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Parent and staff perspectives on the benefits and barriers to communication with infants in the neonatal intensive care unit

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Abstract

Exposure to high quantity and quality of language in the neonatal period is critical to neurocognitive development; however, Neonatal Intensive Care Unit (NICU) environments may contribute to language deprivation. Using qualitative thematic content analysis, this study aimed to characterize the knowledge and attitudes of NICU staff and patient families toward the importance of early language experience, the current NICU language environment, and the benefits and barriers of communication in the NICU. Results revealed that all respondents recognized the importance of communication for optimal cognitive development, though few understood why. Staff and family members alike recognized the role of nurses as coaches and role models in promoting communication at the bedside. Nurses generally felt that family members communicate less with their babies than family members themselves perceived, and that cell phone use has fewer communicative advantages than parents perceive. Respondents reported that patient illness, lack of time, and intimidating equipment all raise barriers to communication. These findings yield important considerations for developing educational interventions to improve NICU language environments, including a synergistic, dual focus on both staff and families. Communication in the NICU is a low cost, feasible, and accessible target with aims of ensuring optimal neurocognitive development for at-risk children.

Keywords

Communication, language, neonatal intensive care units, qualitative methods

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Introduction

Language exposure in infancy is critical for language development (Zauche et al., 2016), and the quantity and quality of language that young children experience is strongly linked to later neurocognitive outcomes (Rowe and Weisleder, 2020). The early postnatal period is particularly important for language stimulation, since neural connections that develop in response to social interaction occur at a faster rate in newborns than any other time in human development (National Scientific Council on the Developing Child, 2007). Thus, this a critical developmental window for rich language interaction.

Preterm infants are at increased risk for deficits in speech, language, and communication development (Barre et al., 2011; Harding et al., 2019; van Noort-van Der Spek et al., 2012; Vohr, 2016). Therefore, early language interaction and communication exposure may be even more crucial for ill and/or premature infants in the Neonatal Intensive Care Unit (NICU). Preterm children exhibit similar rates of language development, but are prevented from "catching up" to term-born children because of initial delays developed during NICU stays (Nguyen et al., 2018). Indeed, greater exposure to adult language in the NICU is related to better cognitive and linguistic outcomes at least 18 months after birth (Caskey et al., 2014). This prompts concern that the NICU environment itself may contribute to language and cognitive delays. Suspected influences include increased noise exposure from medical equipment and hospital staff (Wachman and Lahav, 2010) and language deprivation from decreased adult-infant linguistic interaction (McGowan and Vohr, 2019; Pineda et al., 2017; Rand and Lahav, 2014).

The traditional NICU design involves an open-bay arrangement, in which multiple infants, caregivers, and staff are present simultaneously (Vohr, 2019). While open-bay designs theoretically provide more opportunities for auditory language exposure, only about 2–5% of infants' auditory exposure is human vocalization, while two thirds is background noise (Caskey and Vohr, 2013). While single-family rooms may reduce noise exposure, they may inadvertently increase linguistic isolation if caregivers are not actively exposing infants to talking, reading, and singing (Rand and Lahav, 2014). Preterm infants staying in private rooms, compared to those in open-bays, exhibit more atypical neurodevelopmental patterns and lower language scores 2 years later (Pineda et al., 2014). Furthermore, the structure of infants' immediate surroundings presents additional challenges. Many preterm infants require an incubator which significantly attenuates speech and impairs direct, naturalistic verbal communication that influences neurocognitive development (Newman, 1981; Wubben et al., 2011).

Given the importance of rich language experience for neonates, there is an accelerating effort to improve NICU linguistic environments (Mahoney et al., 2017). The American Academy of Pediatrics issued a policy statement in 2016 recommending that, in order to foster optimal cognitive and language development, pediatricians should support parents "to provide a rich and responsive language environment" (Council on Early Childhood, 2016: 3). Language exposure is one of few modifiable risk factors for NICU infants, and the earlier that positive routines are established, the greater the cumulative experience for children (Mahoney et al., 2017).

