thayer, 2022). In EM, nurses provide the basis for patient care by addressing patients' physiologic needs while promoting the safety and security of their patients. By addressing EM in the PICU, nurses build the foundations to physical and emotional health (Shin et al., 2019; Maslow & Mezey, 2008). Investigators have also demonstrated how the nursing process can serve as a guide for describing nurses' decision making to safely carry out EM in the dynamic environment of the PICU (Maharmeh et al., 2016; Steffen et al., 2021).

Implications of this Study

There are both practice and research implications from this study. Practice implications include the need to train staff on EM. By doing this, nurses could practice mobility sequences and learn from therapists. By providing mobility training, nurses could learn valuable lessons to avoid adverse events for their patients. This study demonstrated the need to incorporate thorough assessments and safety checks into nursing practice. This study also highlighted the importance of interprofessional collaboration as a key factor to the success of an EM protocol. This study also highlighted how nurses rely on rehab therapists, particularly when performing novel

mobility activities. This study also demonstrated the need to support this collaboration in order to allow nurses to be more comfortable as they engage with EM.

There are opportunities for future research to evaluate training programs to improve nurses' ability to perform clinical decision making around EM in the PICU. Krupp et al. (2022) demonstrated the applicability of human factors research to this body of work. Using a human factors lens to evaluate clinician's decision making capacity could also be applied in the PICU. Future research could also evaluate the applicability of the Benner model in EM. This model could be used to examine how nurses' decisions vary from novice to expert and how EM skills are acquired over time (Benner, 1984, 2005). In our study, all participants had been exposed to EM, but in future studies, one could explore how nurses' skills, attitudes and experiences develop over time.

Limitations

The data the researchers presented in this article is narrow in scope, and likely only covers some of the potential barriers to EM in PICUs. The formal interviews were conducted with only nurses, and as a result, the findings from this study describe a narrow spectrum of healthcare providers. In addition, this was a single site, single country, academic pediatric hospital, and only reflects the perceptions of nurses in this hospital.

Conclusions

In our study, nurses extensively described the risk EM posed to patient safety. They also described how they become comfortable with EM by applying the nursing process to gain experience with EM. In time, nurses developed strategies to overcome patient safety concerns. Nurses who actively engaged in EM care learned from therapists, adverse events, and had a thorough understanding of the evidence that supported the EM protocol, and the benefits of EM

for improving patient outcomes. All these factors increased their comfort and helped nurses overcome their patient safety concerns. In the future, departments should incorporate mobility training into clinical orientation and education in order to increase adoption of EM in their departments.

References

American Association for Critical Care Nurses (2022). Beacon Award. Retrieved from https://www.aacn.org/nursing-excellence/beacon-awards

American Nurses Credentialing Center (2022). Magnet Model. Retrieved from https://www.nursingworld.org/organizational-programs/magnet/magnet-model/

ATLAS.ti (2022). Version 22.1.0 (3475). ATLAS.ti Scientific Software Development GmbH

Babazadeh, M., Jahani, S., Poursangbor, T., & Cheraghian, B. (2021). Perceived barriers to early mobilization of intensive care unit patients by nurses in hospitals affiliated to Jundishapur University of Medical Sciences of Ahvaz in 2019. *Journal of Medicine and Life*, *14*(1), 100–104. https://doi.org/10.25122/jml-2019-0135

Bakalis, N. (2006) Clinical decision-making in cardiac nursing: A review of the literature. *Nursing Standard*, *21*, 39-46.

Banning M. (2008). A review of clinical decision making: models and current research. *Journal of Clinical Nursing*, *17*(2), 187–195. https://doi.org/10.1111/j.1365-2702.2006.01791.x

Barr, M. (2021). ICU Liberation. Retrieved from https://www.sccm.org/iculiberation

Benner, P. (1984). From Novice to Expert: Excellence and Power in Clinical Nursing Practice. Addison-Wesley, MA.

Benner, P. (2005). Using the Dreyfus Model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *The Bulletin of Science, Technology and Society Special Issue: Human Expertise in the Age of the Computer*, *24*(3) 188-199.

Benner, P. & Tanner, C. (1987). Clinical judgment: How expert nurses use intuition. *American Journal of Nursing* 87, 23–31.

Betters, K. A., Hebbar, K. B., Farthing, D., et al. (2017). Development and implementation of an early mobility program for mechanically ventilated pediatric patients. *Journal of Critical Care, 41*, 303-308.

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Cameron, S., Ball, I., Cepinskas, G., Choong, K., Doherty, T. J., Ellis, C. G., Martin, C. M., Mele, T. S., Sharpe, M., Shoemaker, J. K., & Fraser, D. D. (2015). Early mobilization in the critical care unit: A review of adult and pediatric literature. *Journal of Critical Care, 30*(4), 664–672. https://doi.org/10.1016/j.jcrc.2015.03.032

Cioffi, J. (2000). Nurses' experiences of making decisions to call emergency assistance to their patients. *Journal of Advanced Nursing, 32*(1), 108-114. **doi.org/10.1046/j.1365-2648.2000.01414.x**

Cioffi, J. (2001). A study of the use of past experiences in clinical decision making in emergency situations. *International Journal of Nursing Studies, 38*(5), 591-599. https://doi.org/10.1016/S0020-7489(00)00096-1

Colwell, B. R. L., Williams, C. N., Kelly, S. P., & Ibsen, L. M. (2018). Mobilization therapy in the pediatric intensive care unit: A multidisciplinary quality improvement initiative. *American Journal of Critical Care, 27*(3), 194–203

Corcoran, K. J. (1986). Measuring burnout: A reliability and convergent validity study. *Journal of Social Behavior & Personality, 1*(1), 107–112.

Cuello-Garcia, C. A., Mai, S. H. C., Simpson, R., et al. (2018). Early mobilization in critically ill children: A systematic review. *The Journal of Pediatrics, 203*, 25–33.e6. https://doi.org/10.1016/j.jpeds.2018.07.037

Cui, L. R., LaPorte, M., Civitello, M., et al. (2017). Physical and occupational therapy utilization in a pediatric intensive care unit. *Journal of Critical Care, 40*, 15–20

Currey, J., Botti, M., & Browne, J. (2003). Hemodynamic team decision making in the cardiac surgical intensive care context. *Heart & lung : the journal of critical care*, *32*(3), 181–189. https://doi.org/10.1016/s0147-9563(03)00041-4

Currey, J., Browne, J. & Botti, M. (2006). Haemodynamic instability after cardiac surgery: nurses' perceptions of clinical decision-making. *Journal of Clinical Nursing, 15*(9), 1081-1090. **doi.org/10.1111/j.1365-2702.2006.01392.x**

Dubb, R., Nydahl, P., Hermes, C., Schwabbauer, N., Toonstra, A., Parker, A. M., Kaltwasser, A., & Needham, D. M. (2016). Barriers and strategies for early mobilization of patients in intensive care units. *Annals of the American Thoracic Society*, *13*(5), 724–730. https://doi.org/10.1513/AnnalsATS.201509-586CME

Geertz, C. (1973). Interpretation of cultures. New York: Basic Books.

Gunnarsson, B. M., & Warrén Stomberg, M. (2009). Factors influencing decision making among ambulance nurses in emergency care situations. *International Emergency Nursing*, *17*(2), 83–89. https://doi.org/10.1016/j.ienj.2008.10.004

Hammersley, M. (2006). Ethnography: Problems and prospects. *Ethnography and Education, 1*(1), 3-14, DOI: 10.1080/17457820500512697

Hancock, H. C. & Durham, L. (2007). Critical Care Outreach: The Need for Effective Decision-Making in Clinical Practice (Part 1). Intensive and Critical Care Nursing, (23)1, p. 16. https://doi.org/10.1016/j.iccn.2006.06.003

Hanna, E. S., Zhao, S., Shannon, C. N., & Betters, K. A. (2020). Changes in provider perceptions regarding early mobility in the PICU. *Pediatric Critical Care Medicine, 21*, e30–e38

Herbsman, J. M., D'Agati, M., Klein, D., O'Donnell, S., Corcoran, J. R., Folks, T. D., & Al-Qaqaa, Y. M. (2020). Early mobilization in the pediatric intensive care unit: A quality improvement initiative. *Pediatric Quality & Safety*, *5*(1), e256. https://doi.org/10.1097/pq9.0000000000000256

Herrup, E. A., Wieczorek, B., Kudchadkar, S.R. (2017). Characteristics of post-intensive care syndrome in survivors of pediatric critical illness: A systematic review. *World Journal of Critical Care Medicine*, ;6:124-34. 10.5492/wjccm.v6.i2.124

Hodgson, C. L., Bailey, M., Bellomo, R., Berney, S., Buhr, H., Denehy, L., Gabbe, B., Harrold, M., … Webb, S., & Trial of Early Activity and Mobilization Study Investigators (2016). A binational multicenter pilot feasibility randomized controlled trial of early goal-directed mobilization in the ICU. *Critical Care Medicine*, *44*(6), 1145–1152. https://doi.org/10.1097/CCM.0000000000001643

Hodgson, C. L., Capell, E. & Tipping, C. J. (2018). Early mobilization of patients in intensive care: Organization, communication and safety factors that influence translation into clinical practice. *Critical Care 22***,** 77. https://doi.org/10.1186/s13054-018-1998-9

Holloway, I. & Wheeler, S. (2010). Ethnography. In Immy Holloway & Stephanie Wheeler (Eds.), Qualitative research in nursing and healthcare: John Wiley & Sons.

Hoyer, E. H., Brotman, D. J., Chan, K. S., & Needham, D. M. (2015). Barriers to early mobility of hospitalized general medicine patients: survey development and results. *American Journal of Physical Medicine & Rehabilitation*, *94*(4), 304–312. https://doi.org/10.1097/PHM.0000000000000185

Institute of Healthcare Improvement (IHI) (2022). The IHI triple aim. Accessed from http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Ista, E., Scholefield, B. R., Manning, J. C., Harth, I., & Gawronski, Bartkowska-Śniatkowska A., Ramelet, A. S., Kudchadkar, S. R., (2020). Mobilization practices in critically ill children: A European point prevalence study (EU PARK-PICU). *Critical Care, 24*, 368-380. https://doi.org/10.1186/s13054-020-02988-2

Jones, J. & Smith, J. (2017). Ethnography: challenges and opportunities. *Evidenced-Based Nursing, 20*(4), 98-100. doi:10.1136/eb-2017-102786.

Knoblauch, H. (2005). Focused ethnography. *Qualitative Social Research. 6*(3), 44.

Krupp, A., Steege, L., Lee, J., Lopez, K. D., & King, B. (2022). Supporting decision-making about patient mobility in the intensive care unit nurse work environment: Work domain analysis. *JMIR Nursing*, *5*(1), e41051. https://doi.org/10.2196/41051

Kudchadkar, S. R., Nelliot, A., Awojoodu, R., Vaidya, D., Traube, C., Walker, T., Needham, D. M., & Prevalence of Acute Rehabilitation for Kids in the PICU (PARK-PICU) Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network (2020). Physical rehabilitation in critically ill children: A multicenter point prevalence study in the United States. *Critical Care Medicine*, *48*(5), 634–644. https://doi.org/10.1097/CCM.0000000000004291

Lebet, B. R. M., Hasbani, N. R., Sisko, M. T., Agus, M. S. D., Nadkarni, V. M., Wypij, D., Curley M.A.Q. (2021). Nurses' perceptions of workload burden in pediatric critical care. *Pediatric Critical Care, 30*(1), 27–35.

