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**Improving Maternal and Infant Health: A Quality Improvement Initiative to Recognize  
Postpartum Depression in the Neonatal Intensive Care Unit**

by

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Paper submitted in partial fulfillment of the  
requirements for the degree of

Doctor of Nursing Practice

School of Nursing, University of Louisville

July 13, 2023

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**Dedication**

*I dedicate this project to all NICU mothers who have ever felt alone, unsupported, or forgotten in the walls of the NICU. I see you, I hear you, and I stand with you.*

### **Acknowledgments**

I could not have undertaken this journey without the support of the organization and the medical providers that dedicate their life's work to improving the quality of care for neonatal patients and their families. Maternal mental health has lived in the shadows long enough, and I am grateful for your willingness to broaden your scope of practice to include maternal mental health.

Words cannot express my gratitude to Dr. Baker and Dr. Knott for your unwavering support, patience, and feedback throughout the project. I appreciated your guidance every step of the way, and I hope to have as much compassion as a future nurse practitioner as both of you exude daily. Lastly, I would be remiss not to mention the support of my family, especially my husband, Ryan. Through the tears and frustration, you have encouraged me to persevere. When I am caught up in the world of academia, your sarcasm and humor keep me grounded. Thank you for calming my fears, reading my drafts that seemed to go on for days, and loving me through this crazy three-year journey.

### Abstract

**BACKGROUND:** While postpartum depression (PPD) is a significant problem in the postpartum population, emerging literature suggests that PPD is disproportionately concentrated and underdiagnosed among mothers of infants admitted to the neonatal intensive care unit (NICU).

**PURPOSE:** The purpose of this project was to institute a PPD screening protocol within a Level III NICU to identify mothers exhibiting signs of distress and initiate social work referrals.

**METHODS:** A quality improvement project implemented utilizing the Plan-Do-Study-Act (PDSA) framework and a pre-and-posttest design.

**INTERVENTION:** Staff education regarding PPD symptoms and the project's protocol occurred via electronic means. Mothers of NICU infants who remained admitted at day of life 14 were screened with the Edinburg Postnatal Depression Scale (EPDS). Mothers scoring greater than or equal to 10 on the EPDS received a social work consult.

**RESULTS:** Compliance with the completion of the pre-and-posttest assessment was 64%. The increased scores of the staff knowledge and perception of PPD assessment reached statistical significance ( $p < .001$ ). Screening, documentation, and referral compliance totaled 86%, 87%, and 100%, respectively. A weak positive correlation was found between the maximum EPDS score and gestational age (GA) at birth ( $r = .093$ ). A weak negative correlation was found between the maximum EPDS score and length of stay (LOS) ( $r = -.213$ ). Neither correlation reached statistical significance ( $p = .705$ ,  $p = .382$ , respectively).

**DISCUSSION:** High compliance rates within the three arms of the screening protocol demonstrate the feasibility of PPD screening in the NICU.

*Keywords:* postpartum depression, neonatal intensive care unit, NICU, mother, screening, Edinburgh Postnatal Depression Scale, referral

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## **Improving Maternal and Infant Health: A Quality Improvement Initiative to Recognize Postpartum Depression in the Neonatal Intensive Care Unit**

The environment in which an infant develops is highly dependent upon maternal behavior and affection (Brummelte & Galea, 2016). Maternal instincts that manifest naturally for some mothers may be impeded by intense feelings of apprehension and despair for others, inhibiting the woman's ability to demonstrate a secure attachment to her infant and fulfill maternal responsibilities (Lehnig et al., 2019; Roque et al., 2017). Postpartum depression (PPD) is defined by the American Psychiatric Association (APA, 2013) as a depressive disorder ranging from mild to severe intensity presenting in pregnancy or within four weeks following delivery. The onset of PPD is extended by some references, with many physicians urging vigilance up to one year postpartum (Langan & Goodbred, 2016). While PPD is underrecognized and seldomly addressed, the condition is relatively common, with one out of every eight postpartum women in the United States reporting PPD symptoms (Bauman et al., 2020). However, the prevalence in the general population pales in comparison to the subcategory of mothers whose infants are admitted to the neonatal intensive care unit (NICU), with many national studies consistently demonstrating PPD incidence rates of up to 40% in NICU mothers (Vigod et al., 2010).

### **Problem Statement**

Despite a growing body of evidence indicating the necessity of PPD surveillance in the NICU setting, screening guidelines from leading maternal and infant health organizations are severely lacking. Current recommendations from the American Academy of Pediatrics (AAP) entail screening at one-, two-, four-, and six-month well-child checks, marginalizing women with hospitalized infants (Earls et al., 2018; Vaughn & Hooper, 2020). Similarly, the American College of Obstetricians and Gynecologists (ACOG, 2018) focuses on outpatient screening,

acknowledging that PPD screening should occur during pregnancy and the comprehensive postpartum visit. The exclusion of NICU mothers in current guidelines elicits a gap in practice, leading to the omission and inconsistency of PPD prevention, screening, and treatment in mothers who convey the highest risk.

### **Background and Significance**

While PPD is a significant problem in the postpartum population, emerging literature suggests the burden of PPD is disproportionately concentrated and underdiagnosed among mothers of NICU infants due to a high-stress environment and insufficient screening practices (Vaughn & Hooper, 2020). In evaluating risk factors for PPD in NICU mothers, sociocultural factors were identified as strong predictors of PPD development. Mothers who are young, single, and of lower educational attainment have higher rates of PPD due to economic hardship and decreased support (Gerstein et al., 2019; Hawes et al., 2016). This finding is noteworthy to the proposed project population as one out of seven citizens in the Metropolitan area lives below the poverty line (Greater Louisville Project, 2016). Furthermore, immigration status compiled with various economic, language, and cultural barriers also negatively impact PPD development (Kassam, 2019). Currently, over 50,000 Louisville residents are foreign-born with 136 different languages spoken, warranting additional PPD attention with the increasing diversity of the families served (Center for Health Equity, 2017)

Accompanying socioeconomic factors, the appearance and behavior of the infant arose as a prominent distressing factor that misaligned with the idea of motherhood held by the woman (Spinelli et al., 2015; Woodward et al., 2014). The infant's complete dependence on unfamiliar medical devices and foreign medical terminology provokes anxiety and worry among NICU mothers (Staver et al., 2019). Infant medical complexity was especially pertinent in mothers of

premature infants; Barber et al. (2021) found that as gestational age (GA) decreased, maternal feelings of hopelessness increased. Prematurity as a contributor to PPD development is problematic in the Louisville area, as the preterm birth rate continually surpasses the national average at 11.0% and 10.2%, respectively (National Center for Health Statistics, 2020). Segre et al. (2014) surmised the association between preterm birth and increased PPD occurrence is related to frequent invasive procedures, length of hospitalization, and developmental complications that accompany preterm birth.

A final theme gleaned from the literature proposed to accelerate PPD development was parental role alteration and loss of control (Staver et al., 2019). Infant care dominated by medical staff in the NICU prompts feelings of emotional separation and hinders the mother's ability to assume the parental role (Spinelli et al., 2015). Unable to help their infants in the traditional sense, mothers experience guilt and hopelessness (Woodward et al., 2014). Without practices to detect and treat PPD development, the mother's emotional state suffers, and the instinctive responsiveness to her infant's needs is suppressed (Binda et al., 2019). The absence of trusting interactions during critical periods of neurologic growth hinders the infant's physical, emotional, social, and cognitive development throughout the lifespan (Brummelte & Galea, 2016; Goodman, 2019). For the mother, suffering from PPD doubles the likelihood of future episodes of major depressive disorder, further expanding the infant's developmental risk into childhood and adolescence (Vigod et al., 2010).

As a result of detrimental developmental effects on the infant and poor maternal coping, untreated PPD poses a considerable economic burden. Highlighting the financial risks, Luca et al. (2020) found that untreated perinatal mood disorders cost the United States economy \$14 billion or \$32,000 per maternal-infant dyad over a five-year period. Economic factors associated

with skyrocketing public costs include decreased productivity, increased utilization of public assistance programs, increased behavioral and developmental disorders, and frequent emergency room visits. Thus, economic instability coupled with a growing body of evidence suggestive of profuse developmental delay and maternal mental health consequences catapults PPD prevention, recognition, and treatment to the forefront of maternal-fetal medicine.

### **Literature Review**

While the literature focuses heavily on the disruption of the maternal-infant bond and parental role alteration prevalent in NICUs across the country, a disparity remains in maternal mental healthcare between mothers who leave the hospital with their infants and those who do not. This evidence review showcases a multitude of implementation strategies, emphasizing that PPD screening programs require a highly tailored approach to each setting. Common themes deemed critical to explore before executing similar projects in the NICU setting include choice of screening instrument, threshold score for the Edinburgh Postnatal Depression Scale (EPDS), necessity of alternative postpartum mood disorder (PPMD) instruments, screening timeframe, screening population, and implementation strategies for success.

### **Research Methods**

PubMed, CINAHL, PsychINFO, and Embase databases were utilized to assemble the evidence for appraisal. The search was performed using the Boolean search technique, combining keywords with "OR" and strings of keyword searches with "AND." Synonyms and appropriate medical subject headings (MeSH) unique to each database deemed conducive to the aims of the intervention were applied as follows: postpartum, postnatal, or perinatal depression or anxiety, adjoined with assessment, diagnosis, screening, or identification, and completed with

neonatal intensive care unit, neonatal intensive care, or NICU. Search criteria was not restricted by geographic location and included studies conducted outside of the United States.

The search commenced in PubMed, where the initial search yielded 130 articles. Upon further limitation of publication date (2016-present), English language, and study design such as systematic review, meta-analysis, randomized control trials, and observational studies, 57 articles remained. The same search and exclusion criteria were executed in CINAHL, resulting in 47 articles. Of those that remained, 25 duplicates emerged within PubMed leaving 22 articles from CINAHL for review. This search and elimination process was repeated in PsychINFO and Embase, yielding 21 and 38 articles, respectively. However, 12 articles in PsychINFO and 15 articles in Embase were identified as duplicates in PubMed, yielding 32 additional articles to consider. The initial search totaled 111 articles with five articles deemed pertinent to the analysis of the intervention published before 2016. As a result, these studies were added back to the analysis eliciting 116 articles for review. Abstracts of the remaining studies were examined for relevance to project goals. Studies were selected that employed inpatient NICU screening practices and used single or multiple postpartum mood disorder screening tools, totaling 25 articles. Furthermore, the remaining articles were criticized based on study design; five additional articles were excluded due to poor methodologies. After refinement of search criteria by date of publication, appropriateness of population, and utilization of a postpartum mood disorder assessment tool, 20 articles were selected for integrative review.

## **Evidence for Intervention**

### ***Depression Screening Instrument***

The EPDS, a tool highly recommended by the AAP and ACOG, was employed in the majority of studies reviewed (ACOG, 2018; Earls et al., 2018). While Berns and Drake (2021)

cited the previously mentioned recommendations as their reasoning behind selecting the EPDS, alternate studies provided a different rationale. McCabe-Beane et al. (2018), Stasik-O'Brien et al. (2017), and Garfield et al. (2021) note the strong validation of the tool within adult and adolescent pregnant women. Barkin et al. (2019) and Vasa et al. (2013) cited the tool's validations among differing age, language, and cultural groups provide strength in ethnically diverse settings. Statistically speaking, Cajiao-Nieto et al. (2021) and Cyr-Alves et al. (2018) mention superior sensitivity, specificity, and internal consistency as the reasoning behind their choice. Segre et al. (2014) present robust evidence for selecting the EPDS, citing the tool's validity against the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria.

A small group of studies chose to use an alternative assessment, the Postpartum Depression Screening Scale (PDSS), due to the perceived pitfalls of the EPDS. Cherry et al. (2016) chose the PDSS in response to the lack of maternal experience captured within the EPDS, while Cole et al. (2018) and Lefkowitz et al. (2010) chose the PDSS over the EPDS due to interest in PDSS subscales. In the review of each scale, Tahirkheli et al. (2014) noted acceptance of both scales within the NICU setting but cited similar concerns of previous studies. Regarding the EPDS, Tahirkheli et al. (2014) also noted a lack of questions related to maternal experience and reduced positive predictive value. In the appraisal of the PDSS, Tahirkheli et al. (2014) criticized the absence of a self-harm assessment and the demand on staff time due to the length of the survey.

### ***Threshold Score of the EPDS***

The selection of cutoff values denoting a positive EPDS screen differed throughout the literature. Barkin et al. (2019), Berns and Drake (2021), Levinson et al. (2020), and Garfield et al. (2021) deemed a score of 10 or greater on the EPDS a positive screen. Regarding rationale,

Garfield et al. (2021) was the only study to elaborate, selecting greater than or equal to 10 due to superior sensitivity in recognizing depressive episodes. Although Levinson et al. (2020) also used a score of 10 to denote a positive screen, researchers found that 10 of 25 women scoring 10 or greater on the EPDS failed to receive a formal diagnosis of PPD. As a result, Levinson et al. (2020) argue that raising the threshold in NICU mothers may decrease the rate of false positives.