Outside of the NICU setting, several intervention programs have used parent education to improve children's linguistic environments. These studies find improved developmental neurocognitive outcomes, particularly for children who exhibit language impairment (Heidlage et al., 2020). Although preterm and sick infants in NICU environments are at increased risk of language impairment, there has been limited research on the efficacy of language exposure interventions on long-term cognitive outcomes (Best et al., 2018). Additionally, there has been little wide-scale effort to optimize the neonatal linguistic environment of NICUs, likely due to (1) a lack of knowledge by staff

and parents of the benefits of early linguistic exposure for babies, and therefore lower prioritization of this issue in the busy NICU environment, and (2) perceived and/or real barriers to communication with NICU patients due to physical and medical challenges (Rand and Lahav, 2014).

Overlooking the importance of optimizing the linguistic and communicative environment of NICU patients is a missed opportunity to improve neurodevelopmental outcomes in this at-risk group. Yet the majority of existing interventions to increase language exposure may not be appropriate for the atypical developmental environment present in the NICU (Best et al., 2018). In order to design appropriate, effective intervention to enhance the linguistic environment in the NICU setting, it is critical to first understand the *current* perspectives of providers and families who would be recipients of future interventions and key change agents. The present study aims to fill this gap in knowledge by better understanding and characterizing beliefs about the role of adult-infant communication in the NICU, with a specific focus on the perceived benefits of and barriers to communication. We conducted prospective, semi-structured interviews of multidisciplinary NICU staff and family members and employed qualitative content analysis. The results of this study have the potential to improve the efficacy of future interventions.

Aims and objectives

To characterize the perspectives of NICU staff and patient families toward adult-infant communication, both in the NICU setting and in general. Specifically, to understand staff's and families' (1) beliefs about the influence of early language experience on development, (2) if and how they currently communicate with infant patients, and (3) perceived benefits and barriers to communication with infant patients in the NICU.

Methods

The procedures and ethics of this study were approved by the Institutional Review Board of Boston Children's Hospital, study number IRB-P00030325.

Population

Participants were recruited from a single 24-bed, open-bay, quaternary NICU located in a major metropolitan region in the northeastern United States. We conducted interviews until we reached saturation on measures of interest defined as that point when interviews were no longer yielding novel information as determined by the three study investigators who conducted thematic coding. We reached this point of saturation after conducting a total of 40 interviews of staff and patient family members.

Staff inclusion criteria were direct patient contact and proficiency in English, and we sought a range of experience and training. Family inclusion criteria were legal guardianship of the patient, minimum 3 days stay in the NICU, and sufficient English proficiency to complete the interview. Considering the known relationship between socioeconomic status and language exposure (Rowe, 2018), we recruited socioeconomically diverse families, as indicated by educational attainment. Individual staff and family members who met these criteria were approached specifically to provide diverse perspectives. A convenience sample of staff were approached on shift breaks, and family members were approached during their self-initiated visits. All staff and family members approached agreed to participate and provided informed consent.

Interview design and implementation

The authors developed a semi-structured interview to assess participants' knowledge, beliefs, and attitudes toward the unique benefits and barriers to communication in the NICU setting. Previous studies have used quantitative measures to assess knowledge of the developmental role of language experience (MacPhee, 1981; Suskind et al., 2018), but these did not provide respondents the opportunity to expand on perceived benefits and barriers to neonatal language interaction. Moreover, a thorough literature review did not reveal any instruments designed to evaluate the unique setting of a hospital or NICU environment, necessitating development of the present interview.

Two parallel, scripted questionnaires were designed for staff and for family members (Supplemental Material). Questions were designed to address the study's aims of assessing perceptions of the benefits and barriers to adult-infant communication in the NICU. Questions were open-ended and allowed participants to respond with the extent of information they desired to share. The first set of questions focused on general experience in the NICU and perceived importance of infant communication on development. The second set focused on specific experience with infant communication in the NICU, including frequency and modes of communication, perceived barriers to communication, and perspective on phone usage (i.e., whether it supports communication, is a barrier, or both). Staff then answered questions on perceptions of parent-infant communication, including whether they have ever tried to facilitate parent-infant communication and whether the NICU should be doing more to support parents in communicating with their infants. Finally, parents and staff answered general demographic questions. Interviews were conducted individually in a quiet room near the NICU.

