

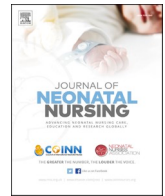


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Parental perspectives on technology use to enhance communication and closeness during the COVID-19 parental presence restrictions

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ABSTRACT

Objective: To explore parental perspectives on the use of technology in neonatal intensive care units (NICU), and its impact during COVID-19 parental presence restrictions.

Methods: Co-designed online survey targeting parents of infants admitted to a Canadian NICU from March 1st, 2020 until March 5th, 2021.

Results: Parents (n = 117) completed the survey from 38 NICUs. Large variation in policies regarding parental permission to use technology across sites was reported. Restrictive use of technology was reported as a source of parental stress. While families felt that technology helped them feel close to their infant when they could not be in the NICU, it did not replace being in-person.

Conclusion: Large variation in policies were reported. Despite concerns about devices in NICUs, evidence on how to mitigate these concerns exists. Benefits of using technology to enhance parental experiences appear substantial. Future study is needed to inform recommendations on technology use in the NICU.

1. Introduction

Globally, 11% of infants are born preterm (i.e., less than 37 weeks gestational age), many of whom require intensive care (Althabe et al., 2012). Preterm birth is the primary driver of infant mortality and morbidity, with increased risk for adverse developmental, social, and behavioural outcomes (Lee et al., 2020). However, there is strong evidence to support that greater parental presence and engagement in care amplifies positive outcomes for both infants and parents. Widespread adoption of family-centered and family-integrated care philosophies in NICUs has facilitated greater, unrestricted parental presence, enhanced collaboration between parents and the clinical team, and parental engagement in caregiving activities (e.g., skin-to-skin care, procedural pain management, feeding) (O'Brien et al., 2018). Family-integrated

care has been found to improve infant growth and development and lower the incidence of infant stress and morbidities (e.g., sepsis, necrotizing enterocolitis, intraventricular hemorrhage) (O'Brien et al., 2018). Parents experience significant benefits from greater engagement in care including enhanced parent-infant attachment and bonding, parental self-efficacy, higher rates of breastfeeding exclusivity at discharge, and lower parental stress and anxiety (Cheng et al., 2019).

Despite these benefits, the rapid onset of the COVID-19 global pandemic triggered hospital administrators and NICU leadership worldwide to implement restrictive visitation policies that aligned with public health guidelines deemed necessary due to the state of emergency (Bembich et al., 2021; Darcy Mahoney et al., 2020; van Veenendaal et al., 2021). While intended to protect families and healthcare providers from illness, these policies significantly limited parental presence

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and engagement in infant care, with some restricting any parents from being in the NICU or allowing only one parent to be present. The severe restrictions and public health physical distancing orders further disrupted access to family and social support networks, greatly impacting parental mental wellbeing (Cameron et al., 2020; Fontanesi et al., 2020).

Prior to the COVID-19 pandemic, use of technology, such as video-conferencing or online learning platforms, were found to support a positive experience for families in the NICU by facilitating easier access to health education and infant information, especially when parents could not be physically present in the NICU (Dol et al., 2017; Monaghan et al., 2020). Technology has played a critical role during the pandemic as a medium to disseminate public health information (Budd et al., 2020), mediate social support and connection (Gabbadini et al., 2020; Shah et al., 2020), to promote coping and mental wellbeing (Gabbadini et al., 2020), and to support health care delivery through interventions like telehealth, epidemiological surveillance, and health education.

Considering the strict limitations on parental presence in the NICU, the degree to which technology was used in Canadian NICUs to mitigate the barriers imposed by presence restriction policies merits exploration.

Objective

Using data collected from a national Canadian parent survey, this study describes parental perspectives on the use of technology and its impact on enhancing communication and parent feelings of closeness with their infant during COVID-19 parental presence restrictions.

2. Methods

2.1. Study population

The target population for this study was parents or persons who were identified as the primary caregiver of an infant admitted to a Canadian NICU on or after March 1st, 2020.