Following questions raised by Levinson et al. (2020), Segre et al. (2014) and Vasa et al. (2013) defined a positive EPDS score as greater than or equal to 12, suggesting that raising the screening threshold increases the sensitivity of the tool while providing strong diagnostic evidence. Further raising the bar, Cyr-Alves et al. (2018), McCabe-Beane et al. (2018), and Stasik-O'Brien et al. (2017) utilized a score of 13 or greater to define a positive EPDS screen, citing emphasis on significant depressive symptomatology. In contrast to one threshold score, Scheans et al. (2016) and Vaughn and Hooper (2020) applied a tailored approach, matching the severity of maternal screening scores to conservative or escalated treatment.

### ***Alternative Postpartum Mood Disorder Screening Instruments***

Complimenting the variance in depressive screening measures, the necessity of anxiety screening in tandem with PPD was prevalent throughout the literature. Stasik-O'Brien et al. (2017) conducted a secondary analysis of the EPDS ( $n=200$ ) to identify an anxiety subscale within the EPDS: the Edinburg Postnatal Depression Scale-Anxiety (EPDS-A). Analyzing their sample using the EPDS-A, 21.9% ( $n=43$ ) of NICU mothers scored a six or higher, meeting the threshold for identification. Of the 43 with elevated anxiety symptoms, 23.3% ( $n=10$ ) did not have elevated EPDS scores, representing women undergoing emotional distress that the EPDS was not equipped to capture. Similarly, McCabe-Bean et al. (2018) applied three different anxiety scales, the EPDS-A, the Beck Anxiety Inventory (BAI), and the Pregnancy Risk



Assessment Monitoring System – Anxiety (PRAMS-A) in tandem with the EPDS. McCabe-Bean et al. (2018) also found that the EPDS failed to identify between 4.7% and 14.7% of women exhibiting significant distress.

Furthermore, researchers acknowledged that anxiety and PPD screening alone might exclude those whose emotional distress stems from trauma (McCabe-Beane et al., 2018). Moreyra et al. (2021) found a strong positive correlation between PPD and post-traumatic stress disorder (PTSD) utilizing the Patient Health Questionnaire (PHQ-9) and Perinatal Posttraumatic Stress Disorder Questionnaire (PPQ) ( $r=.86, p<.001$ ). Lefkowitz et al. (2010) discovered a similar phenomenon through the application of the PDSS and PTSD Symptom Checklist (PCL) ( $r=.65, p\leq.001$ ). Likewise, Shaw et al. (2014) discovered a significant correlation between PPD and PTSD using the Beck Depression Inventory-Second Edition (BDI-II) and the Stanford Acute Stress Reactions Questionnaire (SASRQ) ( $p=.04$ ). In evaluating the effect of time in the NICU, Greene et al. (2015) found compelling evidence that while depression and anxiety symptoms tend to subside, PTSD symptoms remain stable.

### ***Screening Timeframe***

Aside from the diversity of screening tools, assessment timeframes also differed throughout the literature. Cole et al. (2018) screened for PPD within 24 to 72 hours of NICU admission, finding 27% ( $n=196$ ) of women were at significant risk for PPD development. Similarly, Shaw et al. (2014) and Garfield et al. (2021) conducted their first PPD screenings at one week postpartum, finding 33% ( $n=57$ ) and 36.5% ( $n=48$ ) of mothers screened positive for depressive symptoms, respectively. Berns and Drake (2021), McCabe-Bean et al. (2018), Moreyra et al. (2021), and Vasa et al. (2013) screened mothers two weeks after NICU admission citing concerns of false-positive screenings from acute stress reactions and postpartum blues,

uncovering PPD incidence rates between 19.1% and 25%. Comparatively, Cherry et al. (2016) chose to screen at two weeks in accordance with routine nursing tasks, eliciting a 36% ( $n=117$ ) PPD incidence rate but only 48.5% ( $n=395$ ) of eligible mothers screened.

Several studies chose to screen closer to one-month past admission or allowed flexibility in the screening timeframe. Vaughn and Hooper (2020), Levinson et al. (2020), and Lefkowitz et al. (2010) chose to screen women at 30 days postpartum, finding PPD incidence rates of 43.3% ( $n=13$ ), 19% ( $n=25$ ), and 39% ( $n=23$ ), respectively. However, the small sample size of Vaughn and Hooper (2020) ( $n=30$ ) and high rates of attrition leading to missed screenings demonstrated by Lefkowitz et al. (2010) provoke the question of whether conducting PPD assessments 30 days past admission excludes distressed women discharged before screening eligibility. Looking at programs that chose to screen at multiple time frames, Vasa et al. (2013) screened every two weeks after the initial assessment, finding depression symptoms tend to increase up to two to three weeks postpartum and then continually decrease ( $p<.05$ ). Scheans et al. (2016) mimicked AAP guidelines, performing screening at two weeks, one month, two months, and four months while their infant was hospitalized, finding overall 20% of mothers exhibited significant depressive symptoms.

### ***Screening Population***

Numerous studies throughout the literature questioned if solely screening mothers neglected to recognize the distress endured by fathers. Cajiao-Nieto et al. (2021) screened NICU fathers first at three to five days after admission and then again 15 to 20 days later. Researchers found that while depression and anxiety were elevated at the initial screening, only anxiety persisted at the second screening ( $p=.002$ ). Comparatively, Cyr-Alves et al. (2018) found that depressive symptoms improved significantly over time in NICU fathers ( $n= 146$ ,  $p<.05$ ).

Following suit, Garfield et al. (2021) screened a cohort of NICU mothers and fathers, finding a significant difference in the change of scores over time; for every 2.9-point decrease in the EPDS for mothers, fathers decreased by 1 point ( $p < .001$ ). Although Garfield et al. (2021) claimed fathers distress remained consistent, they neglect to mention this may result from mothers having higher EPDS scores initially. Higher depression scores of mothers were also demonstrated by Cole et al. (2018), who found that 9.5% ( $n=57$ ) of fathers reached the screening threshold in comparison to 27% ( $n=196$ ) of mothers.

### ***Implementation Strategies***

#### **Staff Involvement**

While each study aimed to increase distress identification, the means of implementation delivery varied. Scheans et al. (2016), Moreyra et al. (2021), and Greene et al. (2015) recruited different members of the multidisciplinary team, demonstrating 90% compliance screening rates of eligible mothers. A large portion of studies used nursing staff exclusively, citing that nurses are optimally positioned to undertake the role of screening due to frequent interactions and observation of familial distress (Berns & Drake, 2021; Cole et al., 2018; Cherry et al., 2016; McCabe-Beane et al., 2018; Vaughn & Hooper, 2020). Furthermore, Cole et al. (2018), Scheans et al. (2016), and Murthy et al. (2021) highlighted the idea of a nurse champion to motivate other nursing staff and provide feedback.

#### **The Role of Technology**

Further evaluating screening integration to practice, ensuring automation in screening arose as an important process indicator. Berns and Drake (2021) utilized screening in the electronic health record (EHR) and allowed the nurse to place a psychiatric consult. Similarly, Moreyra et al. (2021) utilized screening on tablets, allowing immediate referral to a psychiatric

provider. Berns and Drake (2021) and Scheans et al. (2016) also included the mother's screening status in the provider note, ensuring each provider involved in the infant's care was aware of the mother's emotional state or notified if screening needed to be completed.

### **Implementation Barriers**

A considerable concern that arose through the literature was nursing staff unwilling to champion the initiative. Staff may feel uncomfortable providing psychosocial care or perceive a lack of time for training and education amid other nursing responsibilities (Hall et al., 2015). Nurses may feel their duty only extends to the infant, as the mother is not their primary patient. Additionally, the issue of the mother's outpatient status and preventing fragmentation in treatment was also encountered throughout the evidence (Levinson et al., 2020; Vaughn & Hooper, 2020). Moreover, the importance of same-day referrals and in-house psychiatric providers was emphasized, citing the difficulties in outpatient follow-up and sparse availability of mothers (Berns & Drake, 2021; Levinson et al., 2020; Murthy et al., 2021). If in-house psychiatric services are unavailable, prompt referral to community agencies that accept Medicaid or did not require insurance was also considered essential due to the wide range of socioeconomic status of NICU mothers (Cherry et al., 2016; Levinson et al., 2020; Murthy et al., 2021; Tahirkheli et al., 2014; Vaughn & Hooper, 2020).

Additionally, physical and linguistic barriers to screening were discovered. Numerous studies commented on missed screenings of parents due to physical distance from the facility and weekend-only availability (Berns & Drake, 2021; Lefkowitz et al., 2010; Moreyra et al., 2021; Scheans et al., 2016). Cherry et al. (2016) found that mothers whose primary language is Spanish were less likely to complete the screen or reply to each item with the same answer, while Levinson et al. (2020) found women's responses were affected if the infant's caregiver was not

fluent in Spanish. Moreyra et al. (2021) and Scheans et al. (2016) also found linguistic services a significant barrier to screening, denoting the importance of diverse, convenient translator services or technological applications.

## **Literature Application to Scholarly Project**

### ***Utility of the EPDS***

Although various protocols were trialed across the body of evidence, the literature suggests that a variety of approaches may be used to fit the specific needs of the target population. Unit feasibility and additional barriers must be considered without a NICU-specific PPD assessment tool and similar internal consistency between frequently used measures. The EPDS is the most prevalent screening tool throughout the review, with the PDSS also emerging as a promising tool. However, the literature demonstrates that using a shorter tool such as the EPDS may produce higher compliance rates while respecting staff's competing demands. The lack of consensus surrounding cutoff scores and possible dismissal of distress induces considerable legal concerns if mothers fall through the cracks. Thus, project developers may benefit from employing a tailored approach to ensure each woman receives resources regardless of screening score or severity of symptoms (Scheans et al., 2016; Vaughn & Hooper, 2020).

### ***Screening Timeframe and Technology***

Regarding screening time frame, the literature emphasizes screening after two to three weeks from NICU admission to avoid detecting an acute stress reaction and high attrition rates (Lefkowitz et al., 2010; Vasa et al., 2013; Vaughn & Hooper, 2020). Additionally, the change in severity and duration of PPD in NICU mothers exhibited in the literature strongly suggests that regular screening intervals may demystify the development and recovery of PPD. Rounding out

the logistical elements of program development, utilizing the EHR rose as a pertinent strategy to track screening compliance and trigger the appropriate referral.

### ***Narrow Project Focus***

While the literature demonstrates that screening for other postpartum mood disorders may be warranted, the literature heavily focuses on the implementation of PPD screening. An all-encompassing postpartum mood disorders screening program may be implemented in the future, but substantial evidence and feasibility of such intervention is not thoroughly studied in the current evidence. Thus, the project will focus on PPD. Additionally, as a completely new process for all staff involved, making small strides with one assessment tool is believed to yield consistency and acceptability. Likewise, fathers will not be included in the screening population in the interest of compliance and the lack of PPD prevalence exhibited by the literature.

### **Summary**

This assortment of critically appraised literature attempts to glean a superior, evidence-based PPD screening protocol by evaluating the triumphs and tribulations encountered in prior research endeavors. Thus, after an extensive literature review, the project utilized the EPDS to screen NICU mothers at 14 days of their infant's hospitalization and every two weeks thereafter until the infant was discharged from the facility. Maternal EPDS scores were recorded in the infant's EHR, with social work consults entered in the EHR by NICU advanced practice providers. Escalation of care in response to EPDS score was delivered in a tiered approach, with all mothers regardless of score having received PPD resources and those scoring 10 or greater receiving a social work or emergency referral depending on survey responses.

### **Rationale**

### **Needs Assessment**

Increasing evidence of adverse health effects accompanying NICU admission has provided a strong stimulus for NICUs around the globe to initiate evidence-based protocols and interventions to improve maternal-infant health (Shovers et al., 2021). A needs assessment performed in the Level III NICU in Louisville, KY identified a need for improved processes and procedures regarding PPD identification and education. Numerous nursing staff and the nurse manager identified a perceived increase in parental anxiety and psychiatric distress. This view was echoed by a neonatologist, who felt the proposed intervention was a meaningful and warranted project in the NICU setting. As an integral part of the patient care team, the social workers demonstrated that they provide NICU mothers with resource materials upon admission and complete screening and consultation on an individual basis. Thus, while screening practices existed in a limited capacity, the facility's process lacked consistency and standardization despite staff viewing PPD screening as a necessary intervention in the NICU setting.