Transcript analysis

All interviews were audio-recorded. Recordings were transcribed verbatim by a single, trained individual blind to participant identity or demographics and verified for accuracy by a second coder. Three trained researchers conducted thematic coding of transcripts using Dedoose software version 8.2.14 (Los Angeles, California), which supports qualitative and mixed methods research. Following qualitative thematic content analysis (Braun and Clarke, 2006), broad recurring themes were identified through open coding of repeated readings of all interviews. Interview excerpts could be classified by more than one code. Each interview was fully coded by two independent coders to ensure reliability across participants, and codes were discussed until consensus was achieved. Themes were then categorized into overarching themes and sub-themes. The perceptions of staff and families were aggregated and compared on topics of modalities, benefits, and barriers to communication.

Findings

Participants

Staff participants (n = 26) included nurses (n = 17) and non-nurses (n = 9) (Table 1). Because bedside nurses spend a greater proportion of time with patients and families, they were purposefully overrepresented in the sampling. The final sample included 14 bedside nurses, 3 neonatal nurse practitioners, 1 attending physician, 2 neonatal fellows, 1 surgical fellow, 1 resident, 1 clinical

Table 1. Occupations and experience of staff participants.

	Years of experience in current NICU number (Percent)	
Participants (n = 26)	Less than 5 years	5 years or more
Nurses		
Bedside nurse	5 (19%)	9 (35%)
Neonatal nurse practitioner	2 (8%)	1 (4%)
Other Staff		
Resident	1 (4%)	0 (0%)
Attending	0 (0%)	1 (4%)
Neonatal fellow	2 (8%)	0 (0%)
Surgical fellow	1 (4%)	0 (0%)
Clinical assistant	1 (4%)	0 (0%)
Dietician	0 (0%)	1 (4%)
Respiratory therapist	0 (0%)	1 (4%)
Volunteer	1 (4%)	0 (0%)

Note: NICU: Neonatal Intensive Care Unit.

assistant, 1 respiratory therapist, 1 dietician, and 1 experienced hospital volunteer. Staff had a median of 5 years of experience working in this specific NICU (range of 1 month–29 years).

Thirteen parents (7 mothers, 6 fathers) also consented to participate. Additionally, one grandmother requested to participate to offer a wider family perspective and was included in the final family sample (n = 14). Family participants ranged in educational attainment from completion of high school through graduate degree, with half of participants having attained less than a college degree, and half having attained a college degree or higher (Table 2). Five families (36%) reported speaking languages in addition to English at home. Nine families (64%) reported that this was their first child.

Interviews and thematic coding

The length of interviews ranged from 5–20 min (Median = 9.2 min). After thematic coding was completed, themes were categorized into overarching themes and discrete sub-themes. Five overarching themes and 23 sub-themes were identified and are displayed in Figure 1. Responses are summarized below, with selected quotes denoted by pseudonyms.

Modes of communication

Staff and family members described multiple modes of verbal and nonverbal communication, including talking, reading, singing, touching, looking, and using phones/mobile technology to supplement communication. The most common form of verbal communication was talking to the babies, with staff and family each finding opportunities within their respective roles. One physician noted verbalizing her physical exam saying,

> "your heart sounds good, your lungs sound good."—Margaret

Table 2. Demographic characteristics of family participants.

Participants (n = 14)	Number (Percent)
Relationship	
Mother	7 (50%)
Father	6 (43%)
Grandparent	1 (7%)
Education Level	
High school	3 (21%)
Some college	4 (29%)
Bachelor degree	4 (29%)
Advanced degree	3 (21%)
First Child	—
Yes	9 (64%)
No	5 (36%)
Number of Languages Spoken at Home	
One	9 (64%)
Two	4 (29%)
Three or more	1 (7%)