Linke, C. A., Chapman, L. B., Berger, L. J., Kelly, T. L., Korpela, C. A., & Petty, M. G. (2020). Early Mobilization in the ICU: A Collaborative, Integrated Approach. *Critical Care Explorations, 2*(4), e0090. https://doi.org/10.1097/CCE.0000000000000090

Maharmeh, M., Alshraideh, J. A., Salami, I. & Saleh, Z. (2016). Clinical decision making among critical care nurses: A qualitative study. *Health, 8*(15) 1807-1819. DOI:10.4236/health.2016.815173

Maslow, K., & Mezey, M. (2008). Recognition of dementia in hospitalized older adults. *The American Journal of Nursing*, *108*(1), 40–50. https://doi.org/10.1097/01.NAJ.0000304475.80530.a6

Microsoft (2019). Microsoft Excel (Version 16.22 20011301). Microsoft Inc.

Microsoft (2019). Microsoft Word (Version 16.22 20011301). Microsoft Inc.

Muecke, M. A. (1994). On the evaluation of ethnographies. In Janice M. Morse (Ed.), *Critical Issues in Qualitative Research Methods* (pp.187-209). Thousand Oaks, CA: Sage.

Noone, C. N., Franck, L. S., Staveski, S. L. & Rehm, R. S. (2022). Barriers and facilitators to early mobilization in the pediatric intensive care unit: A scoping literature review. *Nursing in Critical Care*, In Press.

Patel, R. V., Redivo, J., Nelliot, A., Eakin, M. N., Wieczorek, B., Quinn, J., Gurses, A. P., Balas, M. C., Needham, D. M., & Kudchadkar, S. R. (2021). Early mobilization in a PICU: A qualitative sustainability analysis of PICU Up!. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *22*(4), e233–e242. https://doi.org/10.1097/PCC.0000000000002619

Piva, T. C., Ferrari, R. S., & Schaan, C. W. (2019). Early mobilization protocols for critically ill pediatric patients: Systematic review. Protocolos de mobilização precoce no paciente crítico pediátrico: revisão sistemática. *Revista Brasileira de Terapia Intensiva*, *31*(2), 248–257. https://doi.org/10.5935/0103-507X.20190038

Pun, B. T., Balas, M. C., Barnes-Daly, M. A., Thompson, J. L., Aldrich, J. M., Barr, J., Byrum, … Ely, E. W. (2019). Caring for critically ill patients with the ABCDEF bundle: Results of the ICU liberation collaborative in over 15,000 Adults. *Critical Care Medicine, 47*(1), 3–14. https://doi.org/10.1097/CCM.0000000000003482

Ramezani-Bader, F., Nasrabadi, A. and Yekta, P. (2009). Strategies and criteria for clinical decision making in critical care nurses: A qualitative study. *Journal of Nursing Scholarship, 41*, 351-358.

Shih, C.Y., Huang, C. Y., Huang, M. L., Chen, C. M., Lin, C. C., & Tang, F. I. (2019). The association of sociodemographic factors and needs of haemodialysis patients according to Maslow's hierarchy of needs. *Journal of Clinical Nursing, 28*(1-2), 270-278

Smith, H., Besunder, J. B., Betters, K. A., Johnson, P. N., Srinivasan, V., Stormorken, A., Farrington, E., Golianu, B., … Berkenbosch, J. W. (2022). 2022 Society of Critical Care Medicine Clinical Practice Guidelines on Prevention and Management of Pain, Agitation, Neuromuscular Blockade, and Delirium in Critically Ill Pediatric Patients With Consideration of the ICU Environment and Early Mobility. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *23*(2), e74–e110. https://doi.org/10.1097/PCC.0000000000002873

Steffen, K.M., Holdsworth, L.M., Ford, M.A. *et al.* (2021). Implementation of clinical practice changes in the PICU: a qualitative study using and refining the iPARIHS framework. *Implementation Science, 16*(15). https://doi.org/10.1186/s13012-021-01080-

Stolldorf, D. P., Dietrich, M. S., Chidume, T., McIntosh, M., & Maxwell, C. A. (2018). Nurse-initiated mobilization practices in 2 community intensive care units: A pilot

study. *Dimensions of Critical Care Nursing*, *37*(6), 318–323. https://doi.org/10.1097/DCC.0000000000000320

Tanner, C. A., Padrick, K. P., Westfall, U. A., & Putzier, D. J. (1987). Diagnostic reasoning strategies of nurses and nursing students. *Nursing Research, 36*(6), 358- 363.

Taylor, G. W., & Ussher, J. M. (2001). Making sense of S&M: A discourse analytic account. *Sexualities*, *4*(3), 293–314. https://doi.org/10.1177/136346001004003002

Toney-Butler, T. J., & Thayer, J. M. (2022). Nursing Process. In *StatPearls*. StatPearls Publishing.

Walker, T. C., & Kudchadkar, S. R. (2018). Early mobilization in the pediatric intensive care unit. *Translational Pediatrics*, *7*(4), 308–313. https://doi.org/10.21037/tp.2018.09.02

Whitehead, D. (2004). Health promotion and health education: advancing the concepts. *Journal of Advanced Nursing*, *47*(3), 311-320. DOI: 10.1111/j.1365-2648.2004.03095.x

Wieczorek, B., Ascenzi, J., Kim, Y., Lenker, H., Potter, C., Shata, N. J., Mitchell, L., Haut, C., … Kudchadkar, S. R. (2016). PICU Up!: Impact of a Quality Improvement Intervention to Promote Early Mobilization in Critically Ill Children. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *17*(12), e559–e566. https://doi.org/10.1097/PCC.0000000000000983

Wieczorek, B., Burke, C., Al-Harbi, A., & Kudchadkar, S. R. (2015). Early mobilization in the pediatric intensive care unit: A systematic review. *Journal of Pediatric Intensive Care*, *4*, 129–170. https://doi.org/10.1055/s-0035-1563386

Zheng K; Sarti A; Boles S; Cameron S; Carlisi R; Clark H; Khawaji A; Awladthani S; Al-Harbi S; Choong K. (2018). Impressions of Early Mobilization of Critically Ill Children-

Clinician, Patient, and Family Perspectives. *Pediatric Critical Care Medicine,* Zheng K; Sarti A; Boles S; Cameron S; Carlisi R; Clark H; Khawaji A; Awladthani S; Al-Harbi S; Choong K. (2018). Impressions of early mobilization of critically ill children-clinician, patient, and family perspectives. *Pediatric Critical Care Medicine, 19*(7), e350-e357.

Zoom (2022). Zoom Video Communications, Inc. Version: 5.11.6 (9890).

Table 3.1: Sample Interview Questions

Question	Probes
What has been your overall experience with the EM[a] program in the PICU[b]?	Overall positive, negative. Please explain.
Can you describe the process of ensuring the devices attached to the patient were safe while you mobilized your patient when we were doing the observation?	How do you determine how many "hands" are needed to safety carry out mobility activities?
How do you measure or weigh whether or not to participate in mobility activities on any given day?	How do concerns around safety weigh into your decisions?
How do patient level factors influence your prioritization of mobility activities?	What about presence of an endotracheal tube/tracheostomy, mechanical ventilation or the patient's condition?
Do you feel like if a nurse is not comfortable with mobilization those concerns are valid?	How do you think a nurses' comfort plays into whether or not mobilization occurs?
Has your comfort with mobilizing patients changed since the implementation of the EM[a] program?	In what way?

[a] EM, Early Mobilization; [b] PICU, Pediatric Intensive Care Unit

Table 3.2: Demographics
(n=10)

	Count
Years of experience as a nurse	
1-3	1
3-5	2
5-10years	2
>10years	4
Years as a PICU[a] Nurse	
1-3	3
3-5	2
>5years	5
Years of experience in this PICU	
1-3	4
3-5	2
>5years	4
Previous Exposure to EM[b] prior to this program	
Yes	3
No	7
Shift Work Experience	
Days	8
Nights	2
Race/Ethnicity	
White	6
Hispanic/Latin	1
Asian/Asian American	3
Highest Degree	
Bachelor's	6
Master's	4
Role in PICU Up! EM Program	
Developer	2/10
Participants	10/10
Additional committee or improvement work?	
Yes	7
No	3

[a] PICU, Pediatric Intensive Care Unit; [b] EM, Early Mobilization

Chapter 4: Barriers and Strategies to Facilitate EM and Overcome Barriers

Identifying Nurses' Perceptions of Barriers, Facilitators and Strategies for Implementing Early Mobility in the Pediatric Intensive Care Unit: A Qualitative Analysis

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Nursing Practice and Early Mobility in the PICU

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Aims : To describe nurses' perceptions of barriers, facilitators and strategies for implementing Early Mobilization (EM) in the Pediatric Intensive Care Unit (PICU).

Design: This was a focused, ethnographic study. Data were analyzed using thematic analysis. Participants included 10 PICU nurses for in-depth interviews and 5 follow-up interviews.

Results: The overarching theme was nurses' commitment to doing EM because they recognize the benefit and see the positive outcomes. Facilitators to EM included improved patient condition with mobility, support of the rehabilitation team and overall impact on the PICU. Barriers to EM included nursing engagement, system-level factors, resources and equipment issues, and interdisciplinary issues. Participants suggested strategies for overcoming barriers and facilitating adoption of EM in the PICU. Nurses strategized ideas to overcome barriers because of their commitment to EM.

Conclusion: There are many factors beyond concern for individual patient safety preventing the adoption of EM into clinical practice. Despite these barriers, nurses described facilitators which improved their ability to participate in EM. By understanding the barriers, leaders can analyze and develop strategies to better integrate EM into practice.

Implication for Practice: To increase adoption of EM into clinical practice, nurse-patient assignments should be made thoughtfully considering EM as a factor in workload and also supporting nurse-patient continuity. EM should also be integrated into nurse-to-nurse handoff. Care coordination of EM is challenging and time consuming for nurses. EM should be a collaborative process and the benefits of EM should be shared with clinical staff so EM is prioritized in the PICU.

