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Impact of a Parent Video Viewing Program in the Neonatal Intensive Care Unit

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Abstract

Purpose: *Video visits, or televisits, have become increasingly popular across various medical subspecialties. Within the University of California, Davis, Neonatal Intensive Care Unit, a video visitation program known as FamilyLink allows families to remotely view their babies when they are otherwise unable to visit. This study aimed to explore parents' perceived effects of video camera use as well as the relationship of video visit use with rates of breast milk feedings at hospital discharge.*

Materials and Methods: *Families enrolled in this study completed a series of two identical surveys that gathered self-reported data on their experiences during their infant's hospitalization. Comparisons were made considering whether the FamilyLink program was utilized during the admission as well as changes in self-reported experiences over the time course of the hospital admission. The type of enteral feeding at discharge was recorded and reviewed for each baby.*

Results: *Of 100 families enrolled in the study, 30 were found to have used FamilyLink to visit with their baby. The use of FamilyLink was associated with survey findings of sustained intention to breastfeed or provide breast milk to the baby, as well as increased perceived parental involvement in the baby's care. Improved rates of breast milk feedings at the time of discharge were also found among babies whose families conducted televisits using FamilyLink.*

Conclusions: *Video viewing in the NICU has effected a positive impact on breast milk feedings and parents' feelings of involvement during the admission, with the potential to further improve on families' experiences with a hospitalized baby.*

Keywords: *telemedicine, telehealth, neonatology, newborns, televisits, video visits, NICU, NICU parent*

Introduction

Admission to the neonatal intensive care unit (NICU) has been demonstrated as a source of significant stress to parents and families. Parents of neonates who have been admitted to the NICU have reported high levels of stress and anxiety, as well as the feeling that they lack control and are not able to be involved as much as they would like in their baby's care.[1–4] In fact, prior research has emphasized that the intrinsic nature of the NICU, with its noisy alarms, physical separation of the infant from the family, and the critical degree of the babies' illnesses, imparts a negative influence on the parent–infant relationship with potentially long-lasting effects.[5–11] Multiple studies have found that this emotional impact on families and patients persisted in being a burden even following discharge from the NICU, with Schecter et al. reporting persistence of post-traumatic stress disorder symptoms in parents 1 year after an NICU experience.[12]

Foligno et al., in an observational study on breastfeeding and maternal stress levels, found a statistically significant correlation between high Parental Stressor Scale scores, with higher scores corresponding to higher reported stress levels, and reduced breastfeeding rates during the hospitalization.[13] Not surprisingly, predictors of parental stress have also been associated with such factors as increased length of stay, extreme prematurity, cardiovascular diagnoses, and overall worse illness severity.[4,6,7,11,14–17] Moreover, in studies on parental experience within the NICU, one common theme that has emerged is the loss of the parental role related to a loss of control.[5,16] This loss of control falls within the context of an unexpected situation (the baby needing admission to the NICU) and an unpredictable environment, that is, the intensive care unit.

The implications of these familial stressors that result from an infant's admission to the NICU warrant being addressed. A systematic emphasis placed on family-centered care, parental involvement, and communication between providers and

families is a step toward supporting the extraordinarily important bond between parents and/or families and the babies they eventually bring home from the NICU.[8,18–22]

In recent years, telemedicine and telehealth have proven increasingly useful in various health care settings, expanding the reach of medical specialists as well as assisting with remote consultations and allowing increased interfacing between patients and providers. Current telehealth technology has expanded into pediatric and neonatal arenas not only to address gaps in health care needs of pediatric patients but also to allow parents of children admitted to the hospital to increase involvement in their children's care.[23–26]

Applications of telehealth to support family-centered care in the NICU include, for example, providing the family education on caring for their high-risk infants and furnishing a means of communication between the medical team and the patients' families.[18,20,27–29] Many NICUs have begun using bedside video cameras for televisits such that parents are able to see their babies from a remote location when they are unable to be physically present in the NICU. As such, telehealth may play a crucial role in facilitating communication between parents and their babies in the NICU.[30] Our study sought to evaluate if the use of parent video visits in the NICU would demonstrate a positive impact on the family's self-reported experience over the course of the admission and an increase in babies receiving breast milk feedings at the time of discharge from the NICU.

Materials and Methods

The University of California, Davis, NICU is a level IV unit that serves a large catchment area of 33 counties spanning Northern California to the Central Valley, as well as portions of Oregon and Nevada. Neonates are frequently brought to this tertiary care center through a neonatal transport program, in addition to those who were admitted directly from labor and delivery services or the well newborn nursery.