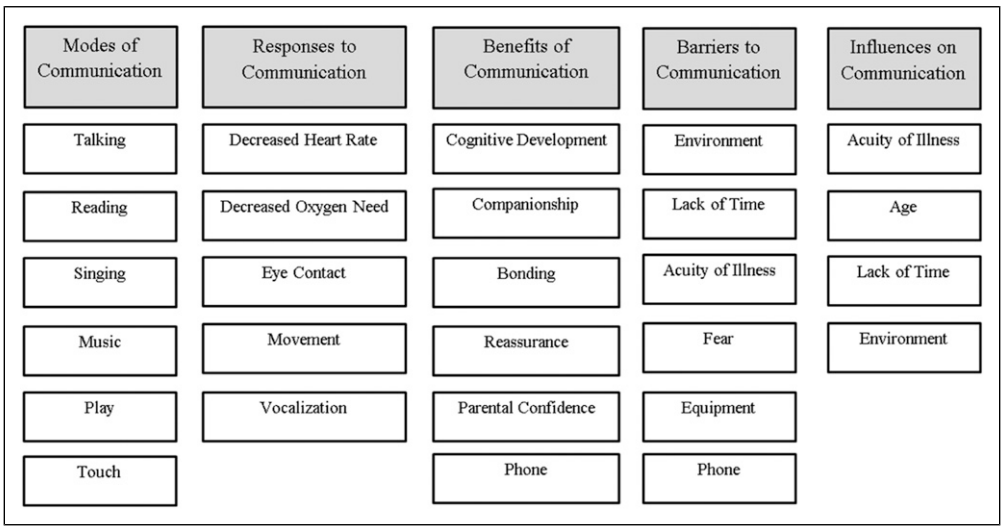

Figure 1. Identified Themes and Sub-Themes. Transcripts of semi-structured interviews were open-coded for broad, recurring themes. The identified themes were then categorized into five overarching themes with 23 discrete sub-themes. Gray boxes represent the overarching themes, and the white boxes directly below represent the associated sub-themes.

A nurse explained that she purposefully talks to babies during care as she would with an adult patient, letting the baby know what she is doing at each stage. A few nurses and most family members said they read to babies to expose them to speech.

The next most common modes of communication mentioned were singing and music. Both staff and family members said singing was an important mode of communication, yet both clarified this was not always comfortable given concerns about their singing voices in the open-bay NICU. Most family members said they played music to their babies. More staff than parents felt listening to music serves as a form of communication. One parent recognized that music was therapy for herself, as well as being a great communication tool for interacting with her baby.

All staff and family members identified touch as the primary mode of nonverbal communication. Types of touch mentioned included rocking, patting, rubbing, holding hands, stroking foreheads, and helping babies make eye contact and track communicators. One nurse described applying lotion and changing the sheets as forms of interaction and communication. Another nurse linked verbal communication with visual communication by encouraging parents to get close to the babies, saying,

> "I like it when parents are right up there almost in the baby's face talking to them, because I know, especially with our preemies and even [term] newborns, they can't see that well and they can't hear that well. But you can see the difference when somebody gets right in their face and they're like 'woah ok, I hear the voice, but now I can tell there's a face with that voice.'"—Karen

When asked how babies respond to their communication efforts, both staff and family members described seeing kicking, finger gripping, and eye contact. Both groups described babies appearing calmer during communication, and nurses described improved physiologic parameters. However, both staff and family members expressed interest in learning more about identifying ways that infants respond to communication.

Benefits of communication

Both staff and family members expressed awareness that communication is important for healthy development, but few could specifically explain specifically how or why. Primary benefits identified were improved bonding between the family member and baby, the calming effect of hearing voices, and potential for a direct role in improving neurodevelopment.

The majority of staff and family members commented that babies seem to recognize their parents' voices and felt this aided bonding. A nurse stressed that communication offers parents an irreplaceable role, since

> "parents have so little control over so many other aspects of their life while they're here, but communication is one of the things that they can control. It is one little piece of normalcy in all this craziness. We do so much hands-on care, but the mother or father's touch or voice, that's the one thing that can only come from them, …and it's so special that they get to own that."—Susan

Multiple staff reported thinking that babies were comforted by hearing voices, especially familiar ones heard in utero. They said frequent talking, singing, and reading may provide a soothing effect amidst the *"chaotic"* and stressful nature of the NICU. Many nurses recounted specific instances of observing physiologic changes in infants' vital signs in response to communication, such as

increased oxygen saturation and decreased heart rate. Additionally, several nurses believed that talking to infants was important even if patients were sedated or undergoing neuromuscular blockade, stating

> "even though they don't talk back doesn't mean they can't hear you."—Patricia

A clinical assistant confirmed this impression, saying,

> "I think talking to any [baby] will help them even if they're sedated and muscle relaxed,…it helps just knowing there's someone there and they're not just lying there alone."—Sarah

Nearly all staff and family members expressed beliefs that communicating with babies benefitted their development. Several staff mentioned that talking with babies can have a positive effect on cognitive development, including language and intelligence. One physician recalled research findings that *"early life experience shapes brain development [during] critical periods of exposure."* Several nurses additionally noted that frequent communication may help to normalize infants' experiences and make it more similar to a home setting. A few staff members suggested that hearing language might be even more important for NICU patients than for the typically developing population because of increased risk for cognitive delays, the potentially noxious nature of the NICU, and because they often cannot be held, accentuating the need for other positive interactions. Family members believe communication was important for neurocognitive development but reported few details of the reasoning.