### **Feasibility and Sustainability Analysis**

In the project site, established leadership and administrative support for implementing a standardized PPD screening protocol was evident. Foundational implementation materials such as maternal PPD educational handouts and community psychiatric providers were already present within the facility prior to the implementation period. Printed EPDS surveys were provided by the DNP student. Pens to complete the surveys were provided by the facility. A locked box for data storage was donated to the project by the DNP committee member. An adequate number of staff, minimal demands on staff time, and project resources continue to be available to support the long-term implementation of the project. The creation of standardized phrasing for nursing communication orders and EPDS documentation was easily accomplished through existing EHR capabilities. Additional expert technical assistance was available through

the IT department. A web-based training platform and large-scale email correspondence were utilized to deliver staff communication and education materials. As the EPDS is designed to be completed by a multitude of healthcare personnel and not just those in psychiatric care, NICU staff were adequately qualified to guide mothers through the screening process should any questions arise (McBride et al., 2014).

The project's sustainability ultimately depended on the development of a highly efficient process involving the coordination of multiple healthcare disciplines. Utilization of a quality improvement (QI) framework promoted flexibility and adaptation to facility culture and daily workflow. The nursing staff were well-versed in QI projects and accustomed to utilizing a rigorous framework to drive QI success through small, purposeful changes. As an organization that continues to maintain Magnet designation, administrators and staff alike encourage exploration and questioning of best practices to continually raise the standard of care.

### **Purpose and Specific Aims**

Prior to project implementation, the project site did not have a standardized PPD screening algorithm, and mothers were referred to social work and psychiatric services individually. Thus, the purpose of this scholarly project was to institute a comprehensive PPD screening protocol within a regional level III NICU to identify postpartum NICU mothers exhibiting signs of distress and initiate social work referrals. It was determined that the implementation of a PPD screening process aligned with the organizational goals of promoting clinical excellence through the frequent adoption of evidence-based principles and interdisciplinary collaboration. Additionally, the focus on maternal mental health care and forging a foundational bond between the maternal-infant dyad further advanced the organization's goal of maintaining an environment of patient advocacy and compassion to



improve patient outcomes. The attainment of the overall project goals occurred through the four main objectives listed below.

1. Prior to intervention implementation, 100% of NICU staff enrolled in the web-based education will complete the assigned training, which includes completion of a pre and posttest evaluation of knowledge, with an anticipated increase of 30%.
2. 100% of mothers of NICU patients who remain inpatient at day of life (DOL) 14 will receive their primary EPDS screening and then every two weeks thereafter until the infant is discharged from the facility through the eight-week intervention period.
3. Nursing staff will document 100% of completed maternal EPDS screens within the infant's EHR during the eight-week intervention period.
4. During the eight-week intervention period, nursing staff will execute appropriate actions determined by maternal screening score through 100% compliance with the project's referral algorithm.

### **Quality Improvement Model**

Moen et al. (1991) created the Plan-Do-Study-Act (PDSA) cycle in response to a myriad of failed improvement strategies and the desire for a straightforward implementation process. Building off the notoriety and ease of application of the PDSA cycle, Langley et al. (1994) created the Model for Improvement (MFI) by adding three focus questions to the PDSA cycle. Langley et al. (1994) proposed that including additional considerations of project aim, measures, and proposed changes encourages high execution and program efficiency. Since its inception, the MFI has become a highly utilized and reliable quality improvement framework applied to diverse healthcare organizations worldwide, including adoption by the Institute for Healthcare Improvement (IHI, 2022).

### **Framework Description**

The MFI (see Appendix A) begins with three critical thinking questions that encourage project leaders to define the project's aim, measures, and change concepts. Associates in Process Improvement (API, 2012) note that the aim is the primary driver behind the program's progress, keeping the project team striving toward a common goal. Once the aim is established, API (2012) describes that project leaders must choose specific measures, either outcome, process, or balance, to evaluate the project's progression. API (2012) further explains that realistic changes anticipated to result in improvement must be determined in addition to the established aims and measures.

Following careful evaluation of fundamental concepts, program developers are prepared to embark on the first PDSA cycle. API (2012) describes the "plan" phase as comprehensive proposal development for project execution. Within this phase, implementation strategies and means of data collection are distinguished. Following months of preparation, the project is ready to be implemented, thus moving the project to the "do" phase. During the initial PDSA cycle, the implementation begins on a small scale in hopes of discovering and resolving unforeseen barriers before systemwide application. After the initial execution, API (2012) describes that the project falls into the "study" phase, where initial data is analyzed, and areas for improvement are identified. In response to identified barriers, the project progresses to the "act" phase, where program developers acknowledge project pitfalls and suggest alternative changes, thus commencing a new PDSA cycle.

### **Project Application and Utilization in the Healthcare Setting**

The incremental steps of the MFI drastically contrast with the healthcare field's sweeping change culture. The response to sudden change is often met with suspicion, making the

structured, modest steps of the PDSA cycle favorable among administrators and staff (Reed et al., 2016). Incorporating a novel process requires small, purposeful steps to ease staff into the process. Besides staff satisfaction, the dynamic PDSA cycle turns failure into motivation and promotes critical thinking to fix process flaws and discern the superior strategy.

Application of the MFI (see Appendix A) to the scholarly project began in the planning phase. This involved defining the project's intent through gap analysis and site assessment. This step was accomplished through a literature review and stakeholder and organizational assessment. Similarly, process measure identification was also completed and discussed previously. As an innately process-focused project, the change concept that required seamless execution was the improvement of workflow. Therefore, selecting manageable changes to each nurse's daily routine that did not compete with other pressing patient care demands was vital to the project's success.

Further inquiry propelled the project into the "do" phase, which occurred in the Spring of 2023. Following the first iteration, the project leaders reconvened to review screenings completed, score documentation, and referrals initiated to assess the success of the first cycle. In this stage, project developers compared specific statistics to reported barriers and identified any breakdowns in the process. These included the assessment of staff time, charting, and communication. After analysis of the first cycle, which ended on April 26, 2023, the project committee and site will decide on the next course of action and move into a second PDSA cycle. As the project continues to be an intervention utilized at the site, multiple future PDSA cycles are expected and welcomed to help the project evolve into the ideal intervention.

## **Methods**

### **Design**

The scholarly project was a QI initiative in which qualifying NICU mothers were screened for PPD on their infant's 14<sup>th</sup> day of NICU admission. As this project aimed to integrate and uphold the standard of routine PPD screening performed in the outpatient pediatric setting to the NICU, a QI project model was most fitting to guide implementation.

### **Setting and Population**

The project site was a Magnet-designated facility based in the large metropolis of Louisville, KY, housing 519 beds and offering a vast range of services including behavioral health, cancer, cardiovascular, emergency, women's services, neonatal, neurology, orthopedic, physical rehabilitation, and primary care. The focus of the project centered around women's services. Delivering an average of 250 babies per month and 3,000 babies each year, the obstetric and neonatal teams are well-equipped to handle complex and stressful maternal-infant concerns. The Level III NICU houses 12 neonatal beds comfortably but can stretch to 19 if needed. The Level III designation qualifies the site to admit a variety of neonates, from extreme low birth weight (ELBW) infants to term infants requiring intensive care post-delivery. From 2016 to 2021, the project site averaged 343 neonatal admissions per year. The longest length of stay (LOS) spanned 83 days, with 12% of NICU infants hospitalized for greater than or equal to 28 days.

### **Sample**

The project's sample stemmed from mothers who recently delivered at the facility in Louisville, KY. More specifically, participants in the project included mothers of NICU patients who remain hospitalized at DOL 14. Maternal participants were identified by the nursing staff responsible for the care of the infant on day 14 of NICU admission. Inclusion criteria for maternal PPD screening included natural mothers of NICU infants who remain inpatient at DOL

14 regardless of infant diagnosis, birthweight, or GA. Exclusion criteria included mothers with infants discharged prior to DOL 14, adoptive mothers, or other assigned caregivers.

### **Context**

As previously discussed, the root causes of accelerated PPD development in NICU mothers include maternal-infant separation, loss of parental role due to care dominated by healthcare staff, and the medical fragility of the infant. The project site embodies multiple qualities to combat the root causes of PPD development that promoted the project's success. As a Magnet-designated facility, nursing excellence and evidenced-based practice are innate to the culture of the organization. Additionally, the project aligned with the organization's mission, vision, and values to provide clinical excellence, improve the health of communities, and promote collaboration in all efforts. A multidisciplinary approach was employed for successful implementation. Key stakeholders included women's services and NICU unit managers, NICU medical providers, NICU nurses, NICU mothers and their families, NICU infants, obstetric providers, and social workers.

Because nursing excellence is an expected standard within the organization, quality improvement projects are normal events in the unit. Nurses are accustomed to changing their practice to provide optimal patient and family-centered care. The unit prides itself on compassionate care, catering to the unique needs of not only the infant but to the family unit. Accompanying nursing staff, social services remain very active within the maternal services department. Social workers within the facility continue to employ the EPDS for PPD screening and facilitate outpatient referrals for distressed postpartum mothers to community psychiatric providers or the mother's obstetrician. In the NICU, social services providers are accustomed to assessing maternal needs and documenting their recommendations within the infant's EHR.

Thus, as a process that was already in place in the facility, social services played an integral role in expanding screening into the NICU setting.

While there was administrative support and a recognized need for PPD screening implementation, barriers existed within the project site. The facility does not offer in-patient psychiatric care, and sensitive psychiatric situations are referred to behavioral health services. Complimenting lacking in-patient psychiatric care, the majority of NICU mothers were not in-patient two weeks after birth, excluding them from the specialized behavioral health team the facility offers for inpatient mothers. As the mother is not in-patient, barriers to visiting their hospitalized infant included transportation, childcare, and occupational obligations. Additionally, the stigma of mental health induced the risk of decreased veracity of maternal responses and may have deterred mothers from accepting or asking for help. Linguistic and cultural barriers also existed. Kassam (2019) cited that feelings of guilt and embarrassment may deter immigrant women from asking for mental health services. Therefore, it is assumed that these reasons could also create barriers within the project population. Outside of the maternal perspective, the largest threat to the project was resistance from the nursing staff. Staff may feel uncomfortable providing psychosocial care or perceive a lack of time for training and education amid other nursing responsibilities (Hall et al., 2015). Efficiency was a priority, as the project team was asking nurses to go above and beyond their normal workload.

## **Procedure Implementation**

### ***Intervention Team***

The intervention team included the women's services and NICU managerial staff, NICU nurses, neonatologists, neonatal nurse practitioners (NNPs), social services, and the behavioral health department. Telephone consultation with the manager of women's services at the

designated facility occurred in the Fall of 2022 prior to proposal submission. Further stakeholder assessment (nursing staff, NICU medical providers, social workers, behavioral health manager, NICU nurse manager) also occurred in the Fall of 2022 through electronic correspondence and in-person consultation. Notification of project procedure occurred in January of 2023 through staff meetings and web-based training. The DNP student facilitated questions, comments, and concerns through in-person consultation at the project site during shift huddles.

The project timeline is available in Appendix B. Prior to project implementation, the nursing staff was asked to complete a web-based training module approximately one month before the “go live” period. The educational training was available in the education platform utilized by the facility. The web-based training began with describing PPD symptoms, duration, onset, and consequences of untreated PPD. The training then explained the EPDS in detail, the process for score documentation, referral procedures, and compliance with the Human Insurance and Portability and Accountability Act (HIPAA) to maintain data safety. Multiple job aides reminding staff of the screening algorithm, documentation procedure, and social work referral were placed at each bedside and within the offices for advanced providers.

