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Protecting Against Pain And Stress In The Nicu: An Evidence-Based Eye Examination Guideline

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PROTECTING AGAINST PAIN AND STRESS IN THE NICU:
AN EVIDENCE-BASED EYE EXAMINATION GUIDELINE

by

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Occupational Therapy Doctorate, University of North Dakota, 2022

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This scholarly project, submitted by Heather Bowman, OTDS in partial fulfillment of the requirement for the Degree of Occupational Therapy Doctorate from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

Kelly Dombier, OTD, OTR/L
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4/13/22
Date

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ABSTRACT

Purpose: The purpose of this project was to create an evidence-based Neonatal Intensive Care Unit (NICU) eye examination guideline and associated resources that supported use of non-pharmacological interventions and emphasized the importance of parent education and involvement from both an interdisciplinary and occupational therapy perspective.

Literature Review: Although medically necessary, researchers and practitioners in the NICU interdisciplinary field have discussed pain and stress associated with preterm infant eye examinations (American Academy of Pediatrics [AAP], 2016; Fierson, 2018; Francis, 2016; Pollaci et al., 2020; Samra & McGrath, 2009). Pain and stress likely impact sensory and overall brain development (AAP, 2016; Brummelte et al., 2012; Jeanson, 2019; Ranger et al., 2013; Vinall & Grunau, 2014), as well as occupational outcomes (Hills, 2019; Jeanson, 2019). Some research has aimed to determine the effectiveness of using non-pharmacological interventions for pain and stress (Disher, Cameron, Mitra, Cathcart, & Campbell-Yeo, 2018; Francis, 2016; Pollaci et al., 2020). Parents providing non-pharmacological support to their infants may promote greater infant emotional recovery (Filippa et al., 2019; Jeanson, 2019).

Methodology: To form the basis of this project, a literature review/needs assessment was completed between May and December of 2021. PubMed, the Advances in Neonatal Care Journal, an OT Practice Magazine, and websites from the American Occupational Therapy Association, AAP, Centers for Disease Control and Prevention, National Eye Institute, and the National Association of Neonatal Therapists, were all searched and used. Sources chosen for this review were published between 2005 and 2021. Due to the nature of research related to this project, 10 out of 26 resources included were published either in or prior to 2017.

Product: An evidence-based interdisciplinary eye examination guideline and associated resources were created for the NICU.

Summary: This project emphasized occupational therapists' use of non-pharmacological interventions for pain and stress management, occupational therapists' understanding of visual development and the environment, as well as interdisciplinary and parent collaboration. This project was one of the first, if not the first, to create a NICU eye examination guideline initially inspired by and created within the field of occupational therapy. Future research is imperative to promote product sustainability.

Chapter I

INTRODUCTION

Problem and Purpose Statement

In 2020, one in ten infants born in the United States were preterm, meaning they were born prior to 37 weeks gestation (Centers for Disease Control and Prevention [CDC], 2021). As a result of prematurity, many preterm infants spend weeks to months in the Neonatal Intensive Care Unit (NICU) to receive necessary care and intervention for continued growth and development. Medical procedures in the NICU are some of the most painful and stressful experiences that preterm infants undergo. Pain and stress are jointly defined as “unpleasant sensory and emotional experience[s]” (International Association for the Study of Pain, 2017, para. 1) and can be further quantified based on infant observation (Children’s Minnesota, 2021; Jeanson, 2019; Pollaci, Schlenk, Baum, & Godfrey, 2020) and use of pain scales (American Academy of Pediatrics [AAP], 2016; Desai, Aucott, Frank, & Silbert-Flagg, 2018).

Eye examinations are a type of medical procedure used to screen for retinopathy of prematurity (ROP). Approximately 14,000-16,000 infants are diagnosed with ROP each year (National Eye Institute, 2019). Since vision is the last sensory system to develop, it is typically the most underdeveloped system in preterm infants (Graven, 2011), therefore requiring special care, assessment, and intervention. A challenge for the interdisciplinary team working with preterm infants is to find a balance between the necessity of medical screening, such as eye examinations, while managing pain and stress (AAP, 2016).

Researchers and practitioners in the NICU interdisciplinary field have discussed the pain and stress associated with eye examinations (AAP, 2016; Disher, Cameron, Mitra, Cathcart, & Campbell-Yeo, 2018; Fierson, 2018; Francis, 2016; Pollaci et al., 2020; Samra & McGrath,

2009). Although limited, some existing research has aimed to determine the effectiveness of using non-pharmacological interventions to minimize this pain and stress experience (Francis, 2016; Pollaci et al., 2020). Non-pharmacological interventions, also known as supportive interventions, are non-invasive, non-medication-based interventions for pain and stress management. The AAP (2016) recommends use of various non-pharmacological interventions for pain management, especially in combination with administration of oral sucrose (sugar water) for eye examinations. In fact, maternal presence by itself is considered a non-pharmacological intervention (Altimier & Phillips, 2016). It has been noted in the literature that parent's use of non-pharmacological strategies in the NICU (Filippa et al., 2019; Jeanson, 2019) may overshadow the endocrine system's stress response (Jeanson, 2019) through oxytocin release, therefore promoting greater emotional recovery (Filippa et al., 2019).

Use of non-pharmacological interventions is important, as pain and stress likely impact sensory and overall brain development (AAP, 2016; Brummelte et al., 2012; Jeanson, 2019; Ranger et al., 2013; Vinall & Grunau, 2014). There is even evidence that the etiology of reduced cortical thickness and reduced white and gray matter in the brain can be traced back to pain-related stress exposure in the NICU (Brummelte et al., 2012; Ranger et al., 2013). Unmanaged pain and stress may also have long-term effects that last into childhood and adulthood, impacting educational performance (Hills, 2019) and social participation (Jeanson, 2019). Therefore, management of pain and stress, especially related to procedures such as eye examinations, remains an area of concern within the NICU setting. Occupational therapists (OTs) in the NICU have a vital role in reducing pain and stress both before, during and after eye examinations through assessing for pain and stress, using non-pharmacological intervention to reduce the pain

and stress experience, and through collaborating with parents, all of which are part of OTs scope of practice (American Occupational Therapy Association [AOTA], 2018).

The interdisciplinary team at a Level III, 16 bed NICU in the Midwest recently identified a desire to have an evidence-based eye examination guideline, as they had no written guideline currently in place. Although these eye examinations are brief, the OT on the unit had noted a decline in occupational engagement in the days following the examination. This decline impacted the preterm infant's ability to meet their goals. A desire to promote parent education and involvement was also identified, as well as greater use of non-pharmacological interventions into the eye examination process. The hope was that incorporation of these pieces into the eye examination process would decrease the preterm infant's pain and stress experience, thus supporting occupational outcomes, growth, and development. Therefore, the purpose of this project was to create an evidence-based eye examination guideline and associated resources that supported use of non-pharmacological interventions and emphasized the importance of parent education and involvement from both an interdisciplinary and OT perspective.

Introduction to The Neonatal Integrative Developmental Care Model

The Neonatal Integrative Developmental Care Model (Altimier & Phillips, 2016) was chosen to guide this project for its specificity related to preterm infants in the NICU setting. Four of the seven total core measures were incorporated into the eye examination guideline and associated resources, as research is currently limited related to the connection of the other three core measures to preterm infant pain and stress. The four core measures included were "minimizing stress and pain," "positioning and handling," "partnering with families," and promotion of "the healing environment" to support family-centered care and overall neuroprotection of the preterm infant in the NICU (Altimier & Phillips, 2016, p. 231).

Neuroprotection is defined as “strategies capable of preventing neuronal cell death,” while “neuroprotective strategies are interventions used to support the developing brain or to facilitate the brain after a neuronal injury in a way that decreases neuronal cell death and allows it to heal through developing new connections and pathways for functionality” (Altimier & Phillips, 2016, p. 231).