While staff mostly focused on benefits of communication for babies' long-term development, family members primarily focused on short-term benefits during babies' NICU stay. Multiple family members noted that hearing familiar voices and music, and seeing facial expressions, such as smiles and mouth movements, were calming and intriguing to babies. They described this as being engaging for babies while also providing solace to family members. A few parents mentioned believing vocal communication directly improved babies' physical conditions, and one parent stated,

> "To this day I think [communicating with my baby] truly helped him, with his heart, his breathing…I've always looked back and I think it's been a positive."—Sharon

Barriers to communication

Both staff and family members noted illness acuity and lack of time as the major challenges to communication in the NICU. Illness acuity was directly related to barriers such as lack of prioritization, infeasibility, and physical challenges including incubators and invasive medical equipment, as well as fear of potential risks to patients.

All clinical staff agreed that the medical needs of the most critically ill patients are prioritized over efforts to communicate with them. One surgical fellow explained,

> "how critical a condition they are in has a big effect for me because I get too hyper-focused on the overall vitals and conditions…I lose focus on their cognitive development."—Keith

One nurse reflected that this focus occasionally causes staff to overlook the communication needs of their patients even when they are less acute, stating,

> "I think some of the babies are so ill that we forget that when we have patients who are less ill, that we need to interact with them as if they were at home."—Maria

When staff and family members were able to communicate with acutely ill infants, barriers included degree of sedation, equipment (e.g., intubation), treatments, and the physical environment (e.g., presence of an incubator). All staff found initiating communication to be more challenging when infants had limited responsiveness, such as during deep sedation or neuromuscular blockade. One parent described difficulty communicating with her baby when he was *"surrounded by wires"* and when his schedule was unpredictable. Nearly all parents noted that their communication with their babies was inhibited by noise, limited space, and privacy. Nurses and family members both raised specific concerns about incubators—commonly used for premature babies—as concrete barriers to communication. One nurse stated,

> "for the tiny micro-preemies, I feel like when they're in the box with the cover and the door shut, the parents see a lot of physical and emotional barriers to talking to them,"—Michelle and a parent recalled telling the bedside nurse "I felt crazy talking to a box."

Time limitation was another barrier raised by all staff. Because the majority of their workday must focus on patients' medical needs, it leaves limited time to spend on direct communication with patients. One nurse stated,

> "You just don't have enough time sometimes just to sit there and spend time talking to the baby when you have 5 meds to give to the other [patient] or a family meeting or an off the floor [study]."—Annie

However, many staff members expressed the desire to spend more time at the bedside communicating with their patients if the opportunity were available.

In addition to infeasibility, both nurses and family members identified parental fear and anxiety about communicating with their babies as a major challenge. The degree of fear seemed related to patient acuity and number of medical devices and machines present. One parent said that she was afraid to touch her baby without permission. One nurse observed,

> "I think parents are scared they don't know what to do, how to do it, they don't know if the baby can hear them or not, feel them or not, if they should touch them or not, and the younger the baby the harder it is."—Lisa

Family members voiced that their concern, whether founded or not, often prevented them from interacting with their child.

> "I know with him being intubated, I'm sure it would be ok to hold him, but I'm pretty cautious with that…just for my peace of mind."—Jordan

A few parents stated that they did not want to add to the noise level as they thought it could upset their baby. One parent stated she was striving to find a balance between talking with her baby and letting her get sleep and grow. Some non-nurse staff and parents were concerned that if infants were sick, communication might have a negative impact on them. One clinical assistant shared, *"If*

they're sick…I'm afraid that maybe me talking or making noises will make them worse."—Eileen. No nurses raised this concern.

Differences between staff and family member perceptions

While many responses were similar between staff and parents, there were three main areas of divergence: personal comfort level with communication, perceived frequency of parental communication, and whether cell phones facilitate or hinder communication.