Keywords: Pediatric critical care, early mobilization, rehabilitation, nursing practice

Introduction

There has been a growing trend to incorporate rehabilitation care in order to improve the long-term recovery, quality of life and overall health outcomes of Pediatric Intensive Care Unit (PICU) survivors (Cameron et al., 2015; Cuello-Garcia et al., 2018; Herrup et al., 2017; Piva et al., 2019). Rehabilitation care consists of daily, progressive physical activity for hemodynamically stable patients. These exercises begin in the bed, progress to sitting in bed and transferring to chair, followed by standing and walking (Krupp et al., 2022). Early mobilization (EM) refers to mobilization practices and rehabilitation exercises initiated within the first 48-72 hours of admission to the ICU (Cameron et al., 2015). Implementation of EM programs and protocols have been shown to improve mortality rates, decrease sedation medication use and delirium rates, reduce ICU and hospital length of stay (LOS), reduce hospital costs, and improve functional outcomes in adult patients (Tipping et al., 2017; Parry et al., 2017; Barber et al., 2015; Leditschke et al., 2012; Engel et al., 2013; Morris et al., 2008; Needham & Korupolu, 2010; Schweickert et al., 2009). Further investigation is necessary to understand outcomes of EM though it is assumed that there would be similar outcomes in the PICU population (Hanna et al., 2020). There are many system-level barriers to implementing and sustaining clinical protocols including staffing, team structures, increased workload and time pressures (Crockerry, 2000). These challenges complicate investigators' study of protocol compliance and patient outcomes (Kahn, 2017; Lane-Fall et al., 2021).

Background

Patients in the PICU have higher acuity than ever (Knoester et al., 2007; Czaja et al., 2009; Namachivayam et al., 2012; Farris et al., 2013; Aspesberro et al., 2015). Clinical protocols have been implemented to decrease variation in clinical decisions while allowing for

individualized care by clinicians working in complex PICU environments (Hirshberg et al., 2017; Morris, 2000; Suhonen et al., 2018). Nurses play a critical role in implementing and carrying out clinical pathways and protocols to improve decision making but they also experience competing priorities while doing so (Barto, 2019). In the fast-paced environment of the PICU, the lives of patients often depend on nurses' completion of preventive and lifesaving activities (Lebet et al., 2021). PICU nurses also serve as the communication link between subspecialty teams while supporting patient and family-centered care to critically ill children and family caregivers. Down-time is filled with documentation and teaching families about what to expect in their child's trajectory of illness (Lebet et al., 2021). In addition to this heavy workload and demanding environment, PICU nurses may manage between 5-29 clinical protocols per patient each day. This places a considerable workload burden on nurses (Sevransky et al., 2015).

Authors examining the barriers to EM usually group their findings into four domains including: patient (i.e., instability, sedation, patient safety concerns), clinician (i.e., inadequate training, workload, safety risk), process (i.e. lack of coordination, unclear protocols), and system-level (i.e. lack of mobility culture, competing priorities) (Costa et al., 2017; Dubb et al., 2016; Honiden & Connors, 2015). Quality improvement models have been implemented in an attempt to develop sustainable mobility programs and have included standardized mobility protocols in the PICU (Wieczorek et al., 2016; Betters et al., 2017; Colwell et al., 2018). One quality improvement study attempted to overcome barriers to mobilization and was successful in increasing activity of patients mobilized early by 25%. They also increased the number of physician orders for activity by 50%, physical therapy (PT) by 14%, occupational therapy (OT), by 11%, speech-language pathology (SLP) by 7%, and the number of patients discharged home by 6% (Herbsman et al., 2020). Long term outcomes included a reduction in hospital length of

stay by 35%, and a reduction in PICU length of stay by 34%. Limitations to this quality improvement initiative included lower level of evidence than research, inconsistent data collection methods and low acuity of patients.

Authors of multiple, large-scale studies have demonstrated nurses' essential roles in implementing EM in PICUs (Kudchadkar et al., 2020; Ista et al., 2020). PICU nurses perceive patient safety concerns as the primary barrier to EM with their patients (Noone et al., 2023b). Beyond identifying immediate safety concerns for individual patients at the time of mobilization, there have been limited attempts to understand the nurses' contribution, and workflow while performing EM. In addition, understanding barriers and facilitators associated with EM program implementation is crucial given the critical role nurses play in EM. By understanding how these factors can be addressed, EM will more readily be performed in the PICU.

The Study

Aims

As part of a larger study to explore nurses' and family caregivers' experiences as they perform EM, the purpose of this article is to explore, describe and analyze nurses' perceptions of barriers and facilitators to performing EM, and to identify strategies nurses perceive would assist them to overcome barriers and increase adoption of EM within the PICU.

Methods

Design

Focused-ethnography, a qualitative method for studying shared social and cultural phenomena, was chosen for this study in order to describe and analyze PICU nurses' experiences with an EM program after it was introduced in the setting 18 months prior.

Theoretical Framework

Levine's Model of Conservation forms the rationale for nursing interventions made in the setting of the EM program in the PICU. In this theory, nursing care is focused on the patient and their complex relationship with their environment in an effort to assist the patient by defending their structural, personal and social integrity, and by conserving their energy. Organizational Behavior Management describes the theory behind improvement interventions making EM the standard of care in the PICU. The theory is aimed at increasing worker productivity to achieve a desired outcome. These theories were used by the research team to inform development of the interview guide and to inform data collection and analysis to issues and links between ideas developed from the data.

Sampling and Recruitment

RNs were recruited from the PICU of a quarternary healthcare organization on the west coast. Nurses care for patients from medically and socially complex populations. The healthcare facility is a Magnet organization and is a center of excellence. The PICU is a 32-bed unit that serves both medical and surgical patients. Participants were recruited through staff meetings and peer nomination. The researcher screened all participants for eligibility and obtained informed consent prior to data collection. Nurses received $40 gift cards for their participaton in interviews.

Inclusion and Exclusion Criteria

Eligibility criteria included registered nurses (RNs) with a minimum of 1 year in the PICU and with exposure to the PICU UP! EM protocol.

Data Collection

Formal interviews were conducted with PICU nurses. In addition, there were five observations of mobility activities in the PICU and informal interviews occurred during observations with members of the healthcare team, family caregivers and patients. Members of the healthcare team included registered nurses (RNs), Respiratory Therapists (RTs) and Rehabilitation (Rehab) Therapists including: OTs, PTs, and SLPs. Data collected through observations and informal interviews will be the focus of a future manuscript. Data analysis for this current article is based on the formal interviews with PICU nurses. Interviews questions analyzed for this article were aimed at describing barriers and conflicts to performing EM in the PICU and nurses' perceptions of the facilitators of the program and delivery of EM to PICU patients. Questions also centered around strategies to overcome barriers that participants identified. Some interview guide questions are presented in Table 1.

Data were collected between June and August of 2022. The first author collected data from fifteen interviews with ten PICU RNs using semi-structured and open-ended questions. Interviews occurred at an agreeable date and time for both researcher and participant. Interviews were conducted over a web-based platform (Zoom, 2022), and were recorded and transcribed verbatim using an encrypted third party service. Transcripts were crosschecked for accuracy (Kvale, 1996). Five of the ten RNs participated in follow up interviews to clarify points and to perform member checking. These key informants were selected based on the quality of their responses from the initial interview and to incorporate individuals with a wide range of experience.

Data Analysis

Data were managed with Atlas.ti Software (2022) for coding and data analysis. Data were collected, triangulated and analyzed simultaneously using thematic analysis (Braun & Clarke, 2006). Consistent with Braun & Clarke's (2006) thematic analysis, transcripts were coded and compared across participants. Codes were grouped and developed into categories. Categories were combined, expanded upon, and developed into themes (DeSantis & Ugarriza, 2000). The researchers identified patterns and themes consistent with the constructivist methodology (Taylor and Ussher, 2001). In this method, themes are abstract, patterned and represent meaning which captures something important related to the research question (DeSantis & Ugarriza, 2000). Rich descriptions provide the reader with a meaning of the theme (Braun & Clarke, 2006).

Ethical Considerations

The institutional review boards of the authors' university and the organization where data was collected approved this study.

Rigor

Inverstigators maintained reflexivity through attention to interaction quality, data and analytic triangualtion and methodological memoing to maintain rigor throughout data collection and analysis. Memos were written (CN) for participants and for each theme with data to support research findings (CN & RR). Findings were shared with key informants and discussed with the research team which consisted of the first author (CN), colleagues (SS and LF) and advisor (RR). Throughout this process, the first and last authors met weekly to discuss data analysis.

Findings

Participants

Fifteen formal interviews were conducted with 10 PICU nurses. The sample included 10 experienced nurses, ranging from 2 years to 19 years as a PICU nurse. Experience in this specific

PICU ranged from 18 months to 14 years. Eight out of 10 participants worked day shift, and all nurses worked 12 hour shifts. All nurses were women (n=10). Participants' self-reported ethnicity, years of experience, and highest level of education were collected in a demographic survey. Participants also described their role in the EM program in the PICU as a developer and/or user of the program. See Table 2 for demographic data.

Major Categories & Theme

Patient safety and patient level factors presented as barriers and sources of concern in this study, and these findings are shared in detail in another article (Noone et al., 2023b). There were four major categories of non-safety related barriers reflected in the data including: nurse engagement, system-level factors, logistics and resource issues, and support from the interprofessional team. There were three major categories of facilitators including: improved condition with mobility, rehabilitation team engagement, and impact on unit culture.

The overarching theme that integrated these categories was nurses' commitment to doing EM because they recognize the benefit and see the positive outcomes; however, external barriers present challenges to performing EM in the PICU. Participants identified barriers within these categories that could impede attempts to implement mobility plans. When various barriers were present, nurses felt frustrated. These frustrations created opportunities for nurses to brainstorm and strategize ideas to overcome these barriers because of their commitment to performing EM because of the benefits and positive patient outcomes associated with EM. One nurse poignantly described this theme by saying,

> I think when you see positive outcomes, you see that it's worth doing [EM]. We have a long-term baby [who] has all these signs in the room describing her activities, like she's supposed to do tummy time every day. You can see a big difference because people were

> doing it a lot for a while. She was sitting up in bed and playing. But then, she got really sick and was re-intubated. [Since then,] she's definitely slid back. She's not able to do as much as she was before. I feel like she's going to be so far behind developmentally. (Participant #5)

Nurses described wanting their patients to live as full and independent lives as they can. They acknowledged the impact of integrating the Rehabilitation team (PT, OT, and SLP) into the care of PICU patients from the onset of PICU admission has had a profound, positive impact on their patients. After seeing all these benefits nurses felt the need to advocate for more mobility care. A nurse said,

> Recently we had a patient who was on ECMO. [The team] mobilized her to the wheelchair for the first time since she's been hospitalized. It was a process, it was a big team and it took a lot of effort, but it was all worth it. She did well, [she sat] for probably 10 to 15 minutes, that was a major improvement. (Participant #2)

In this article, we will describe the barriers and strategies nurses described in implementing EM, followed by a description of the facilitators to performing EM in the PICU. A summary of barriers and strategies to overcome barriers can be found in Table 3. A list of facilitators to EM can be found in Table 4.

Barriers & Strategies to Overcome

Nurse Engagement

Nurse engagement refers to participation in and commitment to EM for individual nurses. At the systems level, barriers were identified related to unit workflow, staffing patient assignments, and continuity in care.