### ***Implementation of Intervention***

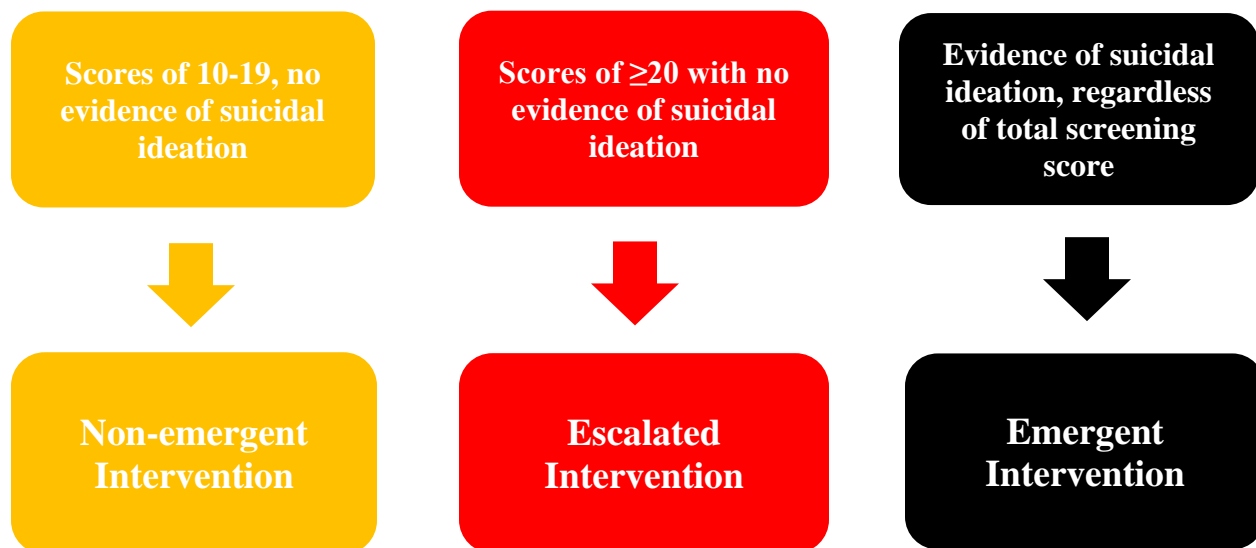
As described above, the nursing staff was asked to complete an electronic online education program approximately one month prior to the implementation of the project to ensure competency and standardization of the described procedure. Following the education of the nursing staff, the intervention was carried out over an eight-week period, from March 1, 2023, to April 26, 2023. Within this time, NICU staff, mothers of hospitalized infants, and EHR data was accessed at the Level III NICU in Louisville, Kentucky. Upon admission, initial consultation with social work was performed, and mothers were given handouts detailing PPD symptoms and

resources available through the facility. A nursing communication order specific to PPD screening was entered upon admission by the NICU advanced practice provider utilizing the standardized phrase created by the DNP student (see Appendix C). NICU mothers were eligible for PPD screening at the infant's DOL 14 using the EPDS. NICU mothers who were present in the unit were screened on their infant's DOL 14. For mothers who were not present at DOL 14, the screening occurred at their next in-person visit. Nurses were responsible for educating the mothers regarding the purpose of the EPDS and asking mothers to complete the tool independently. Mothers returned the EPDS to the nursing staff, who scored the tool and entered the mother's responses into the infant's EHR in a nursing note using a standardized, editable phrase (see Appendix C). Nurses then placed the completed paper survey in a locked box. After the primary screening at DOL 14, nurses encouraged the mother to complete the EPDS at two-week intervals while her infant remained hospitalized.

Considering the lack of consensus on the EPDS threshold score, a tiered approach successfully implemented by Scheans et al. (2016) and Vaughn and Hooper (2020) was utilized to drive consultation and referral needs (see Appendix D). Permission for use is demonstrated in Appendix E. All mothers were counseled to refer to PPD resources provided at admission upon completing the EPDS, regardless of their screening score. The core referral intervention remains social work referral for further management depending on the maternal screening score. Broadly speaking, any mother with an EPDS score of 10 or greater received a social work referral. Depending on the severity of the maternal screening score, the mother fell into the non-emergent, escalated, or emergent intervention categories. A concise portrayal of the algorithm is included in Figure 1. The full algorithm can be found in Appendix D.

### **Figure 1**



*Referral Categories*

After completing the necessary EHR documentation in a nursing note, nurses notified the advanced practice NICU provider or social worker as appropriate, depending on the maternal screening score, per the referral algorithm (see Appendix D). The NICU provider then placed an additional social work consult order specific to PPD utilizing a standardized, editable phrase that included the mother's EPDS score, evidence of suicidal ideation, and if the on-call OB had been notified (see Appendix C). After identification, social workers consulted mothers in person to discuss their current emotional state and facilitate referral to the mother's obstetric provider or a community psychiatric resource utilized by the facility. The functionality of the existing EHR allowed multiple providers access to the mothers' information and prevented care fragmentation.

***Procedure for Data Collection***

Data collection commenced in the first PDSA cycle in February of 2023 with web-based training. Staff nurses used a quick response (QR) code to access the knowledge pretest, complete the education, and then were prompted to complete the knowledge posttest through the same means. The anticipated goal of the training was to prove staff competency in the screening and

referral procedure by demonstrating a 30% increase in knowledge scores following the completion of the program. Nursing knowledge scores and demographic information were collected with unique identifiers (the last four digits of their cell phone numbers) to maintain anonymity. Scores were sent to the password-protected university email account of the DNP chair. An Excel spreadsheet of pre-and-posttest scores was created for data analysis.

As discussed previously, the EPDS was completed independently on paper surveys by NICU mothers at two weeks of hospitalization and every two weeks thereafter, dependent upon the infant's LOS. Upon completion, the mother returned the paper survey to the nurse responsible for the care of the infant that day. After documentation within the infant's EHR and notification of the appropriate provider was made, the nurse placed the EPDS screen into a locked steel box. The DNP student collected and recorded surveys from the locked box weekly throughout the implementation period. The DNP student also audited the infant's chart for score documentation and referrals completed. In addition to referral and screening data, the DNP student collected the infant's completed week of GA at birth and LOS from the EHR. The data collected was entered into an Excel spreadsheet on the password-protected computer of the DNP student. While true anonymity would certainly hinder the ability to distinguish mothers in need, unique identifiers (the last four digits of the mother's phone number) were used to identify the mother while protecting her privacy.

### ***Materials and Financial Needs***

#### **Staff Time**

Delegating the responsibility of PPD screening to the nursing staff allowed the site's social workers to focus on the initial assessment of the mother and facilitate referrals as needed. Shared responsibility with the nursing staff required thorough education and knowledge

assessment, and thus further use of nursing staff time. The creation of the standardized phrases required ample time and collaboration between the DNP student, NICU advanced practice provider, and the project community member. The initial investment to create standardized phrases helped to save staff time during the implementation and prevented fragmentation in communication and care. The inclusion of the advanced practice NICU provider was warranted as the order was placed under their name, and they held ultimate responsibility for the patient's care. Incorporating the PPD screening educational program into the organization's electronic education platform required the assistance of the NICU educator. Uploading the activity to the education platform promoted a sense of normalcy as the staff was accustomed to completing modules within the platform.

#### **DNP Student Time and Resources**

The formulation of the educational PPD activity required sufficient time from the DNP student to ensure the implementation process was clearly communicated. As a follow-up measure, the DNP student attended a day and night shift huddle to answer any lingering questions. Repeated comparison of paper surveys against EHR documentation occurred weekly. This allotted time aided in data collection and, perhaps more importantly, identified any missed referral opportunities if EHR documentation was omitted. A steel-locked box was donated to hold completed PPD paper screenings to address data safety. Screening data was entered into an Excel spreadsheet on the DNP student's password-protected computer and extrapolated for analysis to the IBM<sup>®</sup> Statistical Package for Social Sciences (SPSS) 29 program. Additionally, the DNP student provided white PPD awareness ribbons to staff as a token of gratitude for participating in the project. The cost of the ribbons was \$49 and was covered by the DNP student.

### **Office Supplies and Electronic Resources**

The utilization of printer paper, ink, and pens was integral in multiple arms of the intervention. Within the eight-week implementation period, the distribution of paper EPDS surveys allowed mothers to independently complete the screening and may have increased the veracity of responses. As previously discussed, paper screening allowed the DNP student to assess EHR documentation and referral compliance. Generalized PPD resources were distributed upon admission in case a mother chose to deal with the matter privately. Job aides containing step-by-step screening, documentation, and referral information were provided by the DNP student and distributed throughout the unit as a resource for staff.

Access to the education platform and EHR was facility provided at no additional cost to the DNP project. The application of EHR resources increased the project's efficiency and prevented delays in care. The EPDS was used at no additional cost through compliance with copywriting requirements. Translator services, including a mobile tablet device and telephone services, were also facility-provided resources free of cost to the DNP student.

### **Ethical Consideration and Permissions**

Ethical considerations included protections for maternal and NICU medical staff privacy. Project approval from the University of Louisville Institutional Review Board (IRB) (see Appendix F) and the facility's Nursing Research Oversight Committee was granted prior to project implementation. Data deidentification for all nursing knowledge assessment scores, maternal EPDS scores, and demographic information for both populations was completed by the DNP project lead. All collected data was stored on the password-protected computer of the DNP lead or chair. Paper EPDS surveys were stored in a steel box to which only the DNP lead held the key. Staff training emphasized adherence to HIPPA guidelines.

## Measures

Evaluation of the implementation process occurred continuously through the employment of the PDSA cycle to discern if changes were needed to achieve the established project aims. The project's process measures included the number of NICU staff who completed the pre-and-posttest knowledge assessment, the number of eligible NICU mothers who completed the EPDS screenings at the appropriate timeframe and interval, the number of EPDS scores entered correctly into the infant's EHR, and the number of referrals correctly initiated per the project's algorithm. Evaluation of the first goal of staff participation in the educational initiative was assessed by comparing the number of education enrollments to the number of staff who completed the education. To assess the additional process measures, the DNP student utilized multiple chart reviews. Through a comparison of paper surveys completed by the mothers and the documentation in the infant's EHR, the DNP student discerned screening timeframe, documentation, and referral compliance by healthcare staff.

While the project's main objectives are process based, the primary outcome measures included the nursing staff's pre-and-posttest knowledge scores and maternal EPDS scores. NICU medical staff utilized a QR code to access the knowledge pretest, complete the education, and then completed the knowledge posttest through the same means. Unique identifiers were assigned to staff to maintain anonymity. Scores were sent to the password-protected university email account of the DNP project chair on a password-protected computer. As previously discussed, the EPDS was completed independently by mothers, documented in the EHR by nursing staff, and then placed in the locked steel box located on the unit. Similar to the process measures, the DNP student completed multiple chart audits to compare the mother's EPDS score in the EHR to the paper survey to evaluate accuracy. EPDS scores were documented on the

Excel spreadsheet secured on the password-protected computer of the DNP student. Infant demographic data (GA, LOS) was also accessed through chart review.

### *The Edinburgh Postnatal Depression Scale*

Regarded as the current standard of care, the EPDS (see Appendix G) is a self-report tool equipped to detect women with prolonged distress that surpasses the postpartum blues but does not reach the severity of puerperal psychosis (Cox et al., 1987). Starting with 21 selected depression items, Cox et al. (1987) narrowed their scale to a 10-item, 4-point Likert scale questionnaire with responses ranging from zero to three and items one, two, and four reverse scored. Questions one to nine allude to facets of the mother's postpartum mood such as happiness, anxiety, guilt, and anhedonia, and question 10 assesses suicidal ideation (McCabe-Beane et al., 2018). Women are asked to respond to each question according to their mood in the past seven days.

Individual item scores are summed to form a cumulative score ranging from zero to 30, with a higher score denoting greater depressive manifestations in the mother. Affirmative responses to item 10 regarding suicidal ideation result in a positive screen and further evaluation regardless of the total screening score. Cox et al. (1987) utilized a cutoff score of 12 or 13 to denote a positive screen, yielding a sensitivity of .86 and specificity of .78 when validated against Research Diagnostic Criteria (RDC). Recently, a systematic review published by Levis et al. (2020) found that a cutoff score of 11 generated a sensitivity of 0.81 and a specificity of 0.88. Furthermore, Levis et al. (2020) found the positive predictive value to range from 26-69% and the negative predictive value to range from 93-99% at a threshold score of 11. The original study reported a Cronbach's alpha of .87, with more recent studies reporting reliability coefficients of .82 to .84 (Bergink et al., 2011; Cox et al., 1987).

### *Staff Knowledge and Perception Assessment*

After an exhaustive literature search, it was discovered that a standardized and rigorously tested staff PPD knowledge assessment tool does not exist. As a result, the DNP lead evaluated the work of previous authors who instituted similar projects in the NICU setting. While not statistically evaluated, a strong tool that arose from the literature was created by Dr. Kang Pei San titled “Knowledge, Belief, and Practice on Postpartum Depression among Nurses in Health Clinics of Kepong District,” which specifically targeted nurses’ knowledge and attitudes towards PPD screening. With permission from Dr. Kang Pei San (see Appendix H), the instrument has been edited (see Appendix I) to fit the NICU setting and the project’s inpatient healthcare provider sample. Completion of the pre-and-posttest questionnaire occurred through electronic means.

The questionnaire contains four domains, including demographic information of the healthcare provider, staff knowledge of PPD, staff knowledge of the EPDS, and attitudes and beliefs of healthcare workers regarding PPD screening and management. At the beginning of the questionnaire, healthcare staff were asked to provide the last four digits of their cell phone number to maintain anonymity. Staff were then asked to identify their current role, how long they have been in their current position, if they have ever received PPD education, and if they have ever personally experienced PPD. The questionnaire then moved into nine true or false questions regarding facts about PPD in the general population and the NICU setting. Three questions within the first subset contain multiple true or false statements for healthcare providers to answer. As a result, the first subset yields a cumulative score from zero to nine. Staff were then asked to answer 11 true or false questions regarding their knowledge of the EPDS, yielding a cumulative score on the second subset of 11. Closing out the survey, staff answered 12

questions pertaining to their comfort level and familiarity with PPD screening. Each of these 12 questions was evaluated using a 5-point Likert scale with points assigned for each response for ease of data analysis as follows: strongly disagree=1, disagree=2, neutral=3, agree=4, or strongly agree=5. Question 5 was negatively worded and thus reverse-scored for proper data analysis. The scores for each individual question were simply added for a total score. The lowest possible score of the third subset was 12, and the highest possible score was 60. A higher score reflects the staff's perception that PPD is a warranted intervention in the NICU setting. The highest possible score on the full assessment was 80.