First, while many staff members expressed feeling comfortable communicating with the babies, many parents expressed discomfort and looked toward staff, particularly nurses, to guide them in communicating with their babies. Both nurses and parents recognized the important role of nurses in promoting parent-baby interaction, especially for sicker patients. The majority of staff said that they encourage parents to talk to, read to, and touch their babies. One nurse said that she saw herself as a role model for parents in this regard. Many of the parents stated that they look toward staff to let them know how and when it is ok to talk to or touch their baby. A few parents said that they like knowing that staff members are nearby while they touch their baby. One parent stated that she did not want to *"get in the way"* of the nurse caring for the baby. All parents said that they felt supported by staff in their efforts to communicate.

Second, staff believed that parents were communicating with their babies less frequently than parents thought they were. Parents uniformly reported communicating often with their babies, describing the frequency as *"most of the time," "a lot,"* and *"fairly often."* While some staff reported that parents tend to communicate a lot of the time, other staff thought parents could communicate with their babies more often.

Staff often commented that family members' phones were more of a detriment to communication than family members perceived. Many nurses noted that cell phones at the bedside are distracting and shift parents' focus away from interactions with infants. One nurse remarked,

> "It hurts my heart when someone gets their preemie up for the first time, they're kangarooing [with the baby placed skin to skin on the parent's chest] but they're just on their phone, not even being in the moment."—Mike

While parents felt that phones served a constructive role in supporting communication, some did acknowledge that they tried not to use phones in front of their baby.

Both staff and family members described ways in which cell phones support their communication. Several family members used phones to play audiobooks and music. One nurse described as *"powerful"* how family members often record stories and asked her to play them in their absence. A few parents described watching TV with their babies. Many family members described using videochat to enable relatives who could not visit to talk directly to the baby; however, one parent noted that videochat might benefit the relatives more than the baby.

Effects of babies' age

Only staff were asked about the effect of a baby's age on communication, since family members had only singular experiences. Staff unanimously reported that the patient's age has a large effect, with older babies receiving more communication for reasons of practicality, developmental appropriateness, and responsivity.

In younger babies, nonverbal communication and quiet talking were the most frequently mentioned forms of communication. Many nurses reported using lower volumes and softer tones with younger babies. A few nurses said it was more difficult to communicate with younger babies because they were often in incubators. One nurse reported occasionally talking softly through the incubator, but that her communication with the younger babies was mostly nonverbal, using soft touch and other comforting measures. Most nurses recalled not talking or singing to young babies as frequently as older babies. A few nurses reported that parents of younger babies find it harder to communicate because they do not know what to do, if their baby can hear them, or if they should touch their baby. A surgical fellow stated that he found it harder to communicate with younger patients because they cannot make consistent eye contact or perform tracking movements. A nurse practitioner joked that she likes to *"keep the little preemies contained and the older [babies] entertained."*—Mary

Most clinical staff reported that they are more inclined to initiate communication with older babies because they are more alert and interactive, exhibiting overt responses to communication, such as smiling, cooing, tracking, moving, and making eye contact. A few nurses described it being more appropriate to introduce objects to facilitate communication with older babies, such as giving them toys and mobiles. Yet despite these differences in modality and frequency of communication, most staff acknowledged that communication is important for infants of all ages.

Discussion

This study aimed to characterize the perspectives of NICU staff and patient families toward communication with infant patients. We achieved this aim by employing qualitative thematic content analysis on semi-structured interviews and identifying recurring themes about the benefits and barriers to engaging in communication in the NICU.

Although we aimed to assess verbal communication, respondents reported using a variety of verbal and nonverbal modalities to communicate with NICU patients, which was influenced to some degree by patient age, severity of illness, and degree of sedation. Both staff and family members identified that the primary benefits of communicating with patients included facilitating parent-infant bonding, providing a physiological calming effect, and aiding cognitive and neurological development. These perspectives are consistent with findings on the benefits of "Language Nutrition," which refers to the use of frequent, qualitatively rich language interactions that have been shown to support neural, cognitive, and social development (Zauche et al., 2016, 2017). Results suggest that staff and families had some intuition about the benefits of early language interaction; however, few had a detailed understanding of why, and many expressed interest in gaining greater knowledge. Primary barriers to communication included lack of staff time, medical and equipment barriers, and parental fear of risks to very ill babies, consistent with findings on perceived barriers to general parental engagement (Klawetter et al., 2019). However, respondents were eager to reduce these barriers and increase all types of communication, supporting the need for comprehensive, targeted communication interventions (Mahoney et al., 2017).