While nurses overwhelmingly described being engaged and vested in EM in the PICU, when they were met with challenges, their reported actions varied. Nurse engagement refers to how willing the RN is to deliver EM care, but it also describes the way nurses thought about their role in delivering this care. Experienced nurses often saw their role as active and paramount to delivering EM, while newer nurses did not appreciate their influence in performing EM. One experienced nurse said,

> I feel like I'm a nurse and mobility it's part of my job. I feel like we have the appropriate number of staff to support us to be comfortable [carrying out EM]. I think that if it's safe and if the patient is stable… even if it takes a bit of coordination, more equipment or people, I think there's resources that you can reach out to make you comfortable. So I don't think it's a good excuse [to be uncomfortable and withhold EM activities]. Granted, a poor new grad might not feel the same way, [but] I hope they would come and ask for help because I'd love to help them. (Participant #8)

Most nurses viewed EM as a priority. However when nurses described being met with challenges to performing EM, like parent or patient refusal, less-experienced nurses were less likely to take those opportunities to discuss parental or patient's concerns. More-experienced nurses (n=7) continued to see their role was to facilitate EM and used these opportunities to share the benefits of EM with patients and family caregivers, but less-experienced participants described their role as more passive when delivering EM activities and were less assertive in attempting to overcome s resistance to mobility activities.

Strategies to Overcome Nurse-Level Barriers

Nurses who were engaged cited many reasons for their satisfaction with the EM program and shared the reasons for their engagement. One strategy they suggested was to partner newer

staff with more experienced staff to mentor them through incorporating EM in practice. Nurses discussed facilitators within the program which included its integration into the electronic health record how their assistance in planning the program increased adoption. Nine out of ten participants cited the ease of understanding the program's components and the bedside mobility cards facilitated easy identification of mobility level and activities based on medical criteria for the patient. Several nurses described the education they received when the program was implemented as helpful for them to understand its background and rationale. They also described the need for ongoing conversation and education about EM to engage staff in the program. Four participants discussed receiving encouragement and recognition for their participation as boosting their engagement in EM, indicating that perhaps more encouragement is needed.

Systems-Level Barriers

System level factors described how unit flow, staffing, and exclusion of EM in nurse to nurse report could result in a difficult environment to deliver EM. Some nurses described how unit flow impacted EM. One said, "'How's the unit going? Do you have the support to get mobility work done? Can I give a really good PT session or will I be pulled away?'" (Participant #9). Most participants felt that when the unit was working with staffing shortages, EM was deprioritized on the unit. Nurses described how essential it was for them to have enough people on the unit to support mobility. They had concerns about their patients being negatively impacted if they did not receive EM. One nurse described,

> When you can't find help, it's disheartening. I can't move this kid on my own, he's big and I need somebody to help. Sometimes mobility is not the coolest thing that's happening on the unit. But it's a big necessity. (Participant #5)

Many nurses described feeling overwhelmed and burdened by tasks when they were placed in particular patient assignments. These usually were described as assignments involving caring for patients where there were a lot of tasks to complete. Nurses described mobility work being challenging while caring for multiple patients, particularly when patients are in a "rehab phase" of their condition. One nurse said,

> There have been times when you have a busy [two patient assignment]. The patient that you need to mobilize requires at least two people to move them, so you need to do a lot of planning and they might have a lot of things going on. (Participant #6)

Nurses also reported it necessary to consider continuity in patient assignments while considering how EM is delivered in the PICU. She said,

> It's knowing the patient's schedule, what they tolerate, [and] what they can't. A nurse who's had a patient three days in a row versus one who had one for the first time…the [one who was just there for the first time] is a bit more hesitant. It causes anxiety...Do I know them that well? What are they going [to be able] to do and what are they not [able to do]? (Participant #2)

Nurses saw continuity of patient assignments supporting EM activities. Another nurse said simply, "If it can happen one day, it can happen again the next two days," (Participant #7). With a lack of continuity in patient assignments, there may be a lack of engagement with the patient and in their recovery. One nurse said, "You don't feel as invested in the patient as you normally would if you had them more often," (Participant #6). Nurses described how learning patient-specific nuances helped them gain comfort in caring for patients and specific sequencing while mobilizing them.

Finally, participants indicated that when continuity is not possible or if it's a long-term patient, care should be continuous and seamless across their care team. Nurses discussed how a lack of handoff results in a lack of continuity of care across shifts. This nurse described how EM was frequently skipped over or missed in RN to RN handoff. She said,

> Generally, it's not a huge part of report. Sometimes it's not reported at all. The [day shift nurse might] think, 'Why would I pass it along to them?' It's not a priority, you have to report [for] Neuro, CV, Respiratory, skin... It gets missed because there's really no obvious section [of report] to place mobility. (Participant #10)

Nurses reflected on why EM wasn't well incorporated into report. Others thought maybe it was more of a priority for dayshift over nightshift so the information may not have been heard between each group giving shift reports.

Strategies to Overcome System-Level Barriers

Strategies voiced by participants to improve system-level factors included being thoughtful about staffing nurse-patient assignments. In addition, they said it is important for nurses caring for multiple patients, burdened by tasks of patient care, to receive EM support and resources. Nine of ten participants discussed the need to have an additional team member, whether that be a nurse, nursing assistants, RTs or Rehabilitation therapist, to support mobility in the PICU as a solution. Nurses realized that nurse staffing shortages or unit workflow may result in a reduction of EM activities so they suggested pulling additional resources from the interdisciplinary team may be helpful in those times. Continuity in nurse-patient assignment was also thought to build connection and trust between patient, family caregiver and nurse, and it was thought to increase EM activities.

Logistics and Resources

Nurses described feeling that EM was a good concept and that the program closely aligned with their values. However, they also described feeling like the protocol increased demands on their practice. One nurse said,

> We're expected to do mobility and we aren't given the resources to do it. Care coordination is difficult. There have been times the patient you need to mobilize requires at least two people to move them. You need to do a lot of planning and they might have a lot of things going on. I don't think there is a good understand[ing] of the work that goes into it. Sometimes it's not reasonable. (Participant #6)

For many nurses, the burdens of early mobility often felt demanding. In addition, care coordination and carrying out EM was described as time consuming and nurses reported frequent interruptions making a long process even longer. The nurse said,

> You're [also] constantly interrupted by people coming in: consulting doctors, social work, child life, friends, family, or the chaplain. You have to coordinate your RT and [support nurses] to do it at a particular time. Finding time is difficult. The amount of time spent planning and how much it takes to carry out the plans…It's not a five-minute task, it's a *process*. You can be planning for an hour. (Participant #6)

Early mobility requires time from nursing staff, and some nurses even questioned if these tasks should be their responsibility. One nurse said, “Does [care coordination] fall on the bedside nurse or [is] there someone else who can arrange that?” (Participant #1). Most nurses described the unspoken stress and burden of having to coordinate mobility care for their patients while caring for a critically ill patient and their family.

Without adequate resources to coordinate EM and to deliver EM care, nurses described having to take additional time away from the bedside to coordinate mobility activities. Nurses also voiced concerns about having the appropriate equipment available to carry out EM. One nurse said,

> Having the resources and the hands on deck has been an issue, [but also] having the equipment there, depending on what they need. [For example,] finding a transport monitor. There have been a lot of times where you can't find one. I'm like, 'I can't take you for a walk, if I can't find the transport monitor.' (Participant #10)

Strategies to Overcome Logistics and Resource Issues

Strategies to overcome barriers around resources and equipment included issues related to time constraints. When resources and equipment were unavailable, it took more time away from patient care to coordinate these activities. Half of the participants described their process of planning EM activities as developing the plan and starting early in the day and being thoughtful about the resources and equipment that will be necessary to make the event successful. One nurse said timing the event was important in order to ensure people were available. Participants expressed a need to receive training on equipment in order to feel comfortable using it during mobility activities.

When working under a shortage of people and resources, some nurses described how they leveraged members of the interdisciplinary team to help them with EM. One nurse said,

> It's like everyone is [helping] mobilize our patients… it's interdisciplinary. I think the PT/OT collaboration is probably the most influential [to integrating mobility care into everyday work]. Usually either myself or PT will try to coordinate with our RT. I have a stronger relationship with them [as a result]. (Participant #1)

Many nurses described needing to lean on the support of other team members to perform EM when they were assigned to busy patients or when other staff were unavailable to help. Several nurses delegated early mobility activities, like developmental play, to other team members like Child Life Specialists or nursing assistants.

Some nurses described engaging with family caregivers when resources were short on the unit and they needed support with EM. One nurse said, “I think family engagement encourages [mobilization], it almost optimizes and expedites it,” (Participant #4). These nurses describe how they value family presence at the bedside and partner with family caregivers to accomplish EM with their patients. This was particularly important when they were in busy patient assignments or when there was a lack of support staff to help with mobility activities.

Finally, over half of participants admitted they were not taking full advantage of the resources that were being offered to them through the implementation of the EM protocol. This was the sentiment from many nurses, that there was a need to improve teamwork, collaboration, resources/equipment and training in order to deliver better EM care in the PICU.

Interprofessional Lack of Support

Nurses described care coordination of EM activities or their patients involving an interface with other members of the interdisciplinary team. Interdisciplinary team members within the PICU include rehab team members and PICU providers. PICU providers include the residents, hospitalists, fellows, attending physicians and nurse practitioners. Consulting providers refer to the medical and surgical subspecialties who consult on PICU patients. Nurses described feeling stressed and overwhelmed with the responsibility EM care placed on them and expressed the need for more support from the interdisciplinary team to deliver EM care in the PICU.

Within the PICU

One nurse described how the lack of presence of PT and OT on the unit presented as a barrier to some patients who were not being followed by Rehabilitation therapists. The nurse said,

> I wish that PT and OT were there more often. Sometimes I don't realize that a patient doesn't have a PT or OT order in and they should. Mobility can [often] get overlooked by providers, because they're looking at so many other things. (Participant #7)

Nurses felt disproportionately responsible for the care coordination which for many felt burdensome and stressful. Nurses also described feeling underappreciated by other members of the interdisciplinary team for their contribution to EM. Nurses described how they felt the majority of EM fell on them to plan, coordinate and carry out these activities. One nurse said, "A lot of the responsibility lands on the nurse. We're the ones who need to initiate it, coordinate it, do it and bring it up [at rounds]," (Participant #7).

Consulting Providers

Other nurses expressed concerns over understanding consulting providers' plan of care for specific patient populations. Nurses described being concerned while performing EM if it could harm the patient with trauma and neurosurgical patients. Some nurses described difficulty getting ahold of teams to get their mobility questions answered while others reported variability in particular consulting teams' support for EM. One nurse said,

> We just get really vague answers as to what are the [mobility] limitations. [Mobility restrictions] are something that is talked about with the interdisciplinary team prior to rounds. [However,] there are questions that the nurses have, not the physicians. So you're

> unsure [because your questions go unanswered]. I know it's hard to get some teams together, but [for me, it's] hard to figure out what can happen safely. (Participant #10)

Strategies to Increase Interprofessional Support

Strategies to reduce the bedside nurses' work-load include improving the interprofessional collaboration around EM. Participants saw gaps in delivering EM and thought a solution to that might include increased presence of Rehabilitation therapists in the PICU. Many participants suggested that support come from their partners on the Rehabilitation team, but others thought having an additional nurse or RT to assist would be beneficial. Some nurses thought PICU providers should play a larger role in EM in the PICU. Participants considered that EM is an interprofessional activity and thought that creating a shared responsibility could reduce the burden it places on them. Several nurses suggested strategies to increase consulting providers' engagement in EM. Some participants suggested discussing patient specific mobility plans with consulting providers who did not believe mobility was appropriate for specific patient populations. Others expressed the need to perform education across medical disciplines and specialties to include sharing the evidence about the safety and benefits of EM. A few participants thought it would be more helpful to have a more supportive rounding strategy to include consulting teams so questions about mobility could be answered directly as opposed to waiting prolonged periods for their response.