### ***Completeness and Accuracy of the Data***

Regarding the EPDS, if the mother did not complete the full 10-question survey, the survey was discarded from data analysis. The accuracy of EPDS scores was assessed through the means previously stated. In addition to the completeness of the survey data, the DNP student evaluated the completeness of the sample by determining the number of mothers who qualified for screening, meaning their infant remained hospitalized at DOL 14, and the number of eligible mothers who actually received the EPDS. This was evaluated through a comparison of survey and chart documentation to the infant's LOS documented within the EHR. Additionally, a running log of admissions was kept in the secure office of the advanced practice providers to ensure all maternal-infant dyads were included. Pre-and-posttest survey questionnaires were reviewed by the DNP student prior to screening implementation. The completeness of knowledge assessment surveys was evaluated by subsets. Any incomplete subset was discarded.

### **Data Analysis**

#### ***Demographic Data Analysis***



Demographic data from the knowledge pre-and-posttest included the participant's NICU role, years worked in their current position, if they have ever been taught about PPD, and if they have ever suffered from PPD themselves. Due to the nominal and ordinal nature of the data, frequency distributions are displayed as a number and percentage of the whole. Infant demographic data included completed weeks of GA at birth and LOS and were treated as continuous variables.

### ***Outcome Measures***

Quantitative analysis was completed on staff knowledge test scores, EPDS screening occurrences, maternal EPDS scores, documentation compliance, and referral compliance. The total score and subset scores of the knowledge assessment were treated as continuous variables. Data analysis was completed through a comparison of the means of staff knowledge pre-and-posttest scores using a paired samples *t*-test. To perform an analysis of EPDS screening scores, the total score of the EPDS was used as a continuous variable. A paired samples *t*-test was utilized to assess the difference in means between two-week screening timeframes. Complimenting the comparison of means, Pearson's correlations were utilized to assess the effect of infant GA at birth and LOS on maternal EPDS scores.

### ***Evaluation of the Process***

#### **Facilitators**

Implementation of the scholarly project required coordination from multiple professionals within the NICU. Social work historically facilitated PPD screening and psychiatric referral. As major stakeholders who have expressed a great need for standardization, they were available to assist and guide the implementation. Following the guidance of social work, the nursing staff played a significant role in the project's implementation. Nursing staff

spends the most time with patients and their families; their assessment of family dynamics and interactions with their infants often yielded higher recognition of PPD. The project's community member helped to create standardized charting phrases within the EHR with the DNP student and was thus pivotal to the program's success. The absence of proper documentation carries significant risk, as without screening score documentation, mothers at risk may not have received the care they needed. As the healthcare team leader, the support of various NICU advanced practice providers was integral to facilitating effective PPD referral. Parents tend to place a high level of trust in the provider, and they delivered further encouragement and participation in screening. Because screening is not diagnostic and the NICU is not equipped to provide professional psychiatric care, community providers and organizational resources were utilized.

### **Barriers**

The barriers presented throughout the literature allowed the DNP lead to foresee common barriers and incorporate solutions into the planning stage prior to implementation. Arguably the highest priority barrier was ensuring acceptance of the initiative from the nursing staff. As this was a new process for all staff, incorporating the educational program, program champions, and resources spread throughout the unit increased project compliance. Furthermore, for the lengths taken each day in the NICU to ensure survival, conveying to the nursing staff that they can continue to impact the infant's life outside of the NICU sparked motivation.

To address the mother's outpatient status, the mother's screening score was documented within the infant's chart in a nursing note. This was already a practice within the facility, as social services or other consults for the mothers are documented within the infant's medical chart. The EHR system utilized by the organization can be accessed from any organizational

facility that allowed access of maternal screening scores to authorized personnel outside of the facility.

Transportation and presence in the NICU were also prevalent challenges at the project site. Part of daily charting by nursing staff is to document when the parents are present at the bedside. The DNP lead was able to audit charts to identify which women were being missed due to transportation issues and reminded staff that the mother needed to be screened at her next in-person visit. Complementing physical barriers, cultural and linguistic barriers identified in the literature also applied to the implementation. Fortunately, the facility utilizes a translator iPad and telephone service that harness many language options that aided in screening a diverse population of mothers.

## **Results**

### **Staff Education Analysis**

Of the 61 NICU staff assigned to the web-based training, 47 completed the pretest, and 45 completed the post-test. Three participants completed the pretest twice, and one completed the posttest twice. Therefore, any participant with repeat tests was eliminated from data analysis. Additionally, those who did not complete both assessments were eliminated, revealing that 64% ( $N=39$ ) of participants completed the pre-and-posttest. Of those that completed the pre-and-posttest, staff nurses comprised the largest group role at 74%. Furthermore, the majority of staff completing the pre-and-posttest had between zero to five years of NICU experience. Sample characteristics are described in Table 1. Within the sample, 10% ( $n=4$ ) had never received PPD education. Twenty-six percent ( $n=10$ ) of participants recognized that they have personally experienced PPD.

**Table 1***NICU Staff Characteristics (N=39)*

Characteristics	<i>n</i> (%)
Role	
Charge Nurse	4 (10%)
Managerial Staff	2 (5%)
Neonatal Nurse Practitioner	2 (5%)
Neonatologist	1 (3%)
Patient Care Associate	1 (3%)
Staff Nurse	29 (74%)
Years of Experience	
0-5 years	22 (56%)
6-10 years	7 (18%)
10-20 years	6 (15%)
>20 years	4 (10%)

Pre-and-posttest score analysis was completed utilizing the instrument in its entirety and by subset. The average total score on the pre-and-posttest showed an increase of 7%, which was determined to be extremely significant using a paired samples *t*-test. Additionally, the pre-and-posttest scores of the subsets each increased by 9%, 17%, and 5%, respectively. Each change in subset score also resulted in an extremely significant increase in knowledge and behaviors.

Details of the statistical analysis can be seen in Table 2.

**Table 2***PPD Education Pre-and-posttest Analysis*

Scores	Pretest	Posttest	<i>p</i>
Average Total Score	56.92	61.05	<.001
Average Subset 1	6.87	7.51	<.001
Average Subset 2	8.67	10.18	<.001
Average Subset 3	41.38	43.36	<.001

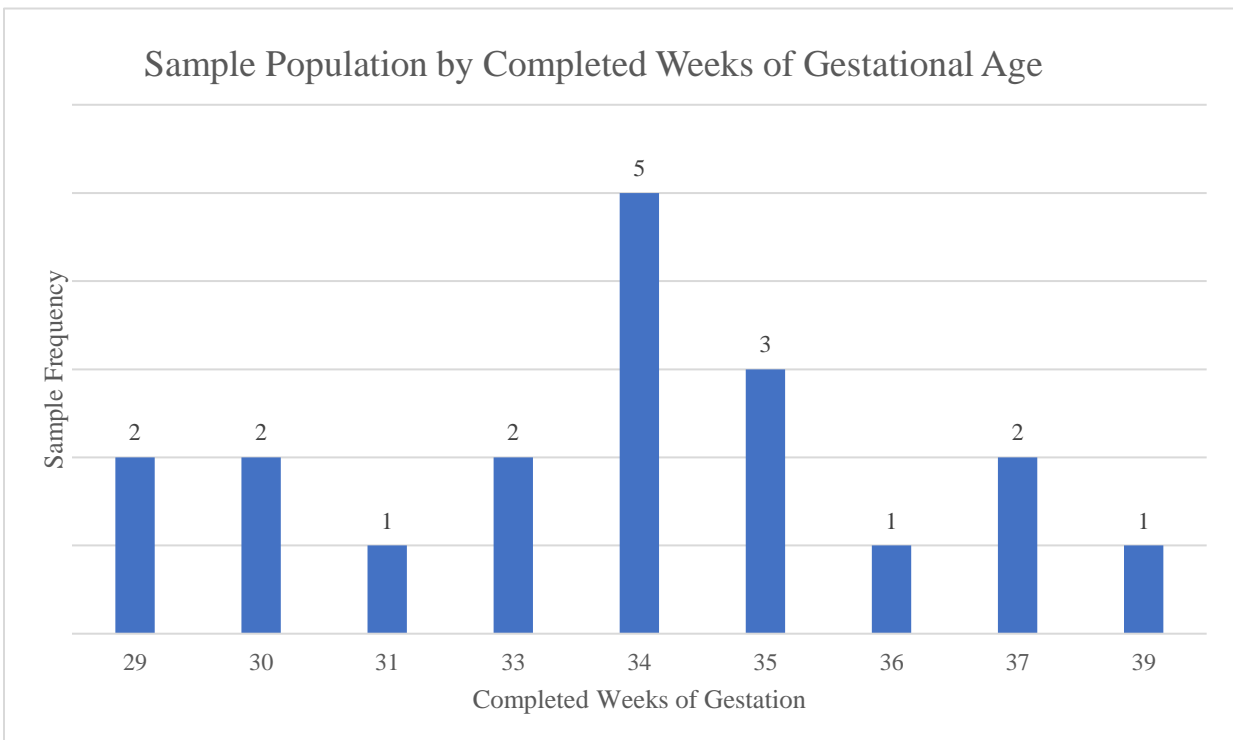
*Note.* Significance level  $p < .05$ .

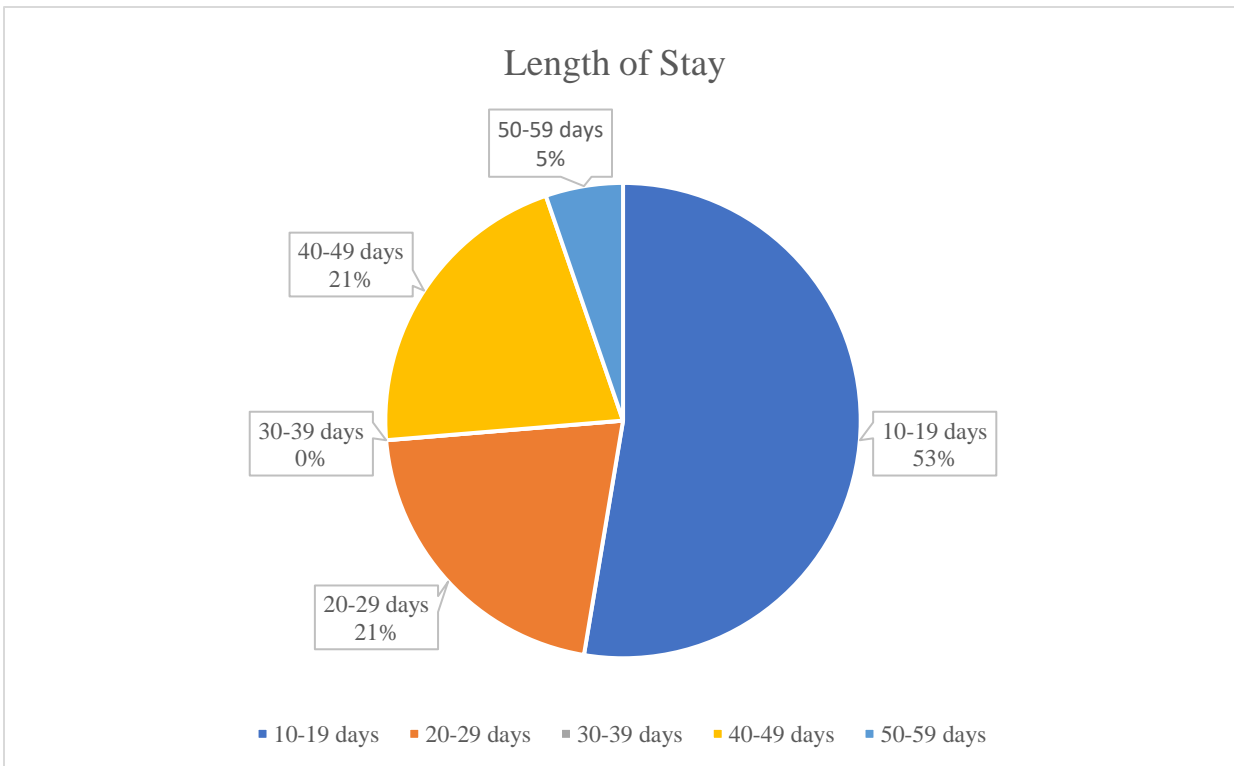
### Screening Population Analysis

In total, 19 of 22 eligible NICU mothers were screened during the intervention period, resulting in a screening compliance of 86%. Of the 19 mothers screened, two completed one repeat screen, and one completed two repeat screens, totaling 23 screenings conducted. All surveys were completed in their entirety and no surveys were discarded from data analysis. For eligible NICU mothers screened, gestational ages ranged from 29 to 39 weeks, and LOS ranged from 11 to 57 days. The mean GA was 33 completed weeks, and the mean LOS was 25 days. Gestational age ranges are depicted in Figure 2 and LOS ranges are depicted in Figure 3. For mothers screened once during their NICU stay, the average day screening was conducted was DOL 18. For those screened twice, the average was DOL 26. The mother who completed the third screening did so on her infant’s DOL 43.