Strengths and limitations

Study participants comprised a wide variety of staff roles and parent socioeconomic status, providing good representation of perspectives. Also, because interviews were conducted within the

scope of the normal practice of the NICU setting, it provides high trustworthiness and transferability (Lincoln and Guba, 1985). However, the setting and participants potentially limit the scope of generalization. First, because the setting was a quaternary NICU, patients primarily had acute medical concerns. Therefore, both staff and family members were likely exposed to higher-than-average medical acuity/complexity and may have perceived more barriers than in units with a large population of healthy preterm babies. Additionally, the open-bay setting likely influenced comments about chaotic atmospheres and loud equipment, and may not be applicable to single-family room designs (Vohr, 2019); though most comments are relevant in either setting. Further, bedside nurses were overrepresented amongst staff because they spend the most time interacting with patients and families and were deemed more likely to be key change agents. A deeper sampling of non-nurse staff may provide additional perspectives. Finally, while the family sample was socioeconomically diverse, it did not include families not fluent in English, which limited the cultural and linguistic variation of potential participants. A more diverse family sample may reveal a wider variety of perspectives. Finally, this study was conducted in a United States-based NICU, so direct implications may be most immediately relevant to similar contexts. However, early communication is important for infant development across global contexts. Because high quality communication is an important modifiable variable that carries no direct financial cost, consideration should be given to adapting our findings to other NICU settings with varying practices and resources.

Implications for practice

These findings have important implications for improving the language and communication environment in NICU settings. While certain medical and equipment barriers are difficult to modify, reducing perceived barriers such as time and knowledge are more feasible. Importantly, both staff and family members recognized the role of nurses as coaches and role models to promote communication, consistent with previous findings of the importance of neonatal nurses to caregivers (Mahoney et al., 2017). Interestingly, nurses believed that parents were communicating with their infants less frequently than parents themselves perceived. Nurses might close the gap and increase parent confidence by acknowledging parents' communication efforts when noticed. Furthermore, because family members perceive cell phones to *facilitate* communication, staff frustration with parental distraction may be mitigated by knowing that families find phones useful for involving those who are likely important sources of support. Simultaneously, staff may improve the benefit of phones by demonstrating uses such as reading or listening to music and stories, while also educating that the gold standard is face-to-face communication with "serve and return" alternating responses between the infant and adult (Shonkoff and Bales, 2011). Additionally, both staff and families might benefit from interactive educational curricula explaining how early language experience supports brain development, with feasible strategies for increasing verbal and nonverbal communication. Families trust their providers; learning of the importance of early communication directly from providers has the potential to transform infants' experiences during and long after they leave the NICU.

Conclusion

The present study revealed that both multidisciplinary care providers and family members recognize the importance of communicating with babies in the NICU. They describe traditional and innovative approaches to communication and demonstrate widespread interest in understanding more about the

neurodevelopmental value of early communication and promoting its benefits. These results suggest the need for scalable, multipronged interventions to reduce systemic barriers to infant communication in the NICU, including education for both staff and family members on the neurocognitive importance of communication across gestational ages and degrees of illness, and demonstrating strategies for increasing communication. Fostering such communication in the NICU is a low cost, feasible, and accessible area for improvement, and a crucial area of attention to improve neurodevelopmental outcomes for at-risk infants.

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Supplemental material

Supplemental material for this article is available online.

References

Barre N, Morgan A, Doyle LW, et al. (2011) Language abilities in children who were very preterm and/or very low birth weight: a meta-analysis. *The Journal of Pediatrics* 158(5): 766–774.

Best K, Bogossian F and New K (2018) Language exposure of preterm infants in the neonatal unit: a systematic review. *Neonatology* 114(3): 261–276.

Braun V and Clarke V (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2): 77–101.

Caskey M, Stephens B, Tucker R, et al. (2014) Adult talk in the NICU with preterm infants and developmental outcomes. *Pediatrics* 133(3): e578–e584.

Caskey M and Vohr B (2013) Assessing language and language environment of high-risk infants and children: a new approach. *Acta Paediatrica* 102(5): 451–461.

Council on Early Childhood and Council on School Health (2016) The pediatrician's role in optimizing school readiness. *Pediatrics* 138(3): e20162293.