In 2017, our NICU piloted the FamilyLink program. At the time, this program consisted of 10 video cameras mounted on tripods, which were then affixed to an isolette or crib and directed toward the baby. FamilyLink gave parents the ability to view their baby remotely using their own phone, tablet, or other devices through a secure connection. Upon admission to the NICU, if a camera was available at their baby's bedside, parents were given the option to voluntarily gain access to be able to conduct FamilyLink televisits at any given time and on a schedule that suited their needs.

With the FamilyLink program ongoing, this survey study was conducted concurrently to reflect parents' self-reported perceptions of the NICU admission with or without the use of FamilyLink televisitation. The time frame of the study included patients admitted to the UC Davis NICU between September 2017 to April 2018 and October 2018 to September 2019. Some patients had access to FamilyLink, but most did not due to the limited number of cameras. A 6-month hiatus in enrollment occurred due to changes in study personnel. In cases where the presenting clinical status or admission diagnosis was thought to warrant a stay of two or more weeks, the parent(s) were approached to enroll in the survey study. No other specific exclusion criteria, such as admission diagnosis or gestational age, influenced enrollment. Institutional Review Board approval from the University of California, Davis, was obtained.

A prospective, observational study approach was utilized. The parents of 119 infants admitted to the NICU during the study period consented to enroll in the survey study wherein they would complete a series of two identical paper surveys; the first survey was administered at the time of enrollment and the second survey was presented just before discharge from the NICU. All subjects were assigned a deidentified study code, which was then applied to the survey papers. Paper surveys were given to parents directly or left with the bedside staff so that parents would be able to complete the surveys confidentially; the surveys were then collected by research staff.

There were a total of 14 survey questions encompassing the following categories: how informed parents felt about the baby's condition and prognosis; feelings of anxiety or worry regarding the baby's weight, feeding, or breathing or because of separation from the baby; parents' self-reported feelings of involvement in the baby's care; plans to breastfeed and/or pump breast milk; and feelings regarding discharge. Each survey question was presented as a statement, and parents were asked to provide responses as defined using a Likert scale of 1–7, with 1 corresponding to strongly disagree, 4 corresponding to neutral, and 7 corresponding to strongly agree.

After identifying 100 infants and their families for inclusion in the analysis, an examination of the medical record was performed to determine whether video cameras under the FamilyLink program had been utilized by the parents in televisits for each baby. Additionally, breast milk feedings received at the time of study enrollment and on day of discharge were noted for each subject. Study subjects, demographic and feeding data, and first and second survey responses were entered into and maintained in the secure REDCap database.

Comparisons of patient demographics were made using Student's *t*-test. For each of the other survey items, within-participant changes from the pre- to postsurvey were computed and mean values compared between groups of subjects who used the video camera and those who did not, using the Welch–Satterthwaite *t*-test. This test was chosen given unequal variance between groups.

Table 1. Admission Demographics and Health Information of Newborns Whose Families Participated in the Survey Study, by Participation or Nonparticipation in FamilyLink

CHARACTERISTICS	VIDEO ($N=30$)	NO VIDEO ($N=70$)	*P*
Gestational age at birth[a]	32.2 (5.2)	34.0 (4.6)	0.15
Gestational age at discharge[a]	40.5 (5.5)	39.4 (3.4)	0.11
Length of stay[b]	57.1 (48.6)	38.2 (31.7)	0.01
Receiving breast milk feeds at enrollment,[c] *n* (%)	27 (90)	59 (84)	0.27

[a]By number of weeks (standard deviation).

[b]Length of stay in days (standard deviation).

[c]Expressed as number of babies within each group, followed by percentage within the group (video users vs. nonusers).

Results

Of the 119 families who provided consent, 100 completed both surveys and were included for eventual analysis. The remaining 19 infants and their families were excluded for the following reasons: incomplete consent ($n=2$) or absence of the second/discharge survey ($n=17$). Reasons for the second survey being unavailable included neonatal demise ($n=5$), refusal to complete the second survey ($n=6$), transferred to a different facility ($n=4$), or discharged to foster care ($n=2$). Thirty families were observed to have utilized FamilyLink televisitation during the NICU admission; 70 families did not use FamilyLink during their child's admission.

An analysis of study subject demographics revealed no significant differences in gestational age at the time of enrollment or in corrected gestational age at the time of discharge. Both groups contained neonates admitted for a variety of reasons typically necessitating neonatal critical care. Subjects in the group that used FamilyLink, however, were found to have a greater length of stay of 57.1 days, compared with 38.2 days in the nonuser group ($p=0.01$). Breast milk feeding rates at enrollment were not different between groups (90% of video users vs. 84% of nonusers, $p=0.27$). *Table 1* presents admission demographics and health information of newborns whose families participated in the survey study, with groups separated by participation in FamilyLink.