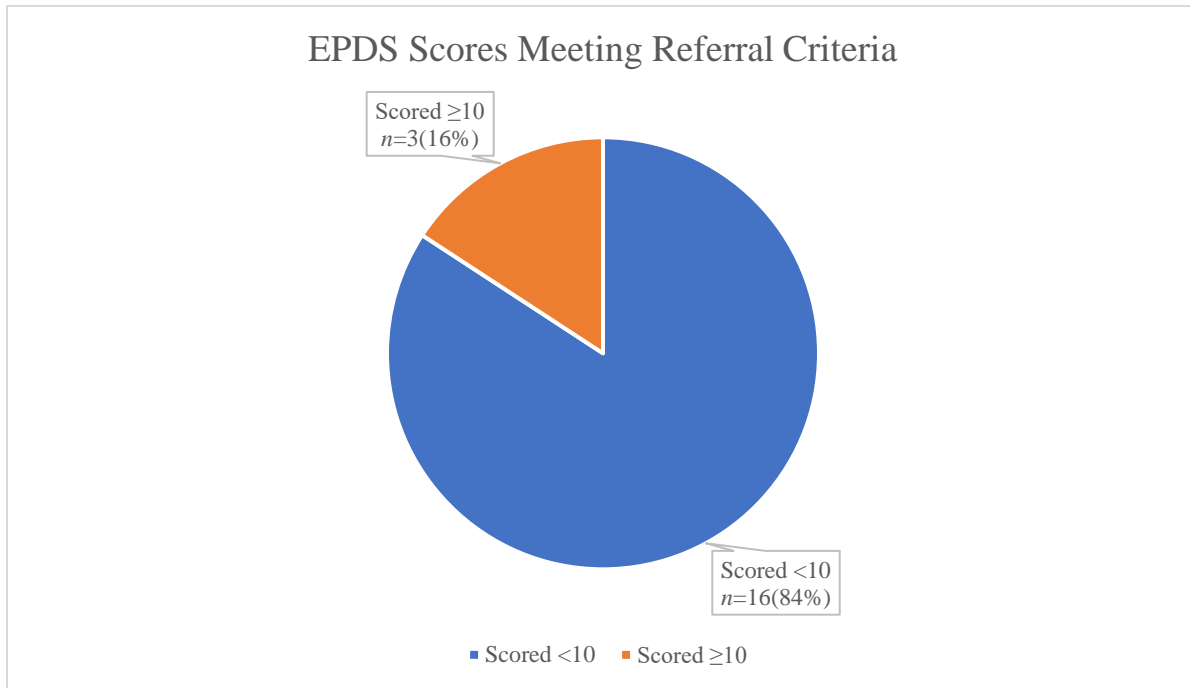
**Figure 1**

*NICU Infant Population by Completed Weeks of Gestational Age*



**Figure 2***Length of Stay*

Of eligible mothers screened, most did not score greater than or equal to 10, and thus did not trigger a social work referral. EPDS data is depicted in Figure 4. There was no evidence of suicidal ideation or self-harm within the sample. Analyzing the sample by max EPDS score, the average score was 5, ranging from zero to 17. Of the 23 screenings completed, 13% ( $n=3$ ) were not documented in the infant's EHR, for a compliance rate of 87%. One hundred percent ( $n=3$ ) of mothers scoring ten or higher received a social work referral and consult.

**Figure 3***EPDS Scores Meeting Referral Criteria*

The relationship between maternal PPD (as measured by the EPDS) and infant GA at birth and LOS was investigated using a Pearson product-moment correlational coefficient. A weakly positive relationship was noted between the maximum EPDS score and GA at birth that did not reach statistical significance ( $r = .093$ ,  $p = .705$ ). Similarly, a small negative correlation was noted between the maximum EPDS score and LOS, though statistical significance was not attained ( $r = -.213$ ,  $p = .382$ ).

To categorize PPD across the infant's LOS, a paired samples  $t$ -test was conducted on the women ( $n = 3$ ) who received two EPDS screenings. In addition, one woman was screened a third time, and her third score was excluded from the analysis. The average PPD score at the first screening timeframe was 9.67, and the average at the second was 5.33. Though the data alludes to a decrease between the two timeframes, it failed to reach statistical significance ( $p = .318$ ).

Minimal barriers and modifications were encountered throughout the project's eight-week intervention period. One unexpected hurdle included difficulties matching mothers' paper screenings with the EHR documentation despite using the last four digits of their cell phone numbers. The utilization of nursing staff assignment logs aided in evaluating documentation compliance. To further the multidisciplinary approach, the obstetricians serving the facility asked to be added to the algorithm to lend their expertise in women's health. Thus, the additional step of the NICU provider notifying the on-call obstetrician was added, emphasizing the project's commitment to collaboration.

### **Discussion**

This quality improvement initiative demonstrated the feasibility of early identification of maternal distress and appropriate referral in the NICU setting. The clinical significance of the intervention was shown by the increase in staff knowledge of PPD and the high compliance with screening, documentation, and referral of women with positive EPDS screenings. Beginning with the staff knowledge assessment evaluation, compliance with assigned pre-and-posttests was well under the goal of 100% of NICU staff, with 64% completing both the pre-and-posttest assessments. Interestingly, when looking specifically at nursing staff compliance, the analysis demonstrated that of 46 nurses assigned, 45 accessed the training presentation. However, access did not lead to assessment completion, as only 31 nurses completed both the pre-and-posttest. This downtrend in assessment completion may be due to each test being accessed with a QR code on their phone rather than embedded into the training module. The extra step may have deterred some participants from completing the assessments and serves as a point of improvement for future projects. Additionally, advanced providers (NNPs/neonatologists) were not enrolled but emailed the assessment prior to an online presentation by the DNP student. The



low compliance rate among this subgroup of staff demonstrates that assigning a due date rather than allowing staff to complete the assessment at their leisure increases engagement in the learning activity.

Though a 30% knowledge increase was not achieved in the instrument's total score, the statistically significant increase in posttest scores demonstrates the instrument's utility in educating staff on warranted PPD interventions in the NICU. Delving further into the instrument, the statistical significance attained in the first subset demonstrates the staff increased knowledge of PPD incidence, risk factors, and symptoms after completing the online education. Similar results in the second subset indicate the staff's increased understanding of the purpose of the EPDS and how to administer the instrument correctly. The third subset does not test the knowledge of PPD interventions but instead aims to describe the staff's attitudes toward the management of PPD. Thus, a statistically significant increase demonstrates that the team was willing to adopt best practices and recognized the importance of combatting maternal mental distress.

Analysis of screening compliance revealed three missed screening opportunities out of 22, for a compliance rate of 86%. This is similar to the 90% screening compliance rate attained by Scheans et al. (2016), Moyera et al. (2021), and Greene et al. (2015), who also utilized different members of the multidisciplinary team to carry out the intervention. Of the three missed screenings, two occurred when the infant was discharged on DOL 16, and one occurred when the infant was discharged on DOL 15. When asked about missed screenings, staff cited similar concerns uncovered in the literature review, emphasizing limited parental visitation and involvement (Berns & Drake, 2021; Lefkowitz et al., 2010; Moyera et al., 2021; Scheans et al., 2016). Compared to studies that also chose to screen in the two-week timeframe, a positive PPD

screening incidence was lower than expected at 16% ( $n=3$ ). However, this may be due to the limited eight-week intervention period and the relatively stable status of infants in this particular NICU. Perhaps the incidence in a level IV NICU or larger sample size and longer intervention period would mirror PPD incidence rates identified in the literature.

Documentation compliance was similar to screening, with three omitted from the infant's EHR. Each documentation omission occurred within the first two weeks of the implementation period. It was identified that nurses were unfamiliar with the use of the standardized phrases. Thus, after the DNP student demonstrated how to document the screenings within a nursing note to various nursing staff, documentation compliance improved to 100% for the final six weeks of the implementation. Referral compliance was robust at 100%, demonstrating the staff's recognized importance of ensuring mothers reaching the screening threshold received the appropriate care. Furthermore, the success of documentation and referral compliance within the EHR emphasizes the pivotal role of technology when carrying out a multidisciplinary intervention, as demonstrated by the literature review (Berns & Drake, 2021; Moyrera et al., 2021; Scheans et al., 2016).

Surprisingly, a weak positive correlation that failed to meet statistical significance was found between GA at birth and maternal EPDS score. This study finding contrasts with those presented by the literature, hypothesizing that GA and maternal distress are inversely related or negatively correlated (Barber et al., 2019; Segre et al., 2014). However, as a newly accredited level III NICU, the unit has just begun managing infants born at less than 28 weeks of GA. Therefore, the population of mature infants compared to prior studies may account for the lack of association.

An additional Pearson correlation described the relationship between the infant's LOS and maternal EPDS score. A small negative correlation that failed to reach statistical significance was uncovered, suggesting maternal EPDS scores decreased as their infant's LOS increased. While one may postulate that increased time in the hospital leads to increased maternal depressive manifestations, this finding is in line with the prior studies that demonstrated maternal EPDS scores peak closer to their infant's initial hospital admission (Cole et al., 2018; Shaw et al., 2014; Garfield et al., 2021). A decrease in EPDS scores suggests mothers may acclimate to the NICU environment or become comfortable with the nursing staff and the unit's workflow. Furthermore, this finding may also be due to the stability of the infants managed in this unit and the LOS averaging 25 days, signifying relatively uncomplicated NICU stays.

The paired samples *t*-test to analyze the same mother's EPDS score between two-week timeframes also demonstrated that maternal EPDS scores fell as their infant's admission continued. This principle was demonstrated in two out of three project cases, with two women's second EPDS scores decreasing at their second screening. As previously stated, this may also be due to the patient population's stability and infants typically improving as they get closer to discharge. More research is warranted in the population of mothers whose infants spend months within the walls of the NICU and experience multiple complications.

The project's highest cost to the organization was staff time to enter orders and carry out screening. However, as the project was integrated into the daily workflow, project efficiency improved, and documentation became less cumbersome. Many staff members commented that the project was incredibly enlightening to the care they are giving not only to their NICU patients but also to NICU mothers. Thus, the project greatly benefited the organization's family-centered

culture by providing higher quality care for NICU mothers and indirectly providing better care to NICU patients.

### **Limitations**

Though the project demonstrated the feasibility of PPD screening in the NICU setting, several limitations existed. The small sample size and short intervention period threaten the generalizability of the results to the population of NICU mothers worldwide. This principle is further demonstrated by the homogeneity of the sample, with only two screenings completed in Spanish. In addition to the generalizability of the sample, each EPDS screening was completed through self-report methods. Though self-report was utilized to increase the privacy of responses and reduce the fear of judgment, response bias is well documented to decrease the validity of survey answers (Barber et al., 2021).

While the reliability and consistency of the EPDS are established across multiple populations of postpartum women, the same cannot be said for the staff knowledge and perception of PPD assessment. The instrument does not have demonstrated reliability and was edited by the DNP student with permission from the original. Further implementation and evaluation of the instrument's ability to measure staff knowledge and perceptions of PPD is warranted. Threats to internal validity include the difference in which the knowledge survey was presented to different staff members for completion. Advanced NICU providers do not use the organization's online education platform and thus require the QR code to be emailed to them. With such a small number of advanced providers completing the pre-and-posttest assessments, the total and subset scores may differ greatly from the general population of NICU providers.

To minimize identified study limitations, the DNP student frequented the unit twice weekly to ensure mothers were screened appropriately and to help perform screenings or consult

on complex situations. Paper copies of the EPDS in English, Spanish, and French were available to staff in addition to an electronic document that held the EPDS in 36 different languages.

Visual screening reminders were placed on computers and high-traffic areas in the unit.

Multidisciplinary rounding occurred twice weekly and addressed maternal mental health and PPD screening. Providers also received weekly email reminders to place PPD screening orders.

### **Conclusions**

Initiating change in any setting can be difficult, with the myriad of uncontrollable variables within the healthcare system particularly challenging. As such, implementing a PPD screening protocol within the NICU setting required tedious planning and consistent execution. Many NICU providers may describe family-centered care as including the parents in the treatment plan or changing their infant's diaper. This project demonstrates that advanced practice NICU providers can elevate family-centered care to encompass the recognition and treatment of maternal mental distress that often accompanies their infant's hospitalization. Additionally, the project supports the growing trend in neonatology of employing psychologists in NICUs to manage PPD and PTSD symptoms (Hynan et al., 2015). The favorable results of the project have led to the adoption of the protocol by the unit, with potential plans to expand the project to other NICUs managed by the same provider group. Furthermore, the project may also be helpful in follow-up clinics where complicated NICU infants are cared for long after their NICU stays.