According to Altimier and Phillips (2016), exposure to “painful, repeated, and unpredictable medical procedures” may precede the development of an “unexpected sensory stress response” or brain related change (p. 234) Therefore, Altimier and Phillips (2016) stated that “non-pharmacological interventions should be the first choice” to mitigate these effects (p. 235). One of these non-pharmacological interventions is “maternal presence” (Altimier & Phillips, 2016, p. 235). Based on this information, parents should be encouraged and supported to provide non-pharmacological intervention for their infant during painful or stressful experiences (Altimier & Phillips, 2016).

Significance of the Eye Examination Guideline to NICU Practice

It is recommended that the NICU have an evidence-based plan for preventing and treating premature infant pain. If little to no plan currently exists, it is important to explore avenues for pain prevention and minimization of the pain experience during both routine and more intensive procedures, especially through use of non-pharmacological interventions (AAP, 2016). According to Fierson (2018), “the goal of an effective ROP screening program is to identify infants who could benefit from treatment and make appropriate recommendations on the timing of future screenings and treatment interventions” and to “minimize the discomfort” while doing so (p. 2). Fierson (2018) additionally stated, “as with all ROP screening programs, specific responsibilities of each individual must be carefully delineated in a protocol” (p. 5).

This project was one of the first, if not the first, to create a NICU eye examination guideline from both an interdisciplinary, as well as an OT and occupational outcome perspective. This project not only addressed a current need within the OT profession, but also a need that has been identified from a NICU interdisciplinary perspective. The hope is that this guideline and associated resources are practically used within the NICU, as well as disseminated beyond, to provide other NICUs with an evidence-based avenue to address similar needs.

Looking Ahead

Chapter II details an extended literature review that continues to provide background information and is organized based on the measures of the chosen model. Chapter III outlines the methodology used for developing the eye examination guideline and its associated resources, which is discussed in Chapter IV. Finally, Chapter V provides a summary of the guideline, strengths, limitations, avenues for sustainability, as well as discusses the need for future research related to this topic.

Chapter II

LITERATURE REVIEW

Developmental Care Through Occupational Therapy in the NICU

In 2020, one in ten infants born in the United States were preterm, meaning they were born prior to 37 weeks gestation (CDC, 2021). As a result of prematurity, many preterm infants spend weeks to months in the NICU to receive necessary care and intervention for continued growth and development.

OTs in the NICU have the unique ability to influence developmental outcomes beyond infancy (AOTA, 2018). OTs have advanced knowledge to guide clinical reasoning related to preterm infant conditions and preterm infant autonomic, motor, and sensory development (AOTA, 2018). More specifically, OTs have knowledge of the visual system due to its sensorimotor integrative abilities and its susceptibility to disability and disease (Titcomb & Okoye, 2005), especially for those infants born prior to 32 weeks gestation (CDC, 2021).

Overall, OTs in the NICU provide assessment and intervention related to feeding, positioning and handling, sleep, bonding and interaction with caregivers (AOTA, 2018). It is also within OTs scope of practice in the NICU to address pain management through providing non-pharmacological interventions to reduce pain and stress during routine assessments and procedures. In addition, OTs are skilled at assessing the NICU environment, ensuring interdisciplinary team collaboration for continuity of care, and providing staff and parent education. Collaboration and rapport building with parents is of utmost importance to help promote initial parenting skills so that parents feel comfortable, supported, and confident while caring for their preterm infant (AOTA, 2018).

NICU Best Practice for Preterm Infant Neuroprotection

Minimizing Pain and Stress

Defining Pain and Stress

It is difficult to fully differentiate between pain and stress when it comes to preterm infants in the NICU, as there is noted overlap in behavioral pain and stress cues (Children's Minnesota, 2021; Jeanson, 2019; Pollaci et al., 2020). Pain has previously been defined in the literature related to procedures (Brummelte et al., 2012; Ranger et al., 2013) that cause "actual or potential tissue damage" (International Association for the Study of Pain, 2017, para. 1), whereas stress can be identified by behaviors noted during routine assessment, cares, and handling. For the purposes of this review, pain and stress will be jointly defined as "unpleasant sensory and emotional experience[s]" (International Association for the Study of Pain, 2017, para. 1).

Impact of Pain and Stress on Preterm Infant Development

Preterm infants in the NICU are subjected to painful routine experiences and procedures during a time of rapid growth and development (AAP, 2016; Vinall & Grunau, 2014). Jeanson (2019) stated, "a progressive change in the culture of pain management in newborns is taking place," (p. 9), as it is now well established that preterm infants experience pain (AAP, 2016; Brummelte et al., 2012; Hills, 2019; Jeanson, 2019; Ranger et al., 2013; Vinall & Grunau, 2014). According to Jeanson (2019), preterm infants, as early as 20 weeks gestation, have complete pain pathways. In addition, preterm infants have a low pain threshold (Hills, 2019) and immature nociceptive functioning (Vinall & Grunau, 2014), which impacts their ability to discriminate between painful experiences as well as modulate these pain experiences (AAP, 2016; Jeanson, 2019; Vinall & Grunau, 2014). Because preterm infants have increased sensitivity to pain (Jeanson, 2019), the effects of these pain experiences may last longer when compared to term

infants, children, and adults (Hills, 2019; Jeanson, 2019). In addition, exposure to pain experiences likely impacts sensory and overall brain development (AAP, 2016; Brummelte et al., 2012; Jeanson, 2019; Ranger et al., 2013; Vinall & Grunau, 2014) as well as occupational performance (Hills, 2019; Jeanson, 2019).

In two studies of preterm infants born between 24 and 32 weeks gestation, it was found that a greater number of painful, repeated procedures (Brummelte et al., 2012) and “greater neonatal pain-related stress” experiences (Ranger et al., 2013, p. 1) were associated with “reduced white matter,” “reduced subcortical gray matter” (Brummelte et al., 2012, p. 391) and a “significantly thinner cortex in 21/66 cerebral regions... predominantly in the frontal and parietal lobes” when evaluated via magnetic resonance imaging at approximately eight years old (Ranger et al., 2013, p. 1). Thus, in infants born preterm, there is evidence that the etiology of reduced cortical thickness and reduced white and gray matter can be traced back to pain-related stress exposure in the NICU (Brummelte et al., 2012; Ranger et al., 2013).

The impact of unmanaged pain and prolonged stress as a preterm infant may last into childhood, adolescence, and adulthood (Hills, 2019; Jeanson, 2019). Preterm infants with unmanaged pain and stress experiences are at a greater risk of developing diabetes and cancer (Jeanson, 2019). In addition, those infants who have multiple or repetitive pain experiences “are left with deficits in cognition [attention, planning, problem solving], learning disabilities...behavioral problems and motor incoordination” (Jeanson, 2019, p. 16). Unmanaged pain in infancy, as evidenced by increased cortisol levels in the hippocampus, has also been found to impact children’s capacities for educational performance (Hills, 2019) and social participation (Jeanson, 2019).

Measurement of Pain and Stress

Observation of infant cues. It is recommended that the NICU routinely utilize assessments for pain (AAP, 2016), as “pain is the fifth vital sign” (Jeanson, 2019, p. 11). The fact that pain has been categorized as another vital sign indicates the importance of its consistent measurement alongside other vital signs in the NICU setting, which include, heart rate, respiratory rate, oxygen saturations and blood pressure. Pain and stress in the preterm infant can be measured in various ways. Jeanson (2019) stated that NICU teams should approach each infant with “suspicion of [likely] pain,” especially those infants undergoing a procedure (p. 12). Indicators of pain and stress include observation of autonomic, face and body cues (Children’s Minnesota, 2021; Jeanson, 2019; Pollaci et al., 2020). Table 1 outlines common infant cues.

Use of infant pain scales. According to Desai et al. (2018), “proper assessment of pain is the first step toward relieving pain” (p. 264). Preterm infant pain can also be measured via available assessment tools (AAP, 2016). The most common psychometrically sound pain scales for infants include the Neonatal Facial Coding System (NFCS), Premature Infant Pain Profile (PIPP), Neonatal Pain Agitation and Sedation Scale (N-PASS), Behavioral Indicators of Infant Pain (BIIP), and Douleur Aigue du Nouveau-ne’ (DAN) (AAP, 2016). According to the AAP (2016), the NFCS and N-PASS can measure both acute and chronic pain, whereas the PIPP and BIIP measure acute pain.