Facilitators

There are many facilitators which contribute to nurses overcoming barriers and performing EM with their patients. Nurses stated that mobility care was reinforced as they witnessed the improved condition of patients. They also described the Rehabilitation team as

playing a major role in facilitating EM, Finally, they reflected upon the overall impact of the program in creating teamwork and mobility culture in the PICU.

Improved Condition with EM

Nurses described feeling a responsibility to provide developmentally appropriate care to their patients. Nurses described that the EM program built PT, OT, and SLP visits into every patient's care from early in their admission so treatment plans integrate their therapies from the onset of admission to the PICU. By incorporating all these therapists into their care, nurses described patient's developmental needs being addressed more comprehensively and routinely. Nurses recognized that mobility care creates opportunities for patients to receive developmentally appropriate play, and activities. Nurses also reported that EM provided opportunities to break up their patient's day. One nurse said, "It's easy to get task oriented that you forget, this is a kid in a hospital. They probably want to be a kid outside the hospital room and at least mobility [helps create some normalcy]" (Participant #1). Nurses described that the benefits EM presented to provide developmentally appropriate care as a reason to incorporate and prioritize EM into their practice.

Nurses also discussed physical or physiologic benefits of EM. Multiple nurses discussed the physical benefits and improvement EM made for their patients particularly in respiratory care. Nurses described coordinating respiratory treatments, improving pulmonary toilet, mobilizing secretions better and an overall improved respiratory status as result of EM. Another nurse described a patient's movement disorder stopping after getting up to a wheelchair when there was previously a lot of hesitation to do so. She described that as more nurses understood the patient's positive response, her mobility plan was better followed by PICU nurses. A few

nurses mentioned that getting patients up to a wheelchair every day reduced their development of pressure injuries.

Nurses also reported the benefits EM had on patients' and family caregivers' psychological state in terms of alleviating stress, anxiety and depression they experienced as a result of prolonged stays in the PICU. Several nurses noted mobility activities resulted in a marked change in their patient's mood after receiving mobility care. Several staff expressed these experiences were influential in better incorporating EM into their daily routine. One nurse described,

> There was a [delirious] patient, on several drips, intubated, and really sick. He was a previously healthy kid, and then all of a sudden he was really sick for a long time and that affects your body. [After some time,] he was able to get up and go out to the patio. I think of the smile on his face, of course there was a bigger smile on mom's face. Seeing him do that, he was so happy to be outside again. It had been two months he was in the hospital. It was such a great experience to see that patient's progress. I think the patients get depressed. But this... Moving to them is progress. Getting up out of bed, that gives them hope. Mom had a bigger smile. She was so happy that he got to be wheeled out to the patio.... So it was nice to see, it gave them hope. (Participant #10)

Nurses described using a lot of positive reinforcement and stressed the need for repeated physical conditioning to improve their patients' clinical status. Nurses described how small, daily interventions had a big impact on patients. Nurses reported feeling a sense of pride in their work and often celebrated when they saw patients making strides in their mobility routines. Nurses described that sometimes the psychological benefits of EM are seen right away in their patients' responses, and other times there were delayed responses to EM. Many nurses described having

positive experiences with patients and families after going to the balcony, and reported that EM often resulted in positive mood shifts in the PICU.

Rehabilitation Team

Nurses often reflected on the importance of the partnership with the Rehabilitation team to deliver EM care. All nurses spoke extensively about how EM took teamwork and since its implementation there being improved team cohesion as a result. Nurses talked about being a team players and supporting their colleagues who were carrying out EM with their patients. Nurses felt particular pride and sense of accomplishment when mobilizing their ECMO patients. They described how EM activities brought about a sense of community when teams accomplished a shared goal. Overall nurses described bonding with the team following these activities. Eight out of ten participants also described the encouragement, teamwork and accomplishment that was fostered by interactions with their colleagues who encouraged participation in the EM program.

Overall Impact on the PICU

Some nurses described that sometimes mobility work can feel monotonous and it was difficult to see the direct benefit of EM care. This was noted to be particularly true when patients were recovering from the acute phase of critical illness and improvements to the patient's condition take time. However, all nurses reported having "milestone moments" that helped reinforce why they were doing the work, and created opportunities to illustrate how patients were benefiting from EM. These advances allowed nurses to see and experience the outcomes of their work delivering EM in the PICU. Nurses often talked about why these moments are so gratifying as they see and hear about patients' progress. One nurse described several patients who were not expected to live because they had such critical stays in the PICU. This nurse said,

> That's where you see mobility helping, when kids come back from the edge. Especially when it’s done safely [and consistently], and PT really works with them. We have some kids who come to the PICU who we think they're going to die. And then they don't. [Then,] they come walking back on the unit. It's always nice to see that. (Participant #5)

Nurses described it being therapeutic to have closure on these sick patients lives as nurses spend much of their time supporting and giving care to patients. Nurses described it being therapeutic to celebrate mobility wins and improvements made by their patients.

Nurses usually described their overall experiences with the program as positive. Nurses described the impact of the program as making them more aware of the benefits of mobility for their patients. For this reason, they discuss readily adopting and incorporating EM into clinical practice. All nurses passionately described their experiences with their patients as rewarding and positive. One nurse said,

> I think it's been a really positive experience overall, for me. There's a lot of assumptions made about a patient's physical ability just by looking at them or their numbers, vital signs, whatever. I've found a lot of use in being able to refer to the specific criteria on the PICU UP! mobility levels and then be able to correlate that with activities and advocate for my patients. I've had a very positive experience with it. (Participant #7)

Nurses described wanting the best for their patients and for them to live independent, full lives and making EM such a big part of their care. Nurses reported that EM has made a significant impact on the patients and nurses attribute these benefits to the EM program.

Participants consistently described how unit culture had shifted towards mobility following the implementation of the mobility program. Nurses described how team leads would often check in with bedside nurses to offer help with EM, and the investment nursing staff had to

carrying out EM plans of the day. Highly enjoyable activities like taking patients to the patio were often discussed as being resource intensive but also important to patients and families. One nurse described an almost snowball effect the program has had in increasing people's awareness and willingness to participate in EM. They said,

> I have seen everyone put forth more effort and getting patients moving. They say, 'So many people have done it, and this is working.' It gets people to feel more confident about [EM]. As for the culture, [nurses say,] 'Let's move them from the bed to a chair. Let's get a team together.' Or you have the buffers that are helping with mobility and movement. Most of the nurses understand, 'I need to make a plan to get this going.' It's [been] helpful [and] it's nice to work towards a common goal together. People are catching onto it, making it a part of their day and working hard to make it happen. Leaders come out of it. Somebody may have a strong work ethic and they inspire others. They make you think, 'Oh, if you can do that, I can do it too.' (Participant #9)

Because mobility stories are being shared and celebrated, it makes it seem possible and achievable for nurses to participate in the program which has increased the momentum towards performing EM in the PICU.

Discussion

The purpose of this article was to describe nurses' perspectives of the barriers to performing EM, beyond patient safety, and to describe the facilitators to EM which helped nurses brainstorm strategies to overcome barriers to facilitate adoption of EM in the PICU. This focused ethnographic study in the PICU included fifteen in-depth interviews with ten nurses. Follow up interviews were conducted to clarify points and to perform member checking. Thematic analysis was used to develop codes, categories and themes. Major categories which

influenced nurses delivery of EM care in the PICU included nurse engagement, system- level factors, logistics and resources, and issues related to working with members of the interdisciplinary team. The overarching theme that linked the major categories of this data set was nurses' commitment to EM because of the benefits and positive patient outcomes associated with EM. However, external barriers present challenges to performing EM which made nurses feel frustrated, but they created opportunities for nurses to brainstorm and strategize ideas to overcome these barriers.

Many of the barriers reported in this study have been supported by other PICU EM research (Noone et al., 2023a; Hopkins et al. 2015). This study demonstrated the significant time commitment EM is for PICU nurses. All nurses reported spending a significant amount of time performing care coordination and delivering EM care which was not shared amongst other members of the healthcare team. Nurses described working under a shortage of resources as a common concern and how all these factors created stress in their work. Participants also identified several strategies to help improve EM including close collaboration with healthcare team members. Difficulty with care coordination was reported by authors studying barriers to EM in many other PICUs (Wieczorek et al., 2016; Colwell et al., 2018; Zheng et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021). Our study also described the importance of thoughtful consideration of nurse-patient assignments to facilitate EM. This was also present in the literature where investigators found an increased ratio of patients to nurses caused a lack of time and was a major barrier to performing EM (Hopkins et al., 2015). These authors also identified that appropriate knowledge dissemination of research evidence, education of clinical team members, use of champions, and inclusion of staff in the development and dissemination of programs increased adoption of EM (Hopkins et al., 2015). Nearly all of these

factors were highlighted in our study, except participants did not discuss the use of champions or as barriers or facilitators in our study.

Authors of adult ICU literature similarly described high workload, need for adequate resources and how staffing affects the implementation and integration of EM into practice (Fontela et al., 2018; Hoyer, 2015; Kim et al., 2019). As in the current study, increased number of patients to care for and the lack of time were also present as barriers in adult ICU literature (Fontela et al., 2018; Hoyer, 2015; Kim et al., 2019). Fontana and colleagues (2018) reported the risk of musculoskeletal self-injury and excessive stress for nurses at work as additional barriers to EM in adult ICUs. All of these factors, with the exception of risk of self-injury, were noted in our study. Linke and colleagues (2020) demonstrated the importance of having an interdisciplinary approach to EM from the beginning stages of program development, but also demonstrated the importance of interdisciplinary rounds in the adult ICU to develop a shared mental model that would fit patients' needs (Linke et al., 2020).

There were several findings that were unique to our study. The participants in our study validated staffing as a barrier, but also described using family as an additional resource for EM in the PICU which was not previously described. Second, the importance of interdisciplinary rounds was another significant finding in our study as this was not reported in previous pediatric literature, to our knowledge. Nurses expressed frustration about not having a thorough understanding of mobility limitations and with not having a shared understanding of the benefits of EM across medical or surgical specialties. Our study also demonstrated the importance of a thorough handoff of the mobility plan. Handoffs provide nurses the time to relay valuable patient information from one caregiver to the next (Starmer et al., 2013). When done properly, handoffs improve patient safety and outcomes, by reducing medical errors and adverse events (Starmer et

al., 2013; Starmer et al., 2014). In our study, nurses reported either not getting any information or receiving incorrect information about the patient's mobility plan during handoff. Many participants felt including EM in bedside nursing report would improve communication about the mobility plan and better incorporate EM into nursing practice. This in turn could also improve patient safety and ability to study patient outcomes of EM in the PICU.