Though this small study displayed a lower frequency of PPD than the literature suggests, the three women with positive screenings represent three distressed NICU mothers who likely would have fallen through the cracks. The success of this project reinforces that NICU mothers are an overlooked population at high risk for PPD. Further inquiry is warranted to characterize the incidence and intensity of PPD within higher acuity NICUs where mothers often spend

months at their infant's bedside. Looking to the future, the next steps include integrating the protocol into other NICUs managed by the same neonatology group, with screening continuing every two weeks. In the next iteration, an "as needed" screening option may prove beneficial, as many nurses asked if screening could occur before DOL 14 due to observed maternal distress. The original NICU where the project was implemented is encouraged to continue tracking data as they begin managing infants of higher acuity. In a year or so, it would be beneficial to compare this data with the second iteration of the project to identify similarities and differences.

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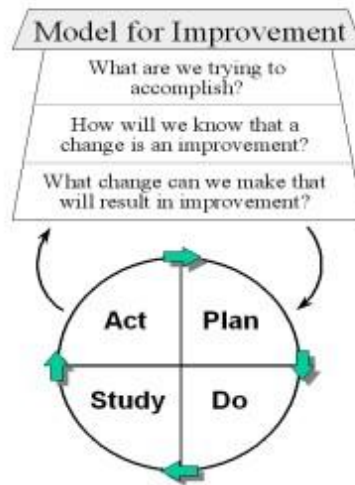
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Appendix A

Quality Improvement Model

*PDSA Cycle and Model for Improvement*



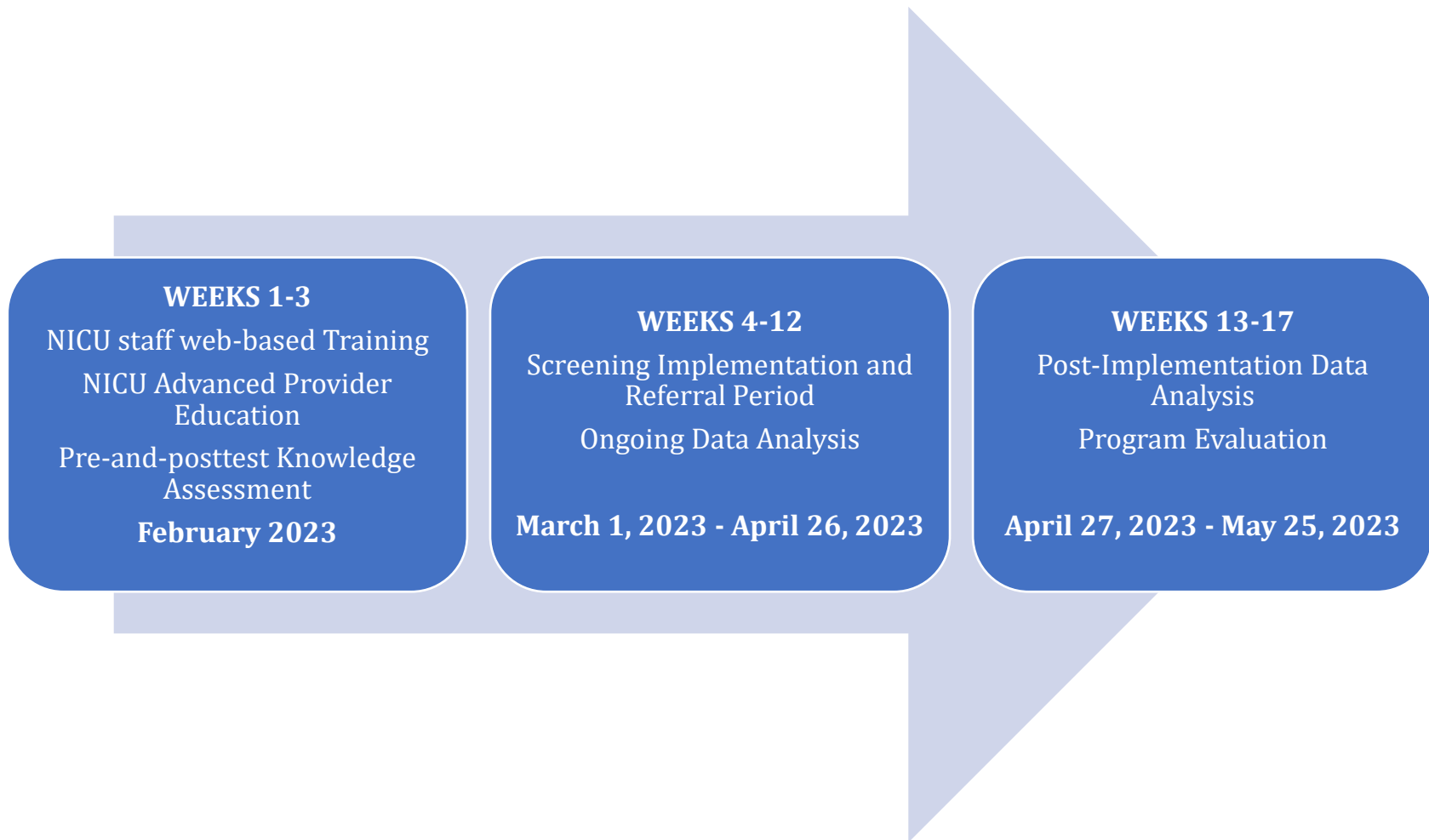
*Note.* The figure on the left refers to the PDSA cycle refined by Moen et al. (1991), the figure on the right refers to the modifications employed by Langley et al. (1994) to create the Model for Improvement (Moen, n.d).

**Appendix A (Continued)**





**Appendix B**  
**Project Timeline**



## Appendix C

### Dot Phrases

#### NICUPPDORDER

Maternal PPD screening using the EPDS per protocol.

-For scores  $\geq 10$  but  $< 20$  with NO evidence of suicidal ideation in the past 7 days, please notify the NICU provider to order a social work consult.

-For scores  $\geq 20$  with NO evidence of suicidal ideation in the past 7 days, please notify the NICU provider to order a social work consult and place an immediate phone call to social work for further management.

-For mothers with evidence of suicidal ideation in the past 7 days (regardless of total screening score), please notify the NICU provider for an emergent social work consult and place an immediate phone call to social work/house supervisor to escort mother to ED for further evaluation.

#### NICUPPDSCREEN

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*.

Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.

These findings indicate need for {NICUPPDSCREEN:44260}.

The following non-emergent interventions were applied: {EPDS non-emergent interventions:44258}.

The following escalated interventions were applied: {EPDS Escalated interventions:44259}.

The following emergent interventions were applied: {EPDS Emergent interventions:44605:::1}

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*.  
Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.

These findings indicate need for {NICUPPDSCREEN:44260}.

The following non-emergent interventions were applied: {EPDS non-emergent interventions:44258}.

The following escalated interventions were applied: {EPDS Escalated interventions:44259}.

The following emergent interventions were applied: {EPDS Emergent interventions:44605:::1}

- self-care/community resources emphasized to mother, score  $< 10$
- non-emergent interventions, score  $\geq 10$  and  $< 20$  with NO evidence of suicidal ideation in past 7 days
- escalated interventions, score  $\geq 20$  with NO evidence of suicidal ideation in past 7 days
- emergent interventions, evidence of suicidal ideation in past 7 days

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*.  
Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.

SmartLink Text Size and Font Color  
Match Template Formatting

Appendix C (Continued)

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.  
 The following non-emergent interventions were applied: {EPDS non-emergent interventions:44258}.  
 The following escalated interventions were applied: {EPDS Escalated interventions:44259}.  
 The following emergent interventions were applied: {EPDS Emergent interventions:44605:::1}

DESCRIPTION

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.

Populate from text

n/a  
 self-care/community resources emphasized to mother  
 MD/NNP notified for social work consult order  
 encouraged mother to call healthcare provider

Match Template Formatting | Keep SmartLink Formatting

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.  
 The following non-emergent interventions were applied: {EPDS non-emergent interventions:44258}.  
 The following escalated interventions were applied: {EPDS Escalated interventions:44259}.  
 The following emergent interventions were applied: {EPDS Emergent interventions:44605:::1}

DESCRIPTION

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.

Text Format

n/a  
 self-care/community resources emphasized to mother  
 MD/NNP notified for social work consult order  
 requested social work to bedside for immediate consult  
 encouraged mother to contact support person  
 provided suicide & crisis lifeline number  
 aided mom in calling healthcare provider  
 social worker/house supervisor escorted mother to the ED

Sharing

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.  
 The following non-emergent interventions were applied: {EPDS non-emergent interventions:44258}.  
 The following escalated interventions were applied: {EPDS Escalated interventions:44259}.  
 The following emergent interventions were applied: {EPDS Emergent interventions:44605:::1}

DESCRIPTION

The infant's mother was screened for PPD on the infant's DOL \*\*\*. The maternal EPDS score is \*\*\*. Evidence of suicidal ideation in the past 7 days: {NO/YES:21738:::1}.  
 These findings indicate need for {NICUPPDScreen:44260}.

Text Format

Rich Text | Plain Text

n/a  
 social work/house supervisor escorted mother to the ED for evaluation  
 mother refused ED evaluation  
 self-care/community resources emphasized to mother  
 MD/NNP notified for social work consult order  
 requested social work to bedside for immediate consult  
 encouraged mother to contact support person  
 provided suicide & crisis lifeline number  
 aided mom in calling healthcare provider

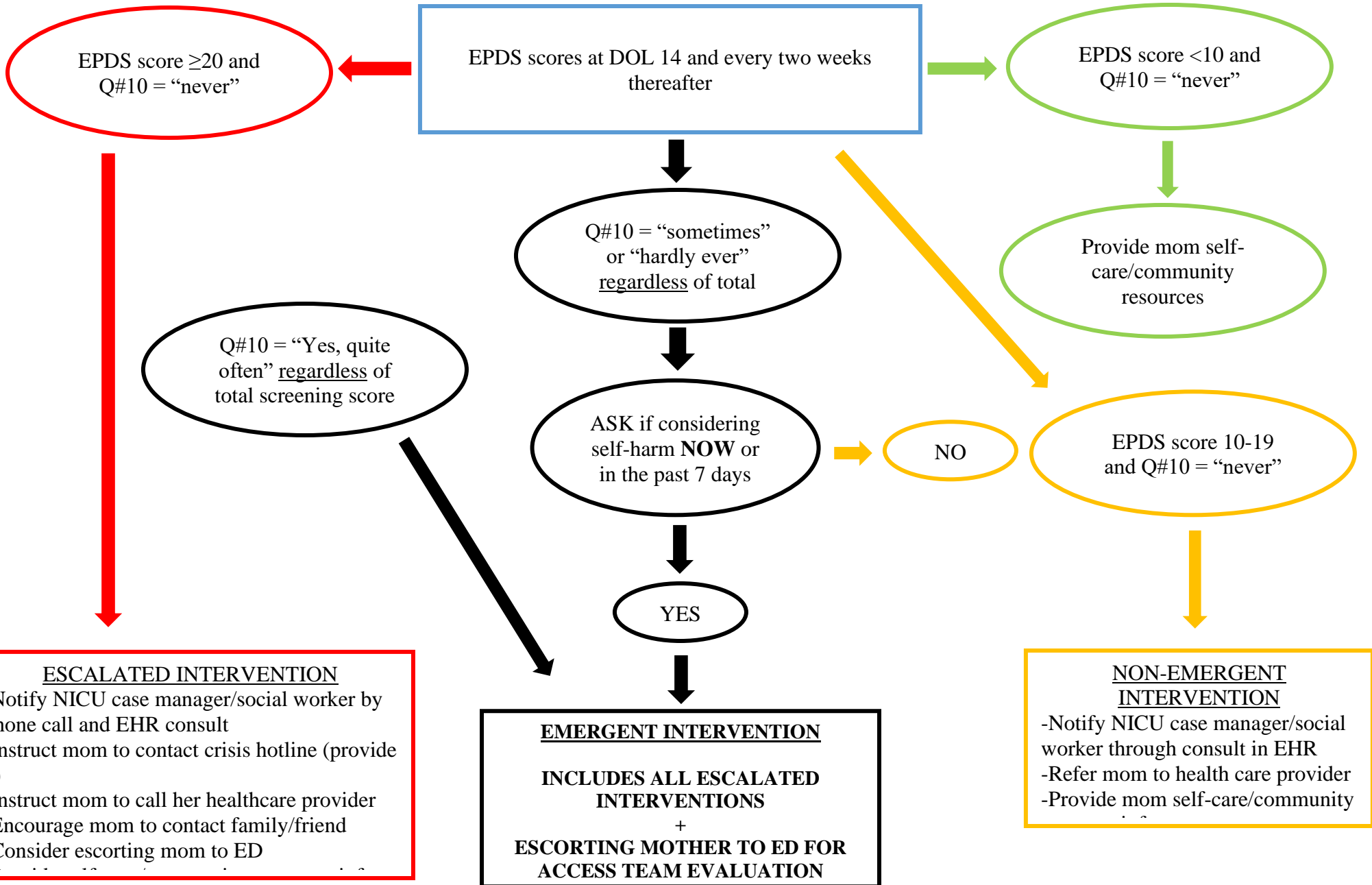
NICUPPDSWCONSULT

Mother's EPDS score \*\*\*. Evidence of suicidal ideation: {NO/YES:21738}.