2.2. Procedures

An online, mixed methods, cross-sectional survey targeted at parents of infants' requiring care in a Canadian NICU during the COVID-19 pandemic (Creswell and Hirose, 2019). Data collection occurred between October 5th, 2020 and March 5th, 2021.

The survey was collaboratively designed by a team of parent partners (i.e., parents of infants who previously required NICU care), researchers, NICU clinicians, and administrators across Canada. To enhance the accessibility of the survey, it was available in Canada's two official languages, English and French. The development and execution of this survey was completed in consultation with key national stakeholders from the Canadian Premature Babies Foundation, Canadian Neonatal Network, and the Family Integrated Care (FICare) research initiative.

The survey was comprised of eight sections to collect data related to participant demographics (parents and infants), specific NICU information (location and unit presence policies), impact of presence policies on families and experience related to COVID-19 and use of technology. Additionally, there were eight open-ended questions which provided parents the opportunity to narratively describe their NICU experience during the pandemic. The primary focus of this paper was to gather, from a parent perspective, a comprehensive understanding of technology use in the NICU considering the restrictive presence policies.

Using the REDCap platform (Harris et al., 2019) the online survey was accessible by a public link (<https://tinyurl.com/momlinc-nicu-covid>) and widely circulated through online approaches including the primary research team's website, social media, paid Facebook advertisements, posts to NICU-related parenting forums, and emails to key stakeholders in NICUs across Canada.

2.3. Statistical analysis

Descriptive statistics were used to describe survey data related to respondent demographics, NICU site characteristics, and technology use. Narrative responses were analyzed using inductive thematic qualitative content analysis (Elo and Kyngäs, 2008). Using NVivo 12, one author categorized findings into themes related to technology use in the NICU during COVID-19. A second author verified the themes prior to finalizing analysis and any disagreements were resolved through consensus.

2.4. Ethical review

The study received ethical approval through the primary research institution, IWK Health (REB # 1025748) before initiating recruitment.

3. Results

3.1. Participants

One hundred and seventeen parents from 38 NICUs across Canada completed the questionnaires on technology use in the NICU. The majority of the sample were from Ontario (n = 40, 34%) or Alberta (n = 19, 16%), with the least number of participants from Newfoundland and Labrador (n = 1, 1%) and Prince Edward Island (n = 1, 1%). Most responses were from mothers (n = 110, 94%). Parents primarily identified as White (n = 103, 88%) and were married or common law (n = 106, 91%). On average, parents were 31.5 ± 4.9 years, lived between 11 and 30 km from the NICU, and were admitted in the NICU for 34.6 ± 35.6 days. Most of the infants were singleton births (n = 107, 94%) with gestational ages between 32 and 36 weeks (n = 39, 33%), above 37 weeks (n = 33, 28%) or between 28 and 31 weeks (n = 26, 22%). Fifty-two parents (45%) had at least one other child at home during their NICU admission. Infant and parent demographics are fully outlined in Table 1.

3.2. Presence policies

Most parents (n = 77, 66%) indicated that only one parent could be present with an infant in the NICU, whereas 40 parents (34%) could have two or more people present, and switching of family members/support people was only permitted for 56 parents (48%). Fifty-three parents (46%) noted that only one parent could stay in the NICU overnight and 51 parents (44%) noted that no overnight stay was permissible.

3.3. Communication and technology

Two-thirds of parents reported that they communicated with the NICU care team primarily by traditional telephone calls. Other forms of technology, such as video calls and text messaging, were less commonly used, and 19 parents reported no communication at all with the NICU care team. Similarly, to feel close with their infant or family, parents primarily used telephone calls, but some also reported using video calls, with a few using text messaging. Over a quarter of parents reported having no communication with family or their infant during the restrictive period in the NICU. Parents reported that they primarily used their own devices (e.g., mobile phone) to communicate with the medical team or connect with their infant or family, only one respondent used a device provided by the hospital (e.g., iPad). The majority of parents reported being comfortable or very comfortable with technology use, only eight parents reported that training to use the technology would have been helpful. In terms of hospital Wi-Fi access and quality, most parents rated it as acceptable to excellent, a quarter rated it as fair or poor, and 10% were unsure or did not use it. Detailed survey results are outlined in Table 2.