Desai et al. (2018) completed a quality improvement study to compare the Neonatal Infant Pain Scale (NIPS) to the N-PASS to determine which pain assessment was more suitable for measuring both neonatal acute and chronic pain. The “N-PASS assessment criteria included crying/irritability, behavior state, facial expression, extremities/tone, and vital sign changes (heart rate, respirations, blood pressure, oxygen saturations)” (Desai et al., 2018, p. 262). It was

found that the N-PASS had greater sensitivity to detect a higher pain level compared to the NIPS, thus allowing for measurement of both acute and chronic pain (Desai et al., 2018) as indicated by the AAP (2016). As previously stated by Hills (2019) and Jeanson (2019), since the effects of preterm infant pain may last into adulthood, it is important that scales used in the NICU account for chronic pain, as well as acute pain.

A Painful and Stressful NICU Procedure: Preterm Infant Eye Examinations

Although important and necessary, medical procedures in the NICU are some of the most painful and stressful experiences that preterm infants undergo. One of these procedures is preterm infant eye examinations (AAP, 2016; Disher et al., 2018; Samra & McGrath, 2009). It has been noted in the literature that vision is a “powerful pathway for entering” the brain (Titcomb & Okoye, 2005, p. 1). Eye development typically begins at 16 weeks in utero (National Eye Institute, 2019), with most visual development occurring between 20 and 40 weeks (Graven, 2011). Vision is the last sensory system to develop (Graven, 2011). Development of the retina normally occurs in utero without light or stimulation, so when an infant is born preterm and is exposed to the NICU environment, external visual stimulation in the form of light has the potential to “produce synaptic overproduction and alterations in the visual system cells and connections,” especially for those under 32 weeks gestation (Graven, 2011, p. 674). Therefore, it is important to assess and take measures to protect visual development as much as possible, which includes evaluating the extent of the healing nature of the NICU macroenvironment, as it relates to vision (Graven, 2011).

Preterm infant eye exams are necessary to screen for ROP, monitor visual development and help determine the need for and/ or plan for visual intervention (National Eye Institute, 2019). Researchers and practitioners in the NICU interdisciplinary field have discussed the pain

and stress associated with these eye examinations (Fierson, 2018; Francis, 2016; Pollaci, et al., 2020; Samra & McGrath, 2009). A challenge for the interdisciplinary team working with preterm infants is to find a balance between the necessity of medical screening while managing pain and stress (AAP, 2016).

ROP and other visual deficits. ROP was first identified as a diagnosis in 1942 and is “one of the most common causes of [bilateral] visual loss in childhood and can lead to lifelong vision impairment and blindness” (National Eye Institute, 2019, para. 1). Approximately 14,000-16,000 infants are diagnosed with ROP each year, many of which do not require any treatment (National Eye Institute, 2019).

ROP is classified based on zone (location), stage (extent of vasculature proliferation), and presence of plus-disease (extent of how dilated and twisted the vasculature is) (Chiang et al., 2021). There are three zones in the eye, each of which are described based on their proximity to the optic nerve (Chiang et al., 2021). There are also five stages (National Eye Institute, 2019). Stage one and two ROP are characterized by “mildly [or moderately] abnormal blood vessel growth” in the retina, to which typically resolves without treatment (National Eye Institute, 2019, para. 4). Stage three ROP is characterized by “severely abnormal blood vessel growth” in the retina, and in some cases, “the blood vessels of the retina have become enlarged and twisted” (National Eye Institute, 2019, para. 6). Treatment is typically considered starting at stage three to prevent the possibility of developing a detached retina. At stage four ROP, the retina is partly detached and at stage five ROP, the retina is completely detached (National Eye Institute, 2019).

When infants are born preterm, peripheral vascularization of the retina is not fully formed and exposure to the extrauterine environment ceases blood vessel growth in the peripheral retina (Leung, Thompson, Black, Dai, & Alsweiler, 2018). After 31 weeks gestation, the present blood

vessels are unable to meet their oxygen needs due to increased demands on the retina, prompting further abnormal growth of blood vessels (National Eye Institute, 2019; Leung et al., 2018).

These newly grown blood vessels increase the likelihood of retinal detachment and vision loss associated with ROP (Leung et al., 2018) through blood vessel leakage and scarring of the retina (National Eye Institute, 2019). Treatment for ROP may consist of laser therapy, cryotherapy, scleral buckle, vitrectomy, or surgery for advanced stages (National Eye Institute, 2019).

In addition, preterm birth is not only heavily correlated with development of ROP, but also visual deficits such as minimized visual acuity, visual field deficits, decreased contrast sensitivity, refractive error, strabismus, and difficulties with processing visual input (Leung et al., 2018). Due to prematurity, the dorsal stream for visual processing of motion and location for visuomotor integration is more greatly affected than the ventral stream for visual processing of object form (Leung et al., 2018). Therefore, preterm birth is associated with visual diagnoses and deficits which have the potential to impact participation in daily activities later in life, including education and social participation (Leung et al., 2018).

Use of Non-Pharmacological Interventions for Pain and Stress with an Emphasis on Positioning and Handling

Non-pharmacological interventions, also known as supportive interventions, are non-invasive, non-medication-based interventions for pain and stress management. Unfortunately, research is currently limited related to the efficacy of non-pharmacological interventions for management of preterm infant pain and stress in the NICU. Francis (2016) specifically indicated difficulty comparing past research studies due to varying methodologies, which makes it difficult to provide best practice recommendations. Non-pharmacological interventions most noted in the literature base are included in this brief review.

The AAP (2016) recommends using the following non-pharmacological interventions for pain management: “swaddling combined with positioning,” “skin to skin,” “facilitated tucking with or without parental assistance,” “nonnutritive sucking,” “massage,” “breastfeeding,” “supplemental human milk via a pacifier or syringe” and “sensorial stimulation” (p. 6). Combining non-pharmacological interventions with administration of oral sucrose (sugar water) may provide greater pain relief, especially for eye examinations (AAP, 2016). Although there continues to be inconsistent results related to use of non-pharmacological interventions specifically for ROP examinations, using a combination of interventions or strategies appears to be most effective to reduce pain (Disher et al., 2018; Francis, 2016). Pollaci et al. (2020) recently found that use of non-pharmacological, or supportive, interventions during eye exams were effective in reducing preterm infant pain, bradycardic events, and stress. Supportive interventions utilized in the study included five minutes of rest prior to the eye examination, hand containment and swaddling before, during and after the eye examination, and offering a sucrose pacifier or human milk before, during and after the eye examination (Pollaci et al., 2020).

A meta-analysis of 29 randomized trials was completed by Disher et al. (2018) to determine the effectiveness of using different avenues for pain relief during ROP examinations. Through this analysis, it was concluded that use of topical anesthetics in combination with offering a sweet taste and another supportive intervention, non-nutritive sucking and/or providing a familiar smell such as breast milk, was the most optimal for management of pain (Disher et al., 2018).

Despite the method of preterm infant pain management, the AAP (2016) stated the importance of having an evidence-based guideline and process for pain management that

includes the use of non-pharmacologic interventions and use of pain assessment tools both before, during and after painful procedures.

Partnering with Families

Parents have an innate understanding of their infant's pain, so it is essential for NICU providers to collaborate with and involve them in various ways (Filippa et al., 2019; Hills, 2019). In fact, maternal presence by itself is considered a non-pharmacological intervention (Altimier & Phillips, 2016). Parents should first be educated about pain assessment and pain management strategies through facilitating an open dialogue about pain (Hills, 2019). It is important for the interdisciplinary team to ask parents to what extent they would like to be involved in managing their infant's pain, and their understanding of pain and stress cues (Hills, 2019). It is equally important for parents to be involved in learning about and using strategies to help proactively reduce the likelihood of preterm infant pain both before, during and after painful procedures (Filippa et al., 2019).