On-call OB notified of positive screen result: {YES/NA/NO:23853:::1}.

Appendix D

Referral Algorithm



## Appendix E

### Approval for Algorithm Use

Yes, I agree.

Katya Bulaevskaya NNP

On Friday, September 16, 2022 at 07:16:01 AM PDT, Barry, Amy <amy.sakalys@louisville.edu> wrote:

Good morning Ms. Bulaevskaya,

My name is Amy Barry, I am a neonatal DNP student at the University of Louisville in Louisville, KY. I am looking to implement a similar project to your program at Randall Children's Hospital described in the article, "Postpartum Mood Disorders Screening in the NICU." I believe your algorithm would work perfectly in my project and ensure every NICU mother receives an appropriate level of support! I am seeking your permission to utilize your process employed in the algorithm within my project. Your contribution will be credited within all aspects of the project implementation.

Thank you so much for your consideration. I look forward to working towards a common goal of providing greater support to NICU mothers in the most trying times of their lives!

Respectfully,  
Amy Barry

## Appendix F

### IRB Letters of Approval

#### University of Louisville

Human Subjects Protection Program Office  
 300 East Market Street, Suite 380  
 Louisville, Ky 40202  
 P: 502. 852.5188 E: [hsppofc@louisville.edu](mailto:hsppofc@louisville.edu)

<b>DATE:</b>	December 13, 2022
<b>TO:</b>	Lela A. Baker
<b>FROM:</b>	The University of Louisville Institutional Review Board
<b>IRB NUMBER:</b>	22.1028
<b>STUDY TITLE:</b>	<b>Improving Maternal and Infant Health: A Quality Improvement Initiative to Recognize Postpartum Depression in the Neonatal Intensive Care Unit</b>
<b>REFERENCE #:</b>	756892
<b>DATE OF REVIEW:</b>	12/10/2022
<b>CONTACT:</b>	Cathy J. Carter, 852-4098, <a href="mailto:cjcart02@louisville.edu">cjcart02@louisville.edu</a>

An IRB Vice-Chair has reviewed your submission. The project described does not meet the “Common Rule” definition of human subjects’ research. The IRB has classified this project as Non-Human Subjects Research (NHSR), and it has been determined to be quality improvement based on the goal(s) stated in the protocol. **The project can proceed.**

Institutional policies and guidelines on participant privacy must be followed. If you are using protected health information, the HIPAA Privacy rules still apply.

Amendments for personnel changes or study closures are not required.

**PLEASE NOTE:** The chair made the following recommendations/suggestions – for future reference. If this HAD been found to be human subjects research, the introductory letter would not have been approved. It seems to over-commit. In addition, if this had been found to be research, the preamble (unsigned consent) template would have better served your purposes (instead of the introductory letter. That template can be found on the HSPPO site at <https://louisville.edu/research/researchers/compliance/irb/templates-for-irb-submissions-1>

**No changes are required at this time.** However, any changes to this project or the focus of the investigation must be submitted to the IRB to ensure that the IRB determination above still applies.

Thank you,



Paula Radmacher, Ph.D., Vice Chair, Biomedical Institutional Review Board



## Appendix G

## Edinburgh Postnatal Depression Scale

Edinburgh Postnatal Depression Scale<sup>1</sup> (EPDS)

Name: \_\_\_\_\_ Address: \_\_\_\_\_

Your Date of Birth: \_\_\_\_\_

Baby's Date of Birth: \_\_\_\_\_ Phone: \_\_\_\_\_

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please check the answer that comes closest to how you have felt **IN THE PAST 7 DAYS**, not just how you feel today.

Here is an example, already completed.

I have felt happy:

- Yes, all the time  
 Yes, most of the time      This would mean: "I have felt happy most of the time" during the past week.  
 No, not very often      Please complete the other questions in the same way.  
 No, not at all

In the past 7 days:

- |   |  |
|---|--|
| <p>1. I have been able to laugh and see the funny side of things</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> As much as I always could</li> <li><input type="checkbox"/> Not quite so much now</li> <li><input type="checkbox"/> Definitely not so much now</li> <li><input type="checkbox"/> Not at all</li> </ul> | <p>*6. Things have been getting on top of me</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, most of the time I haven't been able to cope at all</li> <li><input type="checkbox"/> Yes, sometimes I haven't been coping as well as usual</li> <li><input type="checkbox"/> No, most of the time I have coped quite well</li> <li><input type="checkbox"/> No, I have been coping as well as ever</li> </ul> |
| <p>2. I have looked forward with enjoyment to things</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> As much as I ever did</li> <li><input type="checkbox"/> Rather less than I used to</li> <li><input type="checkbox"/> Definitely less than I used to</li> <li><input type="checkbox"/> Hardly at all</li> </ul>     | <p>*7. I have been so unhappy that I have had difficulty sleeping</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, most of the time</li> <li><input type="checkbox"/> Yes, sometimes</li> <li><input type="checkbox"/> Not very often</li> <li><input type="checkbox"/> No, not at all</li> </ul>  |
| <p>*3. I have blamed myself unnecessarily when things went wrong</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, most of the time</li> <li><input type="checkbox"/> Yes, some of the time</li> <li><input type="checkbox"/> Not very often</li> <li><input type="checkbox"/> No, never</li> </ul>                  | <p>*8. I have felt sad or miserable</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, most of the time</li> <li><input type="checkbox"/> Yes, quite often</li> <li><input type="checkbox"/> Not very often</li> <li><input type="checkbox"/> No, not at all</li> </ul>  |
| <p>4. I have been anxious or worried for no good reason</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> No, not at all</li> <li><input type="checkbox"/> Hardly ever</li> <li><input type="checkbox"/> Yes, sometimes</li> <li><input type="checkbox"/> Yes, very often</li> </ul>                                      | <p>*9. I have been so unhappy that I have been crying</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, most of the time</li> <li><input type="checkbox"/> Yes, quite often</li> <li><input type="checkbox"/> Only occasionally</li> <li><input type="checkbox"/> No, never</li> </ul>  |
| <p>*5. I have felt scared or panicky for no very good reason</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, quite a lot</li> <li><input type="checkbox"/> Yes, sometimes</li> <li><input type="checkbox"/> No, not much</li> <li><input type="checkbox"/> No, not at all</li> </ul>                               | <p>*10. The thought of harming myself has occurred to me</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes, quite often</li> <li><input type="checkbox"/> Sometimes</li> <li><input type="checkbox"/> Hardly ever</li> <li><input type="checkbox"/> Never</li> </ul>   |

Administered/Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

<sup>1</sup>Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786 .

<sup>2</sup>Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002, 194-199

Users may reproduce the scale without further permission providing they respect copyright by quoting the names of the authors, the title and the source of the paper in all reproduced copies.

## Appendix H

### Approval for Staff Knowledge Questionnaire Amendment and Use



PeiSan Kang <kangpsan@gmail.com>

To: Barry, Amy



Sat 9/24/2022 5:52 AM

**CAUTION:** This email originated from outside of our organization. Do not click links, open attachments, or respond unless you recognize the sender's email address and know the contents are safe.

Sure, you can..

Best wishes,  
Kang

On 24 Sep 2022, at 4:04 AM, Barry, Amy <amy.sakalys@louisville.edu> wrote:

Thank you so much! Would it be okay if I changed a few pieces of the survey to better fit my population? Of course, I will still give credit for your contribution throughout the entire project!

Thank you for your time,  
Amy Barry

---



**Appendix I****Staff Knowledge Assessment**

# Knowledge and Perceptions on Postpartum Depression among NICU Healthcare Professionals

Amended with permission.

**Original citation:**

Kang, P. S., Mohazmi, M., Ng, Y. M., & Liew, S. M. (2019). Nurses' knowledge, beliefs and practices regarding the screening and treatment of postpartum depression in maternal and child health clinics: A cross-sectional survey. *Malaysian family physician : the official journal of the Academy of Family Physicians of Malaysia*, 14(1), 18–25.  
<https://pubmed.ncbi.nlm.nih.gov/31289627/>

Thank you for your participation in this study.

It takes about 15 minutes to complete this questionnaire.

Your response will remain **CONFIDENTIAL**.

For further information, please contact:

Amy Barry, BSN, RN, DNP Student

Amsaka01@louisville.edu

Appendix I (Continued)

Questionnaire

**A. Participant's Information**

1. Please provide the last 4 digits of your cellphone number for anonymous identification.

□ □ □ □

2. My position at BHL NICU is:

- Staff RN
- Charge RN
- Managerial Position
- Neonatologist
- Neonatal Nurse Practitioner
- Patient Care Associate

3. Years of working in current role: \_\_\_\_ years

4. Have you been taught about postpartum depression (PPD)?

- Yes
- No

5. Have you experienced PPD before?

- Yes
- No

**B. Knowledge on PPD:**

*Please tick the answer that most closely describes your idea about postpartum depression.*

No	Items	True (1)	False (2)
1.	<u>PPD</u> can occur any time during the first year post-delivery.	√	
2.	<u>PPD</u> only affects mothers, not fathers.		√
3.	<u>PPD</u> affects 10-20% of the overall postpartum population.	√	
4.	The prevalence of <u>PPD</u> in NICU mothers can be as high as 40%.	√	
5.	<u>PPD</u> most commonly occurs during the 1 <sup>st</sup> to 3 <sup>rd</sup> month after delivery.	√	
6.	The "baby blues" and <u>PPD</u> are the same thing.		√
7.	True or false: Which of the following are risk factors of <u>PPD</u> development in the general postpartum population?		
	a. Primigravida	√	
	b. Planned pregnancy		√
	c. Family history of psychiatry illness	√	
	d. History of <u>PPD</u> in a previous pregnancy.	√	
	e. Socioeconomic status	√	
	f. Immigration status	√	
	g. Marital status	√	

## Appendix I (Continued)

8.	True or false: Which of the following are true regarding PPD in the NICU setting?		
	a. Gestational age at birth does not affect the incidence of PPD in the NICU.		√
	b. The infant's appearance in the NICU influences PPD development.	√	
	c. Allowing the mother to participate in her infant's care can influence the incidence of PPD in the NICU.	√	
	d. Physical distance from the NICU promotes PPD development.	√	
	e. Suffering from PPD does not affect the infant's future neurologic and emotional development in childhood and adolescence.		√
	f. There are set standards put forth by the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) that delineate the process of PPD screening in the NICU.		√
9.	True or false: Which of the following are symptoms of PPD?		
	a. Difficulty in sleeping	√	
	b. Disinterest in the care of the infant	√	
	c. Change in appetite	√	
	d. Suicidal thoughts	√	
	e. Tired or no energy	√	
	f. Anxious or worried for no good reason	√	

C. Knowledge of the Edinburgh Postnatal Depression Scale (EPDS)

No	Items	True (1)	False (2)
1.	The EPDS is the recommended PPD screening tool by ACOG and the AAP.	√	
2.	Respondents should answer the questions of the EPDS based on how they have been feeling over the past month.		√
3.	The EPDS is a diagnostic tool.		√
4.	Mothers who score $\geq 10$ on the EPDS should be further evaluated for PPD.	√	
5.	The maximum score of the EPDS is 30.	√	
6.	Assessment of suicidality is not included in the EPDS.		√

**Appendix I (Continued)**

7.	Questions relating to laughter, enjoyment, and anxiety are reverse scored on the EPDS, meaning the first answer choice is scored as a 3 and the bottom answer choice is scored as a 0.		√
8.	Only social workers can administer the EPDS.		√
9.	The EPDS is available in over 50 languages.	√	
10.	Women who positively respond to question 10 on the EPDS require a prompt psychiatric evaluation.	√	
11.	The EPDS can be completed in 5 minutes or less.	√	

**D. Belief on PPD screening and management:**

*Please tick the answer that most closely describes your attitude toward postpartum depression.*

No	Item	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1.	PPD is a social stigma.					
2.	It is our culture that mothers do not discuss their depression with nurses.					
3.	Mothers with PPD prefer to seek alternative treatment for their depression.					
4.	Screening for PPD is necessary.					
5.	Screening for PPD takes too much time.					
6.	Screening for PPD is my responsibility.					
7.	Giving counseling to mothers with PPD is my responsibility.					
8.	Referring mothers with PPD for further treatment is my responsibility.					
9.	It is rewarding to care for mothers with PPD.					
10.	I am comfortable talking with postpartum mothers about depression.					
11.	I am confident in recognizing PPD.					
12.	I am confident in giving counseling to mothers with PPD.					

-----END OF QUESTIONNAIRE-----  
 Thank you for your participation!