Table 1
Infant and Parent Characteristics.

Infant and Parent Characteristics (N = 117)	n (%)
Gestational age at birth	
Less than 28 weeks	19 (16.2%)
Between 28 and 31 weeks	26 (22.2%)
Between 32 and 36 weeks	39 (33.3%)
37 weeks or more	33 (28.2%)
Singleton birth	107 (91.5%)
Male infant	64 (60.4%)
Length of stay (days), mean (SD)	34.6 (35.6)
Parent relation to infant	
Mother	110 (94.0%)
Father	6 (5.1%)
Foster mother	1 (0.9%)
Parent age (years), mean (SD)	31.5 (4.9)
Approximate distance from home to NICU	
11–30 km	70 (59.8%)
31–200 km	31 (26.5%)
201 km or more	16 (13.7%)
White ethnicity	103 (88.0%)
Post-secondary degree	83 (70.9%)
Married or common-law	106 (90.6%)
English primary language	102 (87.2%)
Yearly income before tax (CAD)	
\$49,999 or less	17 (14.8%)
\$50,000–149,999	70 (60.9%)
\$150,000 or more	28 (24.3%)
Additional children in the household	
None	65 (55.6%)
One	38 (32.5%)
Two or more	14 (12.0%)
Province of residence	
Alberta	19 (16.2%)
British Columbia	11 (9.4%)
Manitoba	10 (8.5%)
Newfoundland and Labrador	1 (0.9%)
New Brunswick	5 (4.3%)
Nova Scotia	9 (7.7%)
Ontario	40 (34.2%)
Prince Edward Island	1 (0.9%)
Quebec	15 (12.8%)
Saskatchewan	6 (5.1%)

3.4. Narrative descriptions of technology use in the NICU

There were mixed reports from parents on the use of technology in the NICU to enhance parent and health care team communication. Some parents reported having difficulty hearing the care team or connecting virtually. One mother described their experience: “[our infant’s] team never really worked with us or answered us” [ON-205] and another mother said “we were not given any way to contact NICU staff. We were not consulted about decisions for [our infant’s] care” [BC-276]. However, other families reported that using technology to connect with the care team worked well. Several families stated that “e-rounds [or] joining virtual rounds” [ON-148] helped them feel close to their infant.

Parents reported using technology to stay connected and feel close to their infant, many of which specifically described using video calling such as FaceTime (n = 33, 28%). Parents also reported using video calls to help connect their infant with their partner, siblings, or extended family. One mother said they used “FaceTime as much as possible” [NS-27]. When parents were not able to always be at their infant’s bedside, those able to have their phones in the NICU reported that their mobile devices (e.g., phone or iPad) provided quick access to pictures of their infant and medical updates from the NICU team. One mother described their approach: “I visited [the] first hours [of] each day, took pictures for family and phoned the NICU to check up when not at the hospital” [ON-335].

While most parents were comfortable using technology, many felt restricted in their ability to use it. Some parents were limited to only telephone calls to the NICU team, as one mother shared, “the only thing I could do was call and get an update” [MB-22]. In the NICUs where secure

Table 2
Parent-Reported Use of Technology in the NICU.

Communication and Technology Use (N = 117)	n (%)
Communication with NICU care team (select all that apply)	
Telephone calls	77 (65.8%)
Video calls	4 (3.4%)
Text messaging	4 (3.4%)
Emails	1 (0.9%)
No communication	19 (16.2%)
Communication to feel close to infant (select all that apply)	
Telephone calls	58 (49.6%)
Video calls	11 (9.4%)
Text messaging	5 (4.3%)
Emails	1 (0.9%)
No communication	31 (26.5%)
Quality of hospital WiFi	
Not sure/Did not use	12 (10.3%)
Poor	15 (12.8%)
Fair	17 (14.5%)
Acceptable	31 (26.5%)
Good	21 (17.9%)
Excellent	21 (17.9%)
Access to technology	
Own equipment	68 (58.1%)
Hospital provided equipment	2 (1.7%)
Did not use equipment	45 (38.5%)
Wanted training to use technology	
No	104 (92.9%)
Yes	8 (7.1%)
Comfort using technology	
Not at all comfortable	11 (10.3%)
A little comfortable	8 (7.5%)
Comfortable	34 (31.8%)
Very comfortable	54 (50.5%)

webcam systems were available, families expressed that it really helped them stay connected to their infant. One mother said that “checking the webcam in the NICU” [SK-156] helped her feel close to her infant while she could not be in the NICU.