Harding C, Levin A, Crossley S-L, et al. (2019) Effects of early communication intervention on speech and communication skills of preterm infants in the neonatal intensive care unit (NICU): a systematic review. *Journal of Neonatal Nursing* 25(4): 177–188.

Heidlage JK, Cunningham JE, Kaiser AP, et al. (2020) The effects of parent-implemented language interventions on child linguistic outcomes: a meta-analysis. *Early Childhood Research Quarterly* 50: 6–23.

Klawetter S, Neu M, Roybal KL, et al. (2019) Mothering in the NICU: a qualitative exploration of maternal engagement. *Social Work in Health Care* 58(8): 746–763.

Lincoln Y and Guba EG (1985) *Naturalistic Inquiry*. Beverly Hills, CA: Sage.

MacPhee D (1981) *The Knowledge of Infant Development Inventory*. Chapel Hill, NC: University of North Carolina.

Mahoney AD, Zauche LH, Hallowell S, et al. (2017) Leveraging the skills of nurses and the power of language nutrition to ensure a better future for children. *Advances in Neonatal Care* 17(1): 45–52.

McGowan EC and Vohr BR (2019) Impact of nonmedical factors on neurobehavior and language outcomes of preterm infants. *NeoReviews* 20(7): e372–e384.

National Scientific Council on the Developing Child (2007) *The Timing and Quality of Early Experiences Combine to Shape Brain Architecture: Working Paper No. 5*. Retrieved from www.developingchild.harvard.edu.

Newman LF (1981) Social and sensory environment of low birth weight infants in a special care nursery. An anthropological investigation. *The Journal of Nervous and Mental Disease* 169(7): 448–455.

Nguyen T, Spencer-Smith M, Zannino D, et al. (2018) Developmental trajectory of language from 2 to 13 years in children born very preterm. *Pediatrics* 141(5): e20172831.

Pineda R, Durant P, Mathur A, et al. (2017) Auditory exposure in the neonatal intensive care unit: room type and other predictors. *The Journal of Pediatrics* 183: 56–66.

Pineda RG, Neil J, Dierker D, et al. (2014) Alterations in brain structure and neurodevelopmental outcome in preterm infants hospitalized in different neonatal intensive care unit environments. *The Journal of Pediatrics* 164(1): 52–60.

Rand K and Lahav A (2014) Impact of the NICU environment on language deprivation in preterm infants. *Acta Paediatrica* 103(3): 243–248.

Rowe ML (2018) Understanding socioeconomic differences in parents' speech to children. *Child Development Perspectives* 12: 122–127.

Rowe ML and Weisleder A (2020) Language development in context. *Annual Review of Developmental Psychology* 2(1): 201–223.

Shonkoff J and Bales S (2011) Science does not speak for itself: translating child development research for the public and its policymakers. *Child Development* 82(1): 17–32.

Suskind DL, Leung CYY, Webber RJ, et al. (2018) Development of the survey of parent/provider expectations and knowledge (SPEAK). *First Language* 38(3): 312–331.

van Noort-van der Spek IL, Franken MC and Weisglas-Kuperus N (2012) Language functions in preterm-born children: a systematic review and meta-analysis. *Pediatrics* 129(4): 745–754.

Vohr BR (2016) Language and hearing outcomes of preterm infants. *Seminars in Perinatology* 40(8): 510–519.

Vohr BR (2019) The importance of parent presence and involvement in the single-family room and open-bay NICU. *Acta Paediatrica* 108(6): 986–988.

Wachman EM and Lahav A (2010) The effects of noise on preterm infants in the NICU. *Archives of Disease in Childhood: Fetal and Neonatal Edition* 96: F305–F309.

Wubben SM, Brueggeman PM, Stevens DC, et al. (2011) The sound of operation and the acoustic attenuation of the Ohmeda Medical Giraffe OmniBed. *Noise & Health* 13(50): 37–44.

Zauche LH, Darcy Mahoney AE, Thul TA, et al. (2017) The power of language nutrition for children's brain development, health, and future academic achievement. *Journal of Pediatric Health Care* 31(4): 493–503.

Zauche LH, Thul TA, Mahoney AED, et al. (2016) Influence of language nutrition on children's language and cognitive development: an integrated review. *Early Childhood Research Quarterly* 36: 318–333.