'Engagement' is used to describe and measure a group's willingness to actively participate in a given protocol (Norris et al., 2017). Group engagement is limited if the resources and organizational infrastructure is inadequate to support the protocol at hand (Norris et al., 2017). With this in mind, nurses' willingness to perform the protocol alone will not increase adoption of EM into clinical practice. In order to achieve full engagement, it is important to understand the barriers preventing adoption of EM and to address them appropriately. From our study, we understand the factors preventing full adoption of EM into clinical practice include individual nurse engagement, staffing issues, lack of handoff and thoughtful consideration of patient assignments so the burden of EM is not too difficult for a nurse in any patient assignment. Many EM protocols did not have a dedicated rehab therapist in their PICU, as described in the literature (Wieczorek et al., 2016; Colwell et al., 2018; Zheng et al., 2018; Hanna et al., 2020; Herbsman et al., 2020; Patel et al., 2021). This study's setting also did not have a dedicated Rehab therapist, RT or nurse to assist with EM. Participants described lack of referrals to PT and OT as a barrier to getting them to be seen. Once seen by therapists and a treatment plans was in place, participants discussed how a lift team or coach could help staff carry out EM. In our study, participants felt these team members were highly valued, though under-utilized. Perhaps other facilities would also benefit from a similar model. Finally, it is very important to be able to monitor resource utilization and allocation of resources and monitor compliance around mobility

protocols. Ongoing conversations with leadership must also be done to understand barriers and allocate resources to eliminate barriers to EM whenever possible.

The invisible workload nurses experience with the implementation of evidence-based programs is demonstrated in this study. Nurses understand the benefit of EM but major barriers demonstrated in this study may prevent the long-term sustainability of the program. Participants described their efforts to incorporate EM into practice were thwarted by these barriers and the participants were frustrated by the challenges these barriers presented. These external pressures and challenges made the nurses feel less in control of EM and these factors present as risk factors for nursing burnout. Burnout leads to a loss of psychological wellbeing, increased absenteeism and deterioration of work performance (Teixeira et al., 2013). In Teixeira et al.'s prevalence study, severe burnout was present in one-third of ICU nurses. Risk factors for burnout which are significant to this study include workload and organizational issues, and conflicts with other disciplines (Kerlin et al. 2020; Teixeira et al., 2013). All of these factors are discussed as barriers to EM and described in this study. Protective strategies for burnout include involvement in a work group or committee and positive work relationships with physicians and supervising staff (Kerlin et al. 2020; Teixeira et al., 2013). In addition, staff were able to identify several strategies to overcome or mitigate barriers which could be studied or initiated into practice. It is with this in mind that hospital and unit leaders may also gain awareness of the existence of burnout with the nursing staff and the challenges that protocols place on their work. To alleviate these pressures, nursing leaders may take actions to reduce burnout by focusing their efforts to alleviate workload pressures, create collaborative work environments, and reduce conflicts between team members.

Strengths and Limitations

This study had several limitations. First, it was narrow in scope and likely only described some of the barriers to EM in PICUs because the participants were only nurses and only provided a narrow spectrum of healthcare team perspectives. In addition, this was a single site, single country, academic pediatric hospital, and only reflects the perceptions of nurses in this hospital. This study does not show the attitudes or perceptions about the barriers to EM of decision makers and managers, which is essential for adequate resource allocation and nursing assignments (Linke et al., 2020).

Implications of this Research

There are many practice implications of this study. First, nurses identified the need to have adequate staffing in order to plan, coordinate and carry out EM. This will ensure EM occurs despite the other activities or procedures going on in the unit. We also demonstrated the importance of educating all staff, including ancillary staff, on the importance and practice of EM for patients at various developmental stages. This is because the interdisciplinary nature of the work speaks to the need for all staff working in the PICU to understand the importance of EM for patients' development and recovery and how to carry out these activities safely. In addition, adequate equipment and training on equipment is necessary to carry out EM activities. We also described the importance of integrating EM into nurse-to-nurse handoff so the mobility plan is clear between shifts. Finally, the nurse participants in this study felt EM should be a shared responsibility between all members of the healthcare team, including providers. Perhaps expanding the focus to increase providers' understanding of EM's safety and benefits would help them encourage EM inter-professionally and include it in patients' plan of care.

Future research should be large in scale in order to understand other factors and the implications of the barriers to EM. Future studies could evaluate the role of project champions to address perceptions of barriers and to provide real time education for EM during patient care (Linke et al., 2020). Future studies could also evaluate the effect of including EM in handoff on clinical practice and patient outcomes. Also, investigators could better explore how continuity in care affects EM in future studies. Future studies can be focused on better understanding other healthcare providers' perceptions of barriers to EM including providers and doctors, more specifically. Future studies can be focused on the effect EM protocols have on sleep quality and delirium rates of PICU patients, as well as long term outcomes of EM programs. Finally, patient motivation may also be studied to better understand their willingness to participate in EM activities in the PICU. Burnout as it relates to EM could be studied to better understand the impact of the invisible workload nurses carry. However, it would be a complicated variable to study due to the many ways nurses see EM as benefitting their patients. Nurses choose to participate in EM despite the perceived barriers because it is viewed and experienced as a positive impact to patient care. Better understanding and addressing these issues could further establish EM as the standard of care in the PICU.

Conclusion

There are many issues preventing the adoption of EM into clinical practice. Nurses discussed their perceptions of barriers to EM care in the PICU, beyond patient safety. Nurses perceived three categories of barriers: nurse engagement and nursing and unit factors, resources and equipment issues, and interdisciplinary issues. Facilitators to EM include improved condition with mobility, rehabilitation team, and impact on unit culture. The overarching theme that integrated these categories was nurses' commitment to EM because they recognize the

benefit and see the positive outcomes. These barriers presented challenges and nurses felt frustrated by having to navigate through these barriers, but these frustrations created opportunities for nurses to brainstorm and strategize ideas to overcome these barriers. This study demonstrates the importance of thoughtfully considering the burden evidence-based programs have on the nurses who carry out EM. EM activities fall primarily on nursing staff, and organizational structures and resources must be allocated to reliably deliver this essential care. By better understanding the barriers, leaders can analyze and develop strategies to better integrate EM into practice.

References

Aspesberro, F., Mangione-Smith, R., & Zimmerman, J. J. (2015). Health-related quality of life following pediatric critical illness. *Intensive Care Medicine, 41,* 1235-46.

ATLAS.ti (2022). Version 22.1.0 (3475). ATLAS.ti Scientific Software Development GmbH.

Barber, E. A., Everard, T., Holland, A. E., Tipping, C., Bradley, S. J., & Hodgson, C. L. (2015). Barriers and facilitators to early mobilization in Intensive Care: A qualitative study. *Australian Critical Care: Official Journal of the Confederation of Australian Critical Care Nurses, 28*(4), 177–183. https://doi.org/10.1016/j.aucc.2014.11.001

Barto, D. (2019). Nurse-driven protocols. *Nursing Critical Care, 14*(4), 18-24 doi: 10.1097/01.CCN.0000560104.63793.d9

Betters, K. A., Hebbar, K. B., Farthing, D., et al. (2017). Development and implementation of an early mobility program for mechanically ventilated pediatric patients. *Journal of Critical Care, 41,* 303-308.

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Cameron, S., Ball, I., Cepinskas, G., et al. (2015). Early mobilization in the critical care unit: A review of adult and pediatric literature. *Journal of Critical Care, 30,* 664-72.

Colwell, B. R. L., Williams, C. N., Kelly, S. P., & Ibsen, L. M. (2018). Mobilization therapy in the pediatric intensive care unit: A multidisciplinary quality improvement initiative. *American Journal of Critical Care, 27*(3), 194–203

Costa, D. K., White, M. R., Ginier, E., Manojlovich, M., Govindan, S., Iwashyna, T. J., & Sales, A. E. (2017). Identifying barriers to delivering the awakening and breathing coordination, delirium, and early exercise/mobility bundle to minimize adverse outcomes for

mechanically ventilated patients: A systematic review. *Chest, 152*(2), 304–311. https://doi.org/10.1016/j.chest.2017.03.054

Cuello-Garcia, C. A., Mai, S. H. C., Simpson, R., et al. (2018). Early mobilization in critically ill children: A systematic review. *The Journal of Pediatrics, 203*, 25–33.e6. https://doi.org/10.1016/j.jpeds.2018.07.037

Czaja, A. S., Zimmerman, J. J., Nathens, A. B. (2009). Readmission and late mortality after pediatric severe sepsis. *Pediatrics, 123*, 849-57.

DeSantis, L. & Ugarriza, D. N. (2000). The concept of theme as used in qualitative nursing research. *Western Journal of Nursing Research*, *22*(3), 351–372. https://doi.org/10.1177/019394590002200308

Dubb, R., Nydahl, P., Hermes, C., Schwabbauer, N., Toonstra, A., Parker, A. M., Kaltwasser, A., & Needham, D. M. (2016). Barriers and strategies for early mobilization of patients in intensive care units. *Annals of the American Thoracic Society*, *13*(5), 724–730. https://doi.org/10.1513/AnnalsATS.201509-586CME

Engel, H. J., Needham, D. M., Morris, P. E., & Gropper, M. A. (2013). ICU early mobilization: from recommendation to implementation at three medical centers. *Critical Care Medicine, 41*(9 Suppl 1), S69–S80. https://doi.org/10.1097/CCM.0b013e3182a240d5

Farris, R. W., Weiss, N. S., Zimmerman, J. J. (2013). Functional outcomes in pediatric severe sepsis: Further analysis of the research severe sepsis and organ dysfunction in children: A global perspective trial. *Pediatric Critical Care Medicine, 14*, 835-42.

Fontela, P. C., Forgiarini, L. A., Jr, & Friedman, G. (2018). Clinical attitudes and perceived barriers to early mobilization of critically ill patients in adult intensive care units. Atitudes clínicas e barreiras percebidas para a mobilização precoce de pacientes graves

em unidades de terapia intensiva adulto. *Revista Brasileira de Terapia Intensiva*, *30*(2), 187–194. https://doi.org/10.5935/0103-507X.20180037

Hanna, E. S., Zhao, S., Shannon, C. N., & Betters, K. A. (2020). Changes in provider perceptions regarding early mobility in the PICU. *Pediatric Critical Care Medicine, 21*, e30–e38

Herbsman, J. M., D'Agati, M., Klein, D., O'Donnell, S., Corcoran, J. R., Folks, T. D., & Al-Qaqaa, Y. M. (2020). Early mobilization in the pediatric intensive care unit: A quality improvement initiative. *Pediatric Quality & Safety*, *5*(1), e256. https://doi.org/10.1097/pq9.0000000000000256

Herrup, E. A., Wieczorek, B., & Kudchadkar, S. R. (2017). Characteristics of post-intensive care syndrome in survivors of pediatric critical illness: A systematic review. *World Journal of Critical Care Medicine, 6*, 124-34.

Hirshberg, E. L., Lanspa, M. J., Wilson, E. L., et al. (2017). A pediatric intensive care unit bedside computer clinical decision support protocol for hyperglycemia is feasible, safe and offers advantages. *Diabetes Technological Therapies, 19*(3), 188-193.