Parents reported that technology was restricted in the NICU for three primary reasons: privacy concerns; technology, like video calling, was deemed overstimulating for infants; and bringing devices into the unit led to breaching of infection control policies. One mother explained: “we were not allowed to video call during our NICU stay. We were not allowed to be on our phone when we were bedside” [BC-17]. Another mother stated: “we were told that zooming with baby was too overstimulating, so we didn’t do it. I just filmed a few videos instead” [BC-44]. With respect to infection control concerns, while some parents reported that phones could only be used in the NICU if in a plastic bag, other parents reported that devices such as phones, laptops or tablets were not allowed in the NICU at all. One father said “we tried not to use our phones around NICU staff. When we did, they had to be in bags” [NB-220].

Restrictive use of technology was reported as a source of stress for families, with one family reporting “we would send photos over a family group chat. One day we tried to video chat with our baby’s grandparents so they could see their new granddaughter for the first time on video and we were promptly told by the NICU nurses that was not allowed” [ON-218]. Another mother shared that “the NICU does not allow cellphones. To update people, we had to leave the unit. This was very stressful” [SK-350]. Parents reported considerable mixed messaging around what was allowed for technology use. For example, permission to use phones and other mobile devices was inconsistent across healthcare providers where one mother said “we tried FaceTime but some of the nurses wouldn’t let us on our phone” [ON-283]. When technology use was not permitted, some families resorted to sneaking in phone calls or text messaging when no one was observing. One mother admitted she used “FaceTime, but it was not really allowed so we made quick phone calls when the nurses were not around” [AB-78]. Another mother said “any time I wanted to communicate with my family or husband I had to leave the NICU to do so. Or try to sneak a text or phone call” [MN-313].

While families felt that technology helped them feel close to their infant when they could not be in the NICU, it did not replace being present in the NICU. Many of the families said that being present was the best way to connect with their infant, but when that was not possible, they used technology to help fill that gap. One father said: *“we had pictures and movies from [the] day of birth - we just put them on the big screen at home every evening to have at least something!”* [AB-154]. Another father reported: *“my wife and I Face Timed each day with each other sharing updates and allowing the other to see our daughter on our ‘off’ day”* [ON-198].

4. Discussion

Our findings highlight large variation on parental use of technology during the COVID-19 pandemic across Canadian NICUs. Parents reported large variation in NICU policies governing the use of technology by families and care providers. Parents reported challenges feeling close to their infant and family, communicating with the NICU health care team, and many parents reported feeling high levels of stress regarding restricted technology use. Parents also reported variation in enforcement of technology restrictions, which implies a lack of standard NICU policies related to technology use.

There were three parent-reported reasons for the restrictions put on technology use in the NICU. The first was regarding impacts on privacy and workload. While most of the parents reported positive experiences with NICU webcam use, similar concerns have been reported elsewhere during the adoption of NICU webcams from both families and nursing staff (Kubicka et al., 2021; Le Bris et al., 2020). Various strategies, including IT department support, webcams set to focus solely on the infant, audio limitations, and informed consent from both the families and the healthcare providers, have been reported as successful mitigating strategies (Le Bris et al., 2020; Rhoads et al., 2012).

The second concern was regarding overstimulation of the infant from high sound and light levels. Regarding light concerns, screens are an additional source of light facing the infant during video calls. The Canadian Pediatrics Society recommends no screen time for children under two years of age (Canadian Paediatric Society, 2017). Regarding sound levels, phone calls are an additional source of noise close to the infant. A previous study examined parents' perspectives on overstimulation due to their infant's use of technology which found three main concerns regarding effect on the child, locus of control, and family stress (Radesky et al., 2016). A recent Cochrane review discussed the concerns regarding the generally high sound levels in NICUs (Almadhoob and Ohlsson, 2010). There is currently limited evidence, so further evaluation of potential solutions, such as sound recommendations for devices, use of Bluetooth, sound controlled incubators, or earmuffs, is warranted (Almadhoob and Ohlsson, 2010).