There have been various connections made in NICU evidence-based literature regarding the inverse relationship between cortisol and oxytocin (Filippa et al., 2019; Jeanson, 2019; Vinall & Grunau, 2014). Pain experiences have been found to promote greater release of cortisol as a part of the endocrine systems' stress response (Jeanson, 2019), which may be mitigated through parent's use of non-pharmacological strategies in the NICU (Filippa et al., 2019; Jeanson, 2019). Parent based non-pharmacological strategies that promote oxytocin release to mitigate pain and stress included kissing, cradling and containment, skin-to-skin, breastfeeding, holding hands and "mother's milk aroma therapy," as olfactory senses are present starting at approximately 28 weeks (Jeanson, 2019, p. 52). In addition, vocal contact through parents talking or singing to infants during painful procedures may be effective in reducing their pain experience and/or their

sensitivity to pain through oxytocin release to promote emotional recovery (Filippa et al., 2019). Jeanson (2019) stated that “trust is created when caregivers provide ‘recovery’ from pain experiences that are loving, tender, consistent and persistent” (p. 51). Pain experiences, in combination with separation from parents, leads to greater difficulties with cognition, behavior and social participation later in life (Jeanson, 2019). Therefore, parental involvement in pain related experiences may improve cortisol levels and be an important aspect of neuroprotection for the preterm infant (Vinall & Grunau, 2014).

The Basis for Eye Examination Guideline Development

AAP Recommendations for Eye Examinations

It is currently recommended that all infants born less than 30 weeks and/or are born weighing less than 1500 grams receive at least one eye examination during their NICU stay. The neonatologist may also consider other risk factors, prompting completion of an eye examination for infants outside of these parameters. Risk factors include those infants with hypotension and those that received supplemental oxygen during their stay (Fierson, 2018).

Recommendations for the eye examination process. According to Fierson (2018), it is recommended that preterm infant eye examinations be completed by an ophthalmologist using a binocular indirect ophthalmoscope, lid speculum and scleral depressor. An alternative to this method is completion of digital retinal imaging with a wide-angle fundus camera, to which the images are then sent remotely for interpretation by an ophthalmologist. The infant’s pupils should be dilated prior to the examination (Fierson, 2018). According to Wang, Lavery, Dalgleish, Howlett, Hill and Dotchin (2020), non-pharmacological interventions in combination with oral sucrose should be used to manage discomfort associated with administration of dilating drops for eye examinations.

Eye images, and findings, should be documented in the medial record (Fierson, 2018). Treatment is dependent on eye examination findings and clinical judgement from the practitioner. It is important for the practitioner and NICU team to communicate with parents about the eye examination, provide educational materials, discuss the results, discuss purpose for follow up and timeline, as well as document these interactions. A follow up schedule should be determined based on staging and location of detected ROP and/or additional areas of concern related to ROP. Outpatient ophthalmology appointments should be scheduled prior to discharge from the NICU, and handoff of these appointments should be provided to the outpatient pediatrician (Fierson, 2018). Fierson (2018) additionally stated, “as with all ROP screening programs, specific responsibilities of each individual must be carefully delineated in a protocol” (p. 5).

At the same time, it is also recommended that the NICU have an evidence-based plan for preventing and treating premature infant pain. If little to no plan currently exists, it is important to explore avenues for pain prevention and minimization of the pain experience during both routine and more intensive procedures, especially through use of non-pharmacological interventions (AAP, 2016). According to Fierson (2018), “the goal of an effective ROP screening program is to identify infants who could benefit from treatment and make appropriate recommendations on the timing of future screenings and treatment interventions” and to “minimize the discomfort” while doing so (p. 2).

Introduction to Infant and Family-Centered Developmental Care (IFCDC)

The Consensus Committee of the Standards, Competencies, and Best Practices for Infant and Family-Centered Developmental Care (IFCDC) in the Intensive Care Unit was formed in 2015 via an extensive group of interprofessional experts with the aim to produce

recommendations for evidence-based practice to promote developmental care in the NICU. The Consensus Committee has outlined six categories of recommendations, to which reducing and managing preterm infant pain and stress is one of these categories (Hynan, Cicco, & Hatfield 2021). Eye examination guideline competencies created for this project are outlined in Table 3, which were inspired by original competencies developed by Hynan, Cicco, & Hatfield (2021). Each competency was connected to at least one measure of the chosen model in Table 2.

Summary of Best Practice for Preterm Infant Neuroprotection During Eye Examinations

Upon reviewing the literature, it is evident that preterm infant pain and stress, especially related to procedures such as eye examinations, remains an area of concern within the NICU setting. Not only is the goal to promote growth and development through minimizing the infant's overall pain and stress experience, but also to educate and encourage parents to have a more active role in pain and stress management. While there are non-pharmacological interventions that are recommended for best practice, many of them are not actively being utilized or integrated into procedural processes by the NICU. Since OTs in the NICU have an advanced understanding of visual development and the NICU environment, assess for pain and stress and utilize non-pharmacological intervention, routinely educate, and partner with parents, and assess occupational outcomes, OTs have a vital role in reducing pain and stress both before, during and after eye examinations. The Neonatal Integrative Developmental Care Model, recommendations from the AAP, IFCDC based competencies, and research, served as a framework for the development of an evidence-based eye examination guideline and associated resources.

Chapter III

METHODS

The intention of this project was to create an evidence-based eye examination guideline and associated resources that supported use of non-pharmacological interventions and emphasized the importance of parent education and involvement from both an interdisciplinary and OT perspective.

To form the basis of this project, a literature review/needs assessment was completed between May and December of 2021. PubMed was searched using terms such as NICU, preterm, preterm infants, preterm birth, pain, procedural pain, stress, brain, development, visual development, parent involvement and oxytocin. Using the School of Medicine and Health Sciences (SMHS) website, searches were specifically conducted in the *Advances in Neonatal Care Journal*, using terms such as retinopathy of prematurity, N-PASS, and family-centered care. AOTA's website was searched using the term NICU. An *OT Practice Magazine* from May of 2021 was received in the mail and reviewed using search terms such as OT's role, model, recommendations, best practice, standards, and developmental care. This *OT Practice Magazine* provided exposure to the Neonatal Integrative Developmental Care Model, to which four core measures of the model were threaded throughout the guideline and associated resources.

The AAP website was searched using terms such as NICU and pain. The CDC website was also searched using the term preterm birth, and the National Eye Institute website was searched using the term retinopathy of prematurity. In October of 2021, two National Association of Neonatal Therapists (NANT) continuing education courses related to pain, stress and use of non-pharmacological interventions were completed to help inform the project. The

NICU had already been utilizing AAP guidelines for ROP examinations, and so this was provided by the NICU as an additional resource to help inform the product.

Sources chosen for this review were published between 2005 and 2021. Due to the nature of research related to this specific project, 10 out of 26 resources included were published either in or prior to 2017. This literature review, in addition to the stated need on behalf of the NICU OT and interdisciplinary team, formed the basis of the needs assessment for this project.

Ethical considerations for eye examination guideline development included ensuring collaboration from other disciplines, so that each discipline specifically developed their own part of the eye examination guideline. Each individual part was then systematically synthesized with each discipline's approval. Other ethical considerations were included in the development of associated resources, including parent education. Written parent permission for taking infant images for educational resources was obtained. Health literacy was important to consider, to ensure materials were readable and comprehensible to parents, given their differences in backgrounds and experiences. Various learning styles of parents were taken into consideration with development of materials. Source citations were also included on parent educational resources when appropriate.