Honiden, S. & Connors, G. R. (2015). Barriers and Challenges to the Successful Implementation of an Intensive Care Unit Mobility Program: Understanding Systems and Human Factors in Search for Practical Solutions. *Clinics in Chest Medicine*, *36*(3), 431–440. https://doi.org/10.1016/j.ccm.2015.05.006

Hopkins, R. O., Choong, K., Zebuhr, C. A., & Kudchadkar, S. R. (2015). Transforming PICU Culture to Facilitate Early Rehabilitation. *Journal of Pediatric Intensive Care*, *4*(4), 204–211. https://doi.org/10.1055/s-0035-1563547

Hoyer, E. H., Brotman, D. J., Chan, K. S., & Needham, D. M. (2015). Barriers to early mobility of hospitalized general medicine patients: survey development and results. *American*

Journal of Physical Medicine & Rehabilitation, *94*(4), 304–312. https://doi.org/10.1097/PHM.0000000000000185

Ista, E., Scholefield, B. R., Manning, J. C., Harth, I., & Gawronski, Bartkowska-Śniatkowska A., Ramelet, A. S., Kudchadkar, S. R. (2020). Mobilization practices in critically ill children: A European point prevalence study (EU PARK-PICU). *Critical Care, 24,* 368-380. https://doi.org/10.1186/s13054-020-02988-2

Kahn, J. M. (2017). Bringing implementation science to the intensive care unit. *Current Opinions in Critical Care*, *23*(5), 398-9. https://doi.org/10.1097/MCC.0000000000000446.

Kerlin, M. P., McPeake, J., & Mikkelsen, M. E. (2020). Burnout and joy in the profession of critical care medicine. *Critical Care*, *24*(1), 98. https://doi.org/10.1186/s13054-020-2784-z

Kim, C., Kim, S., Yang, J., & Choi, M. (2019). Nurses' perceived barriers and educational needs for early mobilisation of critical ill patients. *Australian Critical Care: Official Journal of the Confederation of Australian Critical Care Nurses*, *32*(6), 451–457. https://doi.org/10.1016/j.aucc.2018.11.065

Knoester, H., Grootenhuis, M. A., & Bos, A. P. (2007). Outcome of paediatric intensive care survivors. *European Journal of Pediatrics, 166*, 1119-28.

Krupp, A., Steege, L., Lee, J., Lopez, K. D., & King, B. (2022). Supporting decision-making about patient mobility in the intensive care unit nurse work environment: Work domain analysis. *JMIR Nursing*, *5*(1), e41051. https://doi.org/10.2196/41051

Kudchadkar, S. R., Nelliot, A., Awojoodu, R., Vaidya, D., Traube, C., Walker, T., Needham, D. M., & Prevalence of Acute Rehabilitation for Kids in the PICU (PARK-PICU)

Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network (2020). Physical rehabilitation in critically ill children: A multicenter point prevalence study in the United States. *Critical Care Medicine*, *48*(5), 634–644. https://doi.org/10.1097/CCM.0000000000004291

Kvale, S. (1996). Interview views: An introduction to qualitative research interviewing. Thousand Oaks, CA: Sage Publications.

Lane-Fall, M.B., Christakos, A., Russell, G.C. *et al.* (2021). Handoffs and transitions in critical care—understanding scalability: study protocol for a multicenter stepped wedge type 2 hybrid effectiveness-implementation trial. *Implementation Science*, *16*, 63. https://doi.org/10.1186/s13012-021-01131-1

Lebet, B. R. M., Hasbani, N. R., Sisko, M. T., Agus, M. S. D., Nadkarni, V. M., Wypij, D., Curley M.A.Q. (2021). Nurses' perceptions of workload burden in pediatric critical care. *Pediatric Critical Care*, *30*(1), 27–35. https://doi.org/10.4037/ajcc2021725

Leditschke, I. A., Green, M., Irvine, J., Bissett, B., & Mitchell, I. A. (2012). What are the barriers to mobilizing intensive care patients? *Cardiopulmonary Physical Therapy Journal*, *23*(1), 26–29.

Linke, C. A., Chapman, L. B., Berger, L. J., Kelly, T. L., Korpela, C. A., & Petty, M. G. (2020). Early mobilization in the ICU: A collaborative, integrated approach. *Critical Care Explorations*, *2*(4), e0090. https://doi.org/10.1097/CCE.0000000000000090

Morris, P. E., Goad, A., Thompson, C., Taylor, K., Harry, B., Passmore, L., Ross, A., Anderson, L., Baker, S., Sanchez, M., Penley, L., Howard, A., Dixon, L., Leach, S., Small, R., Hite, R. D., & Haponik, E. (2008). Early intensive care unit mobility therapy in the treatment

of acute respiratory failure. *Critical Care Medicine, 36*(8), 2238–2243. https://doi.org/10.1097/CCM.0b013e318180b90e

Morris, A. H. (2000). Developing and implementing computerized protocols for standardization of clinical decisions. *Annals of Internal Medicine, 132*(5), 373-383.

Namachivayam, P., Taylor, A., Montague, T., et al. (2012). Long-stay children in intensive care: Long-term functional outcome and quality of life from a 20-yr institutional study. *Pediatric Critical Care Medicine, 13*, 520-528.

Needham, D. M., Korupolu, R., Zanni, J. M., Pradhan, P., Colantuoni, E., Palmer, J. B., Brower, R. G., & Fan, E. (2010). Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. *Archives of Physical Medicine and Rehabilitation*, *91*(4), 536–542. https://doi.org/10.1016/j.apmr.2010.01.002

Noone, C., Franck, L. S., Staveski, S. L. & Rehm, R. S. (2023a). Barriers and facilitators to early mobilization in the pediatric intensive care unit: A scoping literature review. *Nursing in Critical Care*, In Press.

Noone, C., Franck, L. S., Staveski, S. L. & Rehm, R. S. (2023b). Overcoming patient safety concerns and integrating early mobility into pediatric intensive care unit nursing practice. *Journal of Pediatric Nursing*, In Press.

Norris, J. M., White, D. E., Nowell, L. et al. (2017). How do stakeholders from multiple hierarchical levels of a large provincial health system define engagement? A qualitative study. *Implementation Science, 12*, 98. https://doi.org/10.1186/s13012-017-0625-5

Parry, S. M., Huang, M., & Needham, D. M. (2017). Evaluating physical functioning in critical care: considerations for clinical practice and research. *Critical Care, 21*(1), 249. https://doi.org/10.1186/s13054-017-1827-6

Patel, R. V., Redivo, J., Nelliot, A., Eakin, M. N., Wieczorek, B., Quinn, J., Gurses, A. P., Balas, M. C., Needham, D. M., & Kudchadkar, S. R. (2021). Early mobilization in a PICU: A qualitative sustainability analysis of PICU Up!. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *22*(4), e233–e242. https://doi.org/10.1097/PCC.0000000000002619

Piva, T. C., Ferrari, R. S., & Schaan, C. W. (2019). Early mobilization protocols for critically ill pediatric patients: Systematic review. Protocolos de mobilização precoce no paciente crítico pediátrico: revisão sistemática. *Revista Brasileira de Terapia Intensiva*, *31*(2), 248–257. https://doi.org/10.5935/0103-507X.20190038

Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., Spears, L., Miller, M., Franczyk, M., Deprizio, D., Schmidt, G. A., Bowman, A., Barr, R., McCallister, K. E., Hall, J. B., & Kress, J. P. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: A randomised controlled trial. *Lancet (London, England)*, *373*(9678), 1874–1882. https://doi.org/10.1016/S0140-6736(09)60658-9

Sevransky, J. E., Checkley, W., Herrera, P., et al. (2015). Protocols and hospital mortality in critically ill patients: the United States critical illness and injury trials group critical illness outcomes study. *Critical Care Medicine, 43*(10), 2076-2084.

Starmer, A. J., Sectish, T. C., Simon, D. W., Keohane, C., McSweeney, M. E., Chung, E.Y., et al. (2013). Rates of medical errors and preventable adverse events among hospitalized children following implementation of a resident handoff bundle. *JAMA, 310*(21):2262–70. https://doi.org/10.1001/jama.2013.281961.

Starmer, A.J., Spector, N. D., Srivastava, R., West, D. C., Rosenbluth, G., Allen, A. D., et al. (2014). Changes in medical errors after implementation of a handoff program. *New England Journal of Medicine, 371*(19), 1803-1812. https://doi.org/10.1056/NEJMsa1405556.

Suhonen, R., Stolt, M., Habermann, M., Hjaltadottir, I., Vryonides, S., Tonnessen, S., Halvorsen, K., Harvey, C., Toffoli, L., Scott, P. A., & RANCARE Consortium COST Action - CA 15208 (2018). Ethical elements in priority setting in nursing care: A scoping review. *International Journal of Nursing Studies*, *88*, 25–42. https://doi.org/10.1016/j.ijnurstu.2018.08.006

Taylor, G. W. & Ussher, J. M. (2001). Making sense of S&M: A discourse analytic account. *Sexualities, 4*(3), 293–314. https://doi.org/10.1177/136346001004003002

Teixeira C, Ribeiro O, Fonseca AM, Carvalho AS. (2013). Burnout in intensive care units: A consideration of the possible prevalence and frequency of new risk factors: a descriptive correlational multicentre study. *BMC Anesthesiology*, *13*, 38.

Tipping, C. J., Harrold, M., Holland, A., Romero, L., Nisbet, T., & Hodgson, C. L. (2017). The effects of active mobilisation and rehabilitation in ICU on mortality and function: A systematic review. *Intensive Care Medicine*, *43*(2), 171–183. https://doi.org/10.1007/s00134-016-4612-0

Wheeler, D. S., Dewan, M., Maxwell, A., Riley, C. L., & Stalets, E. L. (2018). Staffing and workforce issues in the pediatric intensive care unit. *Translational Pediatrics*, *7*(4), 275–283. https://doi.org/10.21037/tp.2018.09.05

Wieczorek, B., Ascenzi, J., Kim, Y., Lenker, H., Potter, C., Shata, N. J., Mitchell, L., Haut, C., … Kudchadkar, S. R. (2016). PICU Up!: Impact of a Quality Improvement Intervention

to Promote Early Mobilization in Critically Ill Children. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, *17*(12), e559–e566. https://doi.org/10.1097/PCC.0000000000000983

Zheng K; Sarti A; Boles S; Cameron S; Carlisi R; Clark H; Khawaji A; Awladthani S; Al-Harbi S; Choong K. (2018). Impressions of early mobilization of critically ill children-clinician, patient, and family perspectives. *Pediatric Critical Care Medicine, 19*(7), e350-e357.