The third concern was regarding infection control. Irrespective of the COVID-19 pandemic, infection risk related to phones has historically been a common concern in NICUs. A recent systematic review examined this concern (Curtis et al., 2018). Having shown that stethoscopes harbour similar bacteria contamination as phones, it becomes clear that the focus should be on encouraging proper hand hygiene over restricting the presence of phones (Curtis et al., 2018). Another review discusses potential decontaminating options for devices in order to mitigate this concern (Bhardwaj et al., 2020).

Our findings that parents used their phones to feel close with their infant (e.g., video call with infant/family, review or share photos/video of their infant) while not able to be present at the bedside aligns with other evidence of higher quality of life scores for NICU families who have access and permission to use their phones (Flores-Fenlon et al., 2019). Additionally, a recent review reported that parents who received videos of their infant in the NICU from healthcare providers had reduced stress and increased emotional closeness without a reduction in the number of NICU visits (Kirolos et al., 2021). No technology can replace the benefits of parental presence on infant and parent outcomes in the

NICU (O'Brien et al., 2018). While parents clearly emphasised this concern, technology can be beneficial when presence at the bedside is not possible. This is true for future pandemics as well as for parents who are unable to always be present in the NICU due to other obligations, such as having other children to care for, needing to work, or living far from the Health Centre.

There is evidence that parents consider the use of mobile devices to be important and valuable. Our finding that some parents reported disregarding or working around restrictions on mobile devices is consistent with previous studies that suggested that restrictions were undesirable and impractical even when patients knew the risks (Brady et al., 2011). Previous studies have shown that parents use mobile devices to learn, including to identify strategies to involve themselves in care (Orr et al., 2017).

Despite legitimate concerns about mobile devices in NICUs, evidence on how to mitigate these concerns exists. There appears to be substantial benefits to using technology to enhance parental experiences and given a lack of alternative solutions, many parents choose to ignore restrictions. Further study will likely show the benefits far outweigh the concerns especially once appropriate mitigations are in place. However, this work needs to be done.

5. Limitations

The recruitment for the survey was done virtually and therefore may not have captured NICU parents who are less comfortable with technology. The sample was representative of usual gestational ages of neonatal populations across Canada. Nevertheless, a limitation is our small sample size, and that most of the sample included Caucasian, highly educated, married/common law parents with access to technology and relatively high socioeconomic status (SES). As such, it does not represent the underserved high-risk groups with lower education, SES, and access to internet.

6. Implications for practice and research

There is a paucity of empirical evidence, systematic reviews, and subsequent lack of national or international recommendations for appropriate and safe technology use in the NICU.

While policies due to the global pandemic limited parental presence, our findings are also relevant to post-pandemic less restrictive situations as some parents are not able to be in the NICU for a variety of reasons, including distance from hospital, employment, and caring for other children. There is evidence in support of a wide range of device policies for NICUs. Additional research is necessary to ensure safe, consistent, and equitable care practices. While parental presence is of utmost importance for the health and development of newborns, communication technology may offer a viable alternative solution when parental presence cannot be achieved. Future research is needed to determine the safety, effect, and acceptability that communication technology use in the NICU, during periods of parental presence, may have on infant and parent outcomes.

7. Conclusion

Large variation in policies regarding parental permission to use technology was reported across Canadian NICUs. Despite legitimate concerns about devices in NICUs, evidence on how to mitigate these concerns exists. There appears to be substantial benefits to using technology to enhance parental experiences, and many parents choose to ignore restrictions. Future study is needed to inform recommendations on technology use in the NICU, both in the Canadian context and elsewhere.

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Declaration of competing interest

The authors have no conflicts of interest relevant to this article to disclose.

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