Chapter IV

PRODUCT

The first goal of the product was to create an interdisciplinary eye examination guideline that could be practically used by the NICU team. This goal was accomplished through creation of an evidence-based interdisciplinary eye examination guideline that outlined discipline specific processes to complete and environmental factors to consider for the eye examination. The neonatologist's process, nursing staff's process and OT's process both before, during and after the eye examination were systematically organized into step-by-step tasks for each discipline to complete. To create the eye examination guideline, the neonatologist and nursing staff processes were completed by these disciplines and then included within the overall product. Environmental considerations were outlined based on knowledge of preterm infant sensory development with an emphasis on light and sound, and were made while also taking into consideration the physical environment and ergonomic needs of the staff conducting the eye examination. A sign for the NICU door was created to remind staff and parents to keep environmental stimulation low around the time of the eye examination.

The second goal of the product was to incorporate greater use of non-pharmacological interventions into the eye examination process to minimize the preterm infant pain and stress experience and promote greater partnership with families. This goal was accomplished through creation of associated resources. In the NICU Eye Examination Guideline Associated Resources packet, OT best practices for supportive intervention are first described via a graphic and supportive interventions are then ranked and categorized into parent direct supportive interventions, parent indirect supportive interventions and staff supportive interventions before, during and after the eye examination. Also in this resource packet is a booklet of supportive interventions, entitled Ways to Support Your Baby. This booklet provides parents with infant

pictures and simple descriptions of ways they can be involved before, during and after the eye examination to provide support to their baby. It is intended that this resource be used by the OT when going through the process for parent collaboration, which is also outlined in the resources packet. In addition, an N-PASS reference card is in the packet which includes scoring criteria for the OT to refer to both before, during and after the eye examination for quantification of pain, identification of the possible impact of supportive interventions provided, and for documentation purposes. Lastly, an eye examination note for OT documentation was also included. This note was created through the EPIC system with use of a dot phrase and contains fill-in-the-blank information for the OT to document pre, during and post eye examination information. It includes a place to document the parent's goal for the eye examination, supportive interventions provided by parents or the OT, parent education completed, environmental considerations made, observed infant neurobehavioral system responses to the eye examination and the infant's N-PASS score before, during and after the examination.

The third goal of the product was to create an avenue for the NICU interdisciplinary team to offer consistent parent education about the eye examination purpose and process. This goal was also accomplished through creation of associated resources. The first resource is an eye examination parent education brochure with QR code. This brochure provides information on visual development, an introduction to eye examinations, provides a brief connective description between eye examinations and pain and stress, and discusses the importance of parent involvement. References to evidence-based literature were also included. The second resource is an eye examination process infographic for parent education and is also in the NICU Eye Examination Guideline Associated Resources packet. This resource includes pictures of equipment, tools and medications used in the eye examination with simple written descriptions

and is organized in a step-by-step way to help describe the eye examination process to parents. Separate, but may be offered for parent education in conjunction with the process infographic, is an image of an infant eye with an inserted speculum. It is intended that this image be offered to parents who have previously stated their desire to be involved in the eye examination but are unsure whether they would feel comfortable looking at their infant during the exam. It is the hope that this resource be used to help parents make informed decisions about their involvement. The third resource is an eye examination parent talking points card, also in the resources packet. This card contains simple supportive talking points for parent education related to the eye examination.

Together, this product includes the interdisciplinary eye examination guideline and associated resources to accomplish the above goals. All four core measures of The Neonatal Integrative Developmental Care Model (Altimier & Phillips, 2016) that were previously discussed can be tied back to the content housed within the guideline and associated resources.

Chapter V

SUMMARY

This scholarly project, *Protecting Against Pain and Stress in the NICU: An Evidence-Based Eye Examination Guideline*, was intended to serve as the basis for the NICU to have an evidence-based, systematic reference point in which to conduct the eye examinations from an interdisciplinary perspective, as the NICU did not have a written guideline prior.

Although literature has discussed the importance and necessity of preterm infant eye examinations in the NICU, it was also determined that there was a connection between eye examinations and pain and stress. Therefore, there was a need to address pain and stress within the guideline through promoting non-pharmacological intervention and parent collaboration for continued growth and development.

Implications

This project emphasized OTs role and scope of practice within the NICU setting, especially OTs use of non-pharmacological interventions for pain and stress management, OTs understanding of visual development and the environment, as well as interdisciplinary and parent collaboration. This project was one of the first, if not the first, to create a NICU eye examination guideline initially inspired by and created within the field of OT. The hope is that this guideline and associated resources are practically used within the NICU, as well as disseminated beyond, to provide other NICUs with an evidence-based avenue to address similar needs.

Strengths and Limitations

Information and feedback gathered through presentations and informal conversations with NICU team members were used to determine the initial impacts of the project. Strengths of this project included its use of evidence-based interdisciplinary research, which through this product, was translated into practice. Additional strengths included collaboration with the

interdisciplinary team throughout product development, as well as creation of a simple eye examination guideline and clear and concise parent educational materials with images.

Limitations of this project included seeing limited implementation of the guideline and resources following dissemination to the NICU. Upon creation and dissemination of the materials, the NICU team will also not have direct parent involvement during eye examinations until determined by the team to be appropriate. In the meantime, parents will still be encouraged to provide indirect supportive intervention to their infant during the eye examinations without being in the room, as well as direct and indirect supportive intervention prior to and after the eye examination. With that said, there is currently no available parent feedback to better understand their perspective on the extent of education and support they received from the team related to the eye examination process upon guideline implementation. Due to limited time, an image of an infant eye with an inserted speculum was also unable to be obtained as a part of the parent educational resources.

Future Recommendations

It is recommended the NICU eye examination guideline be reviewed by the interdisciplinary team on a bi-annual basis. During this meeting, it is encouraged the team discuss the strengths and limitations of the guideline, the perceived impact of the guideline, and take time to brainstorm necessary changes to promote meeting future interdisciplinary goals for the eye examination process. At the same time, it is recommended that Table 3 in Appendix A be reviewed by the interdisciplinary team to determine the extent that competencies are being met. This table should first be completed for baseline information prior to implementation of the created eye examination guideline. Questions are also added to the bottom of this table to promote further team discussion when meeting. In addition, it is also recommended that the

NICU team evaluate other known painful and stressful procedures and determine the appropriateness for similar supportive interventions to be utilized during these processes as well.

To continue to collaborate with parents related to the eye examination process, it is also recommended that the NICU create and provide a survey to parents to determine the extent of support they felt related to the eye examination process, as well as the extent of education provided. Additionally, it is recommended that the team take a photo of an infant eye with an inserted speculum, with parent consent, to add this item to the resources packet.

There continues to be a large need for research related to this NICU topic. It is recommended that research be conducted to determine the short and long-term impacts of the guideline on managing pain and stress, as well as on feeding, sleep, and interaction with caregivers. Continued research is also needed related to the impact of preterm infant eye examinations on feeding, sleep, and interaction to help quantify these occupational outcomes. In the future, it is also recommended that pain and stress be connected to other core measures of the chosen model, including “safeguarding sleep,” “protecting skin” and “optimizing nutrition” (Altimier & Phillips, 2016, p. 231).

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Appendix A

Table 1*Autonomic, Facial and Body Cues to Indicate Pain and Stress*

Autonomic Cues	Facial Cues	Body Cues
Heart Rate (HR) Norm: 140-160 beats/min.	Grimacing or Frowning	Pulling or Pushing Away
Respiratory Rate (RR) Norm: 20-60 breaths/min.	Crying or Open Mouth	Tremoring or Twitching
Oxygen Saturations (O2) Norm: 88-92%	Clenching	Twisting or Squirring
Skin Color Norm: Pink, stable color	Looking Away	Arching
Blood Pressure (BP) Norm: Dependent on the infant	Sneezing or Hiccapping	UE/LE Saluting
Temperature Norm: 36.5-37.5C	Yawning	Finger Splaying

Note. Table information was synthesized from Children’s Minnesota (2021), Jeanson (2019) and Pollaci et al. (2020).