Table 4.1: Sample Interview Questions

Question	Probes
Can you describe a particularly difficult patient you were responsible for mobilizing? • What made it so difficult?	Was something harmful to the patient? • In what way? • What was going on in that situation? What did the care coordination look like?
Can you describe a situation where there were conflicting opinions about a mobility plan for a patient? • For example: a disagreement in mobility plan Or a time there was a mobility plan you weren't able to follow?	What did (specify person) say to you? How was the disagreement resolved?
What other factors play into whether EM can be carried out at the bedside?	• What resources are necessary? • Is staffing, scheduling and care coordination challenging? If so, in what way? • How do you decide if the patient will tolerate mobility given their acuity? Any other factors that weigh in?
If the mobility program were to continue, what resources should be allocated towards it in order to make it more successful?	
Do you think the EM program has changed unit culture as a whole around mobilizing patients?	• Towards more mobility, less mobility? • In what way? How has rounds contributed to more or less mobility on the unit?
Is there anything that is special about practicing rehabilitation activities with PICU patients that gets you particularly excited to do the work?	• Is there something about the positive feedback you've seen your patients and their family caregivers experience as part of working in the EM program? • Have you had any negative experiences which complicate your willingness to participate in these activities? • How do previous experiences influence how you think about mobilization in the PICU?

Table 4.2: Demographics
(n=10)

	Count
Years of experience as a nurse	
1-3	1
3-5	2
5-10years	2
>10years	4
Years as a PICU Nurse	
1-3	3
3-5	2
>5years	5
Years of experience in this PICU	
1-3	4
3-5	2
>5years	4
Previous Exposure to EM prior to this program	
Yes	3
No	7
Shift Work Experience	
Days	8
Nights	2
Race/Ethnicity	
White	6
Hispanic/Latinx	1
Asian/Asian American	3
Highest Degree	
Bachelor's	6
Master's	4
Role in PICU UP! EM Program	
Developer	2/10
User	10/10
Additional committee or improvement work?	
Yes	7
No	3

Table 4.3: Barriers and Strategies to Overcome

Nurse-Identified Barrier	Strategies to Facilitate EM
Nurse-Level Factors Individual Nurse Engagement	Mentoring Newer Staff Components of the Program Integration in the Electronic Health Record Encouragement
System-Level Factors Unit Workflow Staffing Patient Assignments Continuity in Care Lack of Integration in RN Handoff	Teamwork Fostered Nursing Assignments – Continuity & Workload Additional Team Member Integration into RN handoff
Logistics and Resource Issues Increased Demand on Practice Time consuming, time away from bedside care Care Coordination Lack of Equipment/Supplies	Improve Teamwork Improve Collaboration Make resources, equipment and supplies readily available Educate nurses about use of equipment Perform education/training at orientation and ongoing
Interprofessional Support Variability of PICU Provider Support Consulting Providers Lack of Understanding of Plan of Care Lack of Buy-in for EM	Foster Collaboration Consistent Integration into Rounds Develop Patient Specific Mobility Plans Sharing the Evidence, Educating and Engaging Consulting Providers

Table 4.4: Facilitators to EM in the PICU

Nurse Identified Facilitators	Description
Improved Condition with Mobility	Developmental Gains Physiologic Benefits Psychological Benefits
Rehabilitation Team	Engagement & Presence Support and Partnership Teamwork & Cohesion
Impact on Unit Culture	Mobility Milestones Positive Impact

Chapter 5: Discussion

This body of work demonstrates how instrumental nurses are to EM in the PICU and how important to it is to obtain nurses' engagement for EM programs to be successful. While the literature supports the safety and feasibility of EM in the PICU, results from our scoping review demonstrate the safety and other human or resource issues which presented themselves as major barriers to adopting EM into clinical practice. From our scoping review, it also identified that research regarding the facilitators, as well as patients' and family caregivers' experiences with EM, are limited. In addition, more robust methods are needed to describe healthcare providers' and nurses' experiences with EM. Also lacking is an in-depth understanding of how nurses and family caregivers work together to deliver EM in the PICU. It was after conducting this scoping review that we were able to determine the scope of our study. It was because nurses are so instrumental in EM in the PICU, that we chose to focus this dissertation on nurses' experiences with, and perceptions of the EM program. The scope of this study included barriers and facilitators nurses perceived to delivering EM in the PICU. We also decided to informally interview family caregivers from diverse backgrounds to gain more understanding of the family caregivers' experiences with EM in the PICU. We chose to interview family caregivers of patients with complex conditions and with high acuity for our study because this was missing from the literature.

After conducting our study, three major themes were described. First, nurses meticulously described the risk EM posed to patient safety. However, it was because nurses believed in the benefits of EM that they continued to include EM in clinical care. Nurses described how they applied the nursing process to gain experience and comfort in performing EM. By engaging in EM, nurses developed strategies to overcome their concerns for patient

safety. Nurses described learning how to perform EM safely from therapists and the close collaboration they experienced working together. Nurses also described learning about EM safety through adverse events, whether these were events they were directly involved with or events they learned about while on the unit. Finally, nurses described their understanding of the evidence supporting EM and how it improved patient outcomes as contributing to their comfort in delivering EM in the PICU.

In addition to concerns related to patient safety, nurses identified other barriers impeding adoption of EM into clinical practice. There were three categories of barriers to implementing EM in the PICU. Barriers were categorized into: nursing engagement, system-level factors, resources and equipment issues, and interdisciplinary issues. Nurses also described their commitment to EM because they believed it benefited their patient and improved their outcomes. However, external barriers presented challenges to performing EM which made nurses feel frustrated. These barriers created opportunities for nurses to brainstorm and strategize ideas to overcome these barriers. This study demonstrates the importance of thoughtfully considering the burden an evidence-based program placed on the nurses. With EM programs, the work falls primarily on nursing staff to carry out EM activities, and organizational structures and resources must be allocated to reliably deliver this essential care. The benefits to EM should be clearly understood by both staff and family caregivers and staff should be comfortable carrying out time and using resources for EM activities.

The overarching theme between all results in this data were nurses' and family caregivers' commitment to EM because of the benefits and positive patient outcomes associated with EM. There is a wide range of benefits nurses, family caregivers and patients experienced by participating, but this was most commonly described as an improved condition. Additional

facilitators to EM included the support of the rehabilitation team and overall impact on the PICU. As individuals experienced the benefits of EM, even if they were slow in appearing or difficult to perceive, they were more invested in performing EM activities and overcoming barriers that were present. Because the benefits of exercise were tied to the benefits of EM, individuals were more likely to understand its importance and participate in EM activities in the PICU. However, barriers could be minimized by understanding how to overcome patient safety concerns and by investing in EM at the organizational level in order to alleviate some of these barriers. Further, nurses should encourage family caregivers presence and engagement to further support adoption of EM in the PICU.

Implications for Clinical Practice

There are significant practice implications from this body of work. Nurses must be competent and comfortable using EM equipment and to understand the body mechanics to safely carry out EM activities. There is the potential for the dislodgement of lines, tubes and drains during mobility activities so it is important to have strong safety measures in place in order to secure devices and to avoid their dislodgement. There are several barriers which need to be addressed by the organization to regularly deliver EM in the PICU. These factors include adequate staffing in order to plan, coordinate and carry out EM despite what activities or procedures are occurring on the unit. In addition to the resources and logistical hurdles which must be overcome, this study also demonstrated the importance of the interdisciplinary nature of EM. Due to this factor, this study highlighted the need to include staff in the development and dissemination of programs in order to increase adoption of EM. In addition, barriers to EM may be minimized when benefits to EM are well understood. Staff are able to safely practice EM activities when patients, family caregivers and nurses experience the positive outcomes of EM.

There is value in educating all staff, including ancillary staff, on the importance and practice of EM for patients at various developmental stages. Education should include practicing mobility sequences, comprehensive safety checks and assessments to avoid adverse events for their patients. It is important to integrate EM into nurse-to-nurse handoff so the mobility plan is clear between shifts. The nurses of this study felt EM should be a shared responsibility inter-professionally and it should be formally included in patients' plans of care. This study also highlighted how nurses rely on rehab therapists, particularly when performing novel mobility activities. This study also demonstrated the need to support this collaboration in order to allow nurses to be more comfortable as they engage with EM.

Implications for Future Research

Future studies must demonstrate the long-term outcomes of EM to solidify its value in integration into PICU clinical practice. Future studies can focus on the effect EM protocols have on sleep quality and delirium rates, as well as long-term outcomes of EM programs. These long-term outcomes may include hospital or PICU length of stay, length of mechanical ventilation days, cost of care and patients' functional status upon discharge. These studies must use robust measures and may include use of pedometers or other movement measurement devices to objectively measure the extent to which patients are receiving EM.

To understand healthcare provider perspectives on EM, larger studies should be performed in order to better understand their perspectives and the implications of the barriers to EM. There are also opportunities to apply human factors research methods to evaluate the efficiency, safety, and delivery of EM in the PICU; or by using the Benner Model to evaluate how a nurse's experience impacts delivery of EM in the PICU. Future studies could explore how nurses' skills, attitudes and experiences develop over time through repeated measures. Future

studies could also develop or modify existing tools for organizing report or handoff to assure that mobility status is regularly included in nurse-to-nurse handoff. Studies could then evaluate the effect including EM in handoff would have on clinical practice and patient outcomes, or how continuity in care affects EM. It may also be helpful to explore the nature of the relationship between EM and nursing burnout. Participation in EM presents challenges for nursing staff which can lead to frustrations, but it also allows nurses to practice evidence-based practice and provide better outcomes for their patients. Investigating how these factors may help nursing leaders understand the nature of the relationship and to avoid the harmful consequences of burnout of nursing staff on patient outcomes.

PICU patients' experience with EM are greatly underrepresented in the literature. Future researchers might also study participants' perspectives of EM using robust data collection techniques with repeated measures. Motivation to participate in EM may also be studied to better understand patient's willingness to participate in EM activities in the PICU given how painful and challenging EM may be. The family's role in EM has been better studied and documented, but there are gaps in our knowledge. For these reasons, it is critical to understand the family's perspective from a broader sample including participants from diverse gender, socioeconomic, racial, educational backgrounds and various marital statuses. Better understanding and addressing these issues could establish EM as the standard of care in the PICU.

Overall Significance

This body of work contributes to the state of the science of EM in the PICU by describing nurses' experiences with EM and by identifying barriers to adoption of EM in the PICU. Because nurses play such a large role in EM in the PICU, we explored how nurses thought about patient safety as it related to EM and documented strategies nurses use to overcome these patient safety

concerns with EM. We also described nurses' perceptions of additional barriers to performing EM in clinical practice and captured strategies they identified to overcome these barriers. Neither of these themes had been previously described in the literature from a nursing perspective and the strategies identified in these manuscripts can serve as tools to strengthen EM programs in PICUs.

Our study highlights the importance of explaining the importance of EM to nurses who can then prioritize EM in clinical practice. Our study also offered practical strategies for leaders to overcome barriers which many organizations may find applicable to EM programs within their organizations. By understanding effective implementation and sustainability efforts of the EM programs, we hope to transform PICU culture to be supportive of EM and to explore the cost-effectiveness of this intervention. We hope patients will leave the PICU with better outcomes, greater satisfaction, hope and functional abilities. Future publication from this research will incorporate patient-level facilitators to EM, the experiences of family caregivers from diverse backgrounds and will describe the collaboration between nurses and family caregivers who routinely practice EM in the PICU.

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