Table 2*Connection of Parent Education Competencies to Model*

Competencies	Connection to the Neonatal Integrative Developmental Care Model
1. Parents are educated on preterm infant pain and stress autonomic, facial and body cues.	Minimizing Pain and Stress
2. Non-pharmacologic interventions are routinely used before, during and after eye examinations.	Minimizing Pain and Stress Positioning and Handling
3. Parents are encouraged to participate in discussions about pain management to make informed decisions regarding their infant.	Partnering with Families
4. Parents are encouraged to be present before, during and after eye examinations to provide non-pharmacologic support for the infant.	Minimizing Pain and Stress Partnering with Families Positioning and Handling
5. Parents are consistently educated on the purpose and process of eye examinations.	Partnering with Families
6. The interdisciplinary team is confident in educating parents about the purpose and process of eye examinations.	Partnering with Families
7. The interdisciplinary team is confident in carrying out their roles in the eye examination process via the guideline.	Minimizing Pain and Stress Partnering with Families The Healing Environment
8. The interdisciplinary team is confident in assessing, monitoring, evaluating for and documenting on preterm infant stress and pain.	Minimizing Pain and Stress

Note: Competencies were written with inspiration from Hynan, Cicco, & Hatfield (2021). Measures of the model were from Altimier & Phillips (2016).

Table 3

Eye Examination Guideline and Parent Education Competencies Team Report Form

Standards for Best Practice: Reducing and Managing Pain and Stress for Preterm Infant Eye Examinations *based off of IFCDC Standard 2 for Pain and Stress <https://nicudesign.nd.edu/nicu-care-standards/ifcdc--recommendations-for-best-practice-reducing-managing-pain-stress-in-newborns-families/>

Objectives/ Competencies	Prior to Guideline: No	Prior to Guideline: Somewhat	Prior to Guideline: Yes	Comments	After Guideline: No	After Guideline: Somewhat	After Guideline: Yes	Comments
Are parents educated on preterm infant autonomic, facial and body cues to indicate pain and stress? (2.2, 2.6, 2.9)								
Are non-pharmacologic interventions routinely used before, during and after eye examinations? (2.2, 2.5, 2.6, 2.8)								
Are parents encouraged to participate in discussions about pain management to make informed decisions regarding their infant? (2.10)								
Are parents encouraged to be present before, during and after eye examinations to provide non-pharmacologic support for the infant? (2.2, 2.5)								
Are parents consistently educated on the purpose and process of eye examinations? (2.4)								
Are you confident in educating parents about the purpose and process of eye examinations? (2.4)								
Are you confident in carrying out your role in the eye examination process via the current guideline? (2.11)								
Are you confident in assessing, monitoring, and evaluating for preterm infant's stress and pain? (2.1, 2.2, 2.3)								

What are strengths and areas of growth for the NICU related to reducing and managing pain and stress during ROP exams?

What feedback has been provided by parents related to the interdisciplinary education they receive related to ROP exams and their participation in the eye exam process?

What are your future plans for eye examination guideline sustainability (i.e. what changes are needed to ensure the guideline continues to be up-to-date, continues to promote best practice, and is appropriately followed by the team)?

Note: Competencies were written with inspiration from Hynan, Cicco, & Hatfield (2021). Competency numbers presented on the form allude to the original competencies by Hynan, Cicco, & Hatfield (2021).

Appendix B

Initial Interdisciplinary Team Discussion Questions

- How is it determined that an eye examination is needed for an infant?
- Describe your current eye examination process.
- Describe your role in the eye examination process.
- Describe your understanding of the purpose of eye examinations in the NICU.
- Describe supportive (non-pharmacological) interventions currently used before, during and after eye examinations.
- Describe typical outcomes as a result of eye examinations.
- What is your current confidence in assessing preterm infant pain and stress?
 - Observing pain and stress cues?
 - Scoring and interpreting the N-PASS?
- What education is currently provided to parents before, during and after the eye examination? How is education provided? Is this education consistent amongst the care team?
- Describe current parent involvement in eye examinations.
- Describe observed parent reactions to eye examinations (if present for them).
- Describe your desired eye examination process and your thoughts on best practice for these examinations.

Appendix C

Permission Statements

Written parent permission for taking infant photos and verbal permission from nursing staff for taking photos of the eye examination equipment, tools and medication were all obtained prior to creation of the product. The hospital Marketing team has all written parent consents and photos used on record. Images used within the NICU Eye Examination Guideline Associated Resources packet are subject to copyright.

Verbal permission was granted by the hospital therapy manager and NICU manager, so spoke with the hospital legal team, to include the NICU Eye Examination Guideline Associated Resources packet within Appendix D of this paper. The other two items, the Evidence-Based Interdisciplinary Eye Examination Guideline and the Eye Examination Parent Education Brochure with QR code will not be posted due to use of the hospital logo on materials.

Appendix D

A photograph of a wooden door with a purple sign that reads "NEONATAL INTENSIVE CARE". The sign is rectangular and has the text in white, bold, uppercase letters. The door has a metal handle on the left side. The background is a solid green color.

**NEONATAL
INTENSIVE
CARE**

April 2022

NICU Eye Examination Guideline Associated Resources

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Eye Exam Parent Talking Points Card

Eye Exam Parent Education

- Your baby will need an eye examination due to their prematurity (Fierson, 2018).
- Preterm infants at your baby's gestational age are at a higher risk for developing retinopathy of prematurity (ROP) (Fierson, 2018).
- ROP is a condition caused by an abnormal growth of blood vessels in a specific part of the eye called the retina (National Eye Institute, 2019).
- Eye examinations are very important to make sure we are doing everything we can for your baby's eye development.
- Vision is the last sensory system to develop, so your baby's eyes require special care and attention while in the NICU (Graven, 2011).
- Eye examinations are one of the more stressful procedures babies go through with us, but as a team we will collaborate with you to ensure your baby is as comfortable as possible (Disher et al., 2018; Francis, 2016; Pollaci et al., 2020; Samra & McGrath, 2009).
- As a parent, your involvement in the eye exam process is important and your presence can make a difference (Altimier & Phillips, 2016; Filippa et al., 2018; Hills, 2019; Jeanson, 2019; Vinall & Grunau, 2014).
- The occupational therapist will meet with you to talk more about the eye examination process and ways in which you can be involved to help support your baby before, during and after the exam. They will help you decide what your comfort level is with participating in the exam.
- If you have more medical questions about ROP, I would be more than willing to connect you with the neonatologist.

Sign for NICU Door



Shhh!



**Some of us are resting
before and/or after eye
exams and like quiet,
dim lights and extra
snuggles right now**



Eye Exam Process Infographic

NICU Eye Exam Process



1. Sugar water is given to your baby.



2. Dilating drops are placed in your baby's eyes.



3. The team will make environmental changes.



4. Your baby is placed on an open warmer or in a crib.



5. Pain relief drops are placed in your baby's eyes.



6. Sugar water is given to your baby.



7. A speculum is placed in your baby's eye to help keep their eye open.



8. If needed, a scleral depressor is placed on your baby's eye muscles to help keep their eye in view.



9. Pictures are taken of your baby's dilated eye with a camera.



10. Gel drops are placed in your baby's eye.



11. More pictures are taken of your baby's eye with the camera.



12. The speculum may be taken out at any point during the exam for a supportive rest break. Pictures are taken one eye at a time, so steps 6-11 will be repeated.

Image of Eye with Speculum

*To be added to resources once available.

Occupational Therapy Process for Parent Collaboration

1. Provide parent education on the eye examination process (**see Eye Exam Process Infographic**)
2. Provide parent education on the ways they can support their baby both before, during and after the eye examination (**see OT Best Practice Supportive Interventions Graphic, Booklet of Supportive Interventions & OT Ranked Supportive Interventions**)
3. Discuss appropriateness of each intervention given the specific infant
4. Ask parents about their eye examination goal(s)
5. Ask parents if they are able to/ comfortable with providing direct and/or indirect support during the eye examination process

Yes

1. Determine parent preferences related to the type and extent of support they would like to/ are able to provide before, during and after the eye examination (**see Booklet of Supportive Interventions & OT Ranked Supportive Interventions**)
2. Discuss timing for appropriate support given the specific infant and make a plan (i.e. provide recorder, scent cloth to parents)
3. If parents plan to be present during the eye examination, discuss their comfort with watching the exam. Offer to provide parents with an **image of an eye with a speculum**. Reassure parents that if they are not comfortable with that visual, they can still provide support while not looking during the eye examination
4. Ask parents if they would like to practice their chosen supportive interventions prior to the eye examination

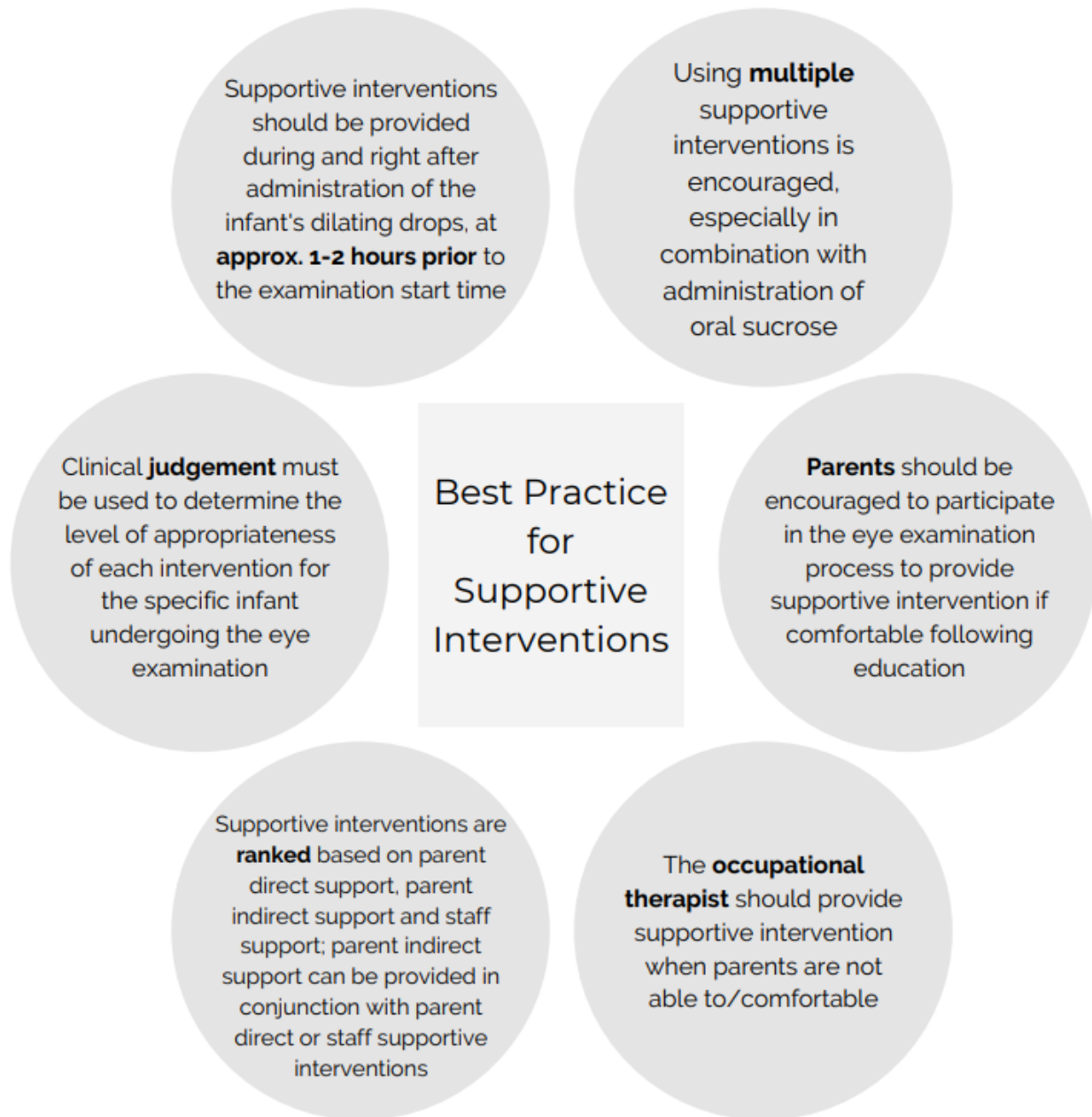
6. Document on parent education provided in daily OT note (.otnicuparentedu)

No

1. Reassure parents that measures will be taken by the team to support the infant during the eye examination
2. Encourage parents to reach out to their NICU team should they have more questions about the eye examination and/or their involvement

(Filippa et al., 2019; Hills, 2019)

OT Best Practice for Supportive Interventions



(American Academy of Pediatrics [AAP], 2016; Disher et al., 2018; Filippa et al., 2019; Francis, 2016; Hills, 2019; Jeanson, 2019; Wang et al., 2020)

OT Ranked Supportive Interventions

Parent Direct Supportive Interventions

Before the Exam: Ranked Supportive Interventions

- 1 Skin-to-skin/ kangaroo care
- 2 Feeding the infant- consider diet order, readiness, schedule and eye examination time
 - Breastfeeding
 - Mother's breast milk or donor milk via bottle, pacifier, syringe or swab for taste
 - Other formula via bottle, pacifier, syringe or swab for taste
- 3 Providing infant massage program, after education is provided by OT
- 4 Holding the infant in a cradle position
- 5 Parents softly talking or singing, support for non-nutritive sucking on a pacifier, swaddling with blankets and/or containment may be provided in combination with any of the above

Parent Indirect Supportive Interventions

- 1 Scent cloth with mother's breast milk *infants greater than 28 weeks gestation

Staff Supportive Interventions

- 1 Feeding the infant- consider diet order, readiness, schedule and eye examination time
 - Mother's breast milk or donor milk via bottle, pacifier, syringe or swab for taste
 - Other formula via bottle, pacifier, syringe or swab for taste
- 2 Providing infant massage program
- 3 Holding the infant in a cradle position
- 4 Staff softly talking or singing, support for non-nutritive sucking on a pacifier, swaddling with blankets and/or containment may be provided in combination with any of the above

OT Ranked Supportive Interventions

Parent Direct Supportive Interventions

During the Exam: Ranked Supportive Interventions

- 1 Swaddling and/or containment with blankets
- 2 Support for non-nutritive sucking on pacifier
- 3 Parents softly talking or singing to infant
- 4 Holding the infant in a cradle position for a rest break between eyes
- 5 Parent presence with hand(s) on infant *parents may look away and still provide direct support to infant

Parent Indirect Supportive Interventions

- 1 Scent cloth with mother's breast milk *infants greater than 28 weeks gestation
- 2 Parent presence in room/area without hand(s) on infant
- 3 Playing a recording of parent's voices softly talking or singing to infant

Staff Supportive Interventions

- 1 Swaddling and/or containment with blankets
- 2 Support for non-nutritive sucking on pacifier
- 3 Staff softly talking or singing to infant
- 4 Holding the infant in a cradle position for a rest break between eyes

OT Ranked Supportive Interventions

After the Exam: Ranked Supportive Interventions

Parent Direct Supportive Interventions

- 1 Skin-to-skin/ kangaroo care
- 2 Holding the infant in a cradle position
- 3 Feeding the infant- consider diet order, readiness and schedule
 - Breastfeeding
 - Mother's breast milk or donor milk via bottle, pacifier, syringe or swab for taste
 - Other formula via bottle, pacifier, syringe or swab for taste
- 4 Providing infant leg massage after education is provided by OT *only if infant is in a quiet alert state
- 5 Parents softly talking or singing, support for non-nutritive sucking on a pacifier, swaddling with blankets and/or containment may be provided in combination with any of the above

Parent Indirect Supportive Interventions

- 1 Scent cloth with mother's breast milk *infants greater than 28 weeks gestation
- 2 Playing a recording of parent's voices softly talking or singing to infant

Staff Supportive Interventions

- 1 Holding the infant in a cradle position
- 2 Feeding the infant- consider diet order, readiness and schedule
 - Mother's breast milk or donor milk via bottle, pacifier, syringe or swab for taste
 - Other formula via bottle, pacifier, syringe or swab for taste
- 3 Providing infant leg massage *only if infant is in a quiet alert state
- 4 Staff softly talking or singing, support for non-nutritive sucking on a pacifier, swaddling with blankets and/or containment may be provided in combination with any of the above

(AAP, 2016; Disher et al., 2018; Filippa et al., 2019; Francis, 2016; Jeanson, 2019; Pollaci et al., 2020)

Booklet of Supportive Interventions: Ways to Support Your Baby

Before the Eye Exam



Skin-to-Skin

Hold your baby on your chest, their skin touching yours.

Cradle Holding

Hold your baby in a cradle position.



Feeding

Ask for your nurse or occupational therapist to see if this would be an appropriate option for your baby, given your baby's feeding time and diet order.



Pacifier

Offer a pacifier to your baby.



Massage

After you have learned about infant massage from your occupational therapist, complete your baby's massage program.

Talking or Singing

Softly talk or sing to your baby.



Swaddling

Wrap your baby in a blanket.



Scent Cloth with Mother's Breast Milk

Place a cloth near your breast for 12-24 hours prior to eye exam.
*Babies greater than 28 weeks gestation.



Containment

Wrap your hands on top or around your baby.

Booklet of Supportive Interventions: Ways to Support Your Baby

During the Eye Exam



Swaddling

Wrap your baby in a blanket.



Hand(s) on Baby

Place one or both hands on your baby.

Containment

Place your hands on top or around your baby.



Scent Cloth With Mother's Breast Milk

Your team will place your cloth next to your baby's face.
*Babies greater than 28 weeks gestation.



Pacifier

Offer a pacifier to your baby.



Parent(s) in Room

Be in the room during the exam.

Talking or Singing

Softly talk or sing to your baby.



Recording of Parent's Voice(s)

Ask your nurse or occupational therapist about playing a recording of your voice talking or singing to your baby.



Holding Rest Break

After the photos for the first eye have been taken, pick up your baby and hold them close for a rest break.

Booklet of Supportive Interventions: Ways to Support Your Baby

After the Eye Exam



Skin-to-Skin

Hold your baby on your chest, their skin touching yours.



Feeding

Ask for your nurse or occupational therapist to see if this would be an appropriate option for your baby, given your baby's feeding time and diet order.

Pacifier
Offer a pacifier to your baby.



Containment

Place your hands on top or around your baby.



Swaddling

Wrap your baby in a blanket.

Massage

If your baby is quiet alert after the exam and you have learned about infant massage from your occupational therapist, you may do massage on your baby's legs.



Cradle Holding

Hold your baby in a cradle position.



Scent Cloth With Mother's Breast Milk

Your team will place your cloth next to your baby's face.
*Babies greater than 28 weeks gestation.



Talking or Singing

Softly talk or sing to your baby.

Recording of Parent's Voice(s)

Ask your nurse or occupational therapist about playing a recording of your voice talking or singing to your baby.



N-PASS Reference Card

N-PASS

Crying/Irritability

- 2: no cry with painful stimuli
- 1: moans or cries minimally with painful stimuli
- 0: no sedation/ no pain signs
- 1: irritable/crying at intervals, consolable
- 2: high pitched/silent continuous cry, inconsolable

Behavior State

- 2: no arousal to any stimuli, no spontaneous movement
- 1: arouses minimally to stimuli, little spontaneous movement
- 0: no sedation/ no pain signs
- 1: restless, squirming, awakens frequently
- 2: arching, kicking, constantly awake/minimal arouse/no movement, non-sedated

Facial Expression

- 2: mouth lax, no expression
- 1: minimal expression with stimuli
- 0: no sedation/ no pain signs
- 1: any pain expression intermittent
- 2: any pain expression continual

Extremities/Tone

- 2: no grasp reflex, flaccid tone
- 1: weak grasp reflex, decreased muscle tone
- 0: no sedation/ no pain signs
- 1: intermittent clenched toes/fists/finger splay, body is not tense
- 2: continual clenched toes/fists/finger splay, body tense

Vital Signs

- 2: no variability with stimuli, hypoventilation/apnea
- 1: less than 10% variability from baseline with stimuli
- 0: no sedation/ no pain signs
- 1: 10-20% from baseline, SaO₂ 76-85% with stim/quick recovery
- 2: greater than 20% baseline, SaO₂ equal/less than 75% with stim, slow recovery, out of sync with vent

Premature Pain Assessment

- 1: <30 weeks gestation/corrected age
- 0: >30 weeks gestation/corrected age

Patricia Hummel, RNC, MA, APN/CNP and Mary Puchalski, RNC, MS, APN/CNS

(AAP, 2016; Desai et al., 2018)

OT Eye Exam Daily Note Documentation

Occupational Therapy NICU Eye Examination Note

Current Gestational Age: ***

Time in: ***

Time out: ***

Units: ***

Date of Service: ***

Diagnoses:

Parent Stated Goal for Infant Eye Examination: ***

Subjective:

*** were present for completion of the eye examination. Therapist present at this time to prepare infant for better tolerance to eye examination and to (support parents to) provide supportive intervention through the eye examination process to facilitate faster recovery and less stress responses.

Pertinent Pre-Session Information:

- State: *** (deep sleep, light sleep, drowsy, quiet alert, active alert, crying)
- Position: *** (supine, L sidelying, R sidelying, prone)
- Vitals: ***HR, ***O2, ***RR, ****temperature
- Respiratory support: ***
- Environment: *** (physical: light, sound, crib/isolette, what infant is wearing)

Pre Eye Examination N-PASS

- Crying/irritability: ***
- Behavior state: ***
- Facial expression: ***
- Extremities/tono: ***
- Vital signs: ***
- Premature pain assessment: ***
 - **Total Pre N-PASS Score:** ***

Parent Education/Involvement

OT educated parents on the purpose of supportive interventions for reducing stress associated with eye examinations, and the importance of their involvement to support occupational outcomes and continued growth and development. Parents were encouraged to actively participate in the eye examination process to the best of their ability and within their level of comfort following education. Parents were provided educational materials to support their understanding of the purpose of the eye examination, what to expect before, during, and after the eye examination, and a description of supportive interventions they can provide during the eye examination process.

OT Eye Exam Daily Note Documentation

Treatment

The following environmental changes were made prior to the eye examination: *** (changing lights, placing privacy curtains, changing the height of eye examination surface, etc.).

The following supportive interventions were provided before, during and after the eye examination by *** OT/parent, with support and guidance from OT.

- Before: ***
 - Length of time for infant support: ***
- During: ***
- After: ***
 - Length of time for infant support: ***

(swaddling, containment, facilitated tucking, non-nutritive sucking via pacifier, massage, gentle voice contact/singing, skin to skin, breastfeeding or milk/formula via bottle, swab, pacifier or syringe, mother's milk aroma therapy, etc.).

During Eye Examination N-PASS

- Crying/irritability: ***
 - Self-regulation response description: ***
- Behavior state: ***
 - State system regulation response description: ***
- Facial expression: ***
- Extremities/tone: ***
 - Motor system response description: ***
- Vital signs: ***
 - Autonomic system response description: ***
- Premature pain assessment: ***
 - **Total During N-PASS Score:** ***

Post Eye Examination N-PASS

- Crying/irritability: ***
- Behavior state: ***
- Facial expression: ***
- Extremities/tone: ***
- Vital signs: ***
- Premature pain assessment: ***
 - **Total Post N-PASS Score:** ***

Plan: ***OT will continue to provide parent education related to eye examinations and will support infant through future eye examinations as able and indicated.

OT will continue to see infant for established POC, sensorimotor and neurobehavioral skills, positioning, engagement skills, promote protected sleep and to educate parents/caregivers in supportive handling with cares and developmental activities that support the infant's positive long term neurobehavioral and sensorimotor outcomes.

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