Table 2. Comparisons of First and Second Surveys by FamilyLink Use

QUESTION/STATEMENT	NUMBER OF SUBJECTS[a]	VIDEO USERS S1[b]	VIDEO USERS S2[c]	NO VIDEO S1[b]	NO VIDEO S2[c]	*P*
1. I feel informed about my baby's condition	30, 70	7 (7–7)[d]	7 (7–7)	7 (6–7)	7 (6.25–7)	0.77
2. I feel informed about my baby's prognosis	30, 69	7 (6–7)	7 (7–7)	7 (6–7)	7 (6–7)	0.27
3. I feel anxious/worried about separation from my baby	30, 70	6 (4.25–7)	4 (2–5)	5.5 (4–7)	4 (2–5)	0.39
4. I feel anxious/worried about my baby's feeding	30, 70	4 (2–5.75)	2 (1–4.75)	4 (2–6)	3.5 (1.25–5)	0.27
5. I feel anxious/worried about my baby's breathing	30, 70	5 (3–6.75)	2.5 (2–5)	4 (2–6.75)	3 (1.25–4)	0.53
6. I feel anxious/worried about my baby's weight	30, 70	3 (1.25–6)	2 (1–4)	4 (2–5.75)	2 (1–4)	0.77
7. I feel involved in my baby's care	30, 70	6 (5–7)	7 (7–7)	6 (6–7)	7 (6–7)	0.08
8. I feel updated by the medical team	30, 70	7 (6.25–7)	7 (7–7)	7 (6–7)	7 (7–7)	0.33
9. I feel satisfied with my baby's care	30, 68	7 (7–7)	7 (7–7)	7 (7–7)	7 (7–7)	0.74
10. I plan to breastfeed my baby	30, 68	7 (7–7)	7 (7–7)	7 (6.25–7)	6 (3–7)	0.01
11. I plan to pump breast milk	30, 70	7 (7–7)	7 (6.25–7)	7 (6–7)	7 (4–7)	0.62
12. I plan to exclusively breastfeed	28, 68	7 (3.25–7)	6 (3.5–7)	5 (4–7)	4 (2–5)	0.54
13. I feel prepared for discharge	29, 70	4 (3–6)	7 (6–7)	4 (3–6)	7 (6–7)	0.95
14. I feel scared/anxious/worried about discharge	29, 70	5 (3–5)	2 (1–4)	4 (2–5)	2 (1–4)	0.71

[a]By FamilyLink use (video, no video).

[b]S1 = enrollment survey.

[c]S2 = discharge survey.

[d]Shown as median reported survey rating (interquartile range).

Table 3. Mean Differences in Survey Responses Over Time with Regard to FamilyLink Use

QUESTION/STATEMENT	VIDEO			NO VIDEO			MEAN DIFFERENCE OVER TIME	
	MEAN DIFFERENCE	STANDARD DEVIATION	95% CI	MEAN DIFFERENCE	STANDARD DEVIATION	95% CI	MEAN DIFFERENCE	95% CI
1. I feel informed about my baby's condition	0.13	0.51	−0.06 to 0.32	0.09	1.11	−0.18 to 0.35	−0.05	−0.37 to 0.27
2. I feel informed about my baby's prognosis	0.43	1.01	0.06–0.81	0.19	1.00	−0.05 to 0.43	−0.24	−0.69 to 0.20
3. I feel anxious/worried about separation from my baby	−1.63	1.69	−2.26 to −1.00	−1.30	1.96	−1.77 to −0.83	0.33	−0.44 to 1.11
4. I feel anxious/worried about my baby's feeding	−1.10	2.11	−1.89 to −0.31	−0.59	2.16	−1.10 to −0.07	0.51	−0.41 to 1.44
5. I feel anxious/worried about my baby's breathing	−1.57	1.65	−2.18 to −0.95	−1.31	2.24	−1.85 to −0.78	0.25	−0.55 to 1.06
6. I feel anxious/worried about my baby's weight	−0.90	2.17	−1.71 to −0.09	−0.76	2.47	−1.35 to −0.17	0.14	−0.85 to 1.13
7. I feel involved in my baby's care	0.97	1.07	0.57–1.36	0.56	0.97	0.33–0.79	−0.41	−0.86 to 0.05
8. I feel updated by the medical team	0.23	0.63	0–0.47	0.06	1.17	−0.22 to 0.34	−0.18	−0.53 to 0.18
9. I feel satisfied with my baby's care	0.17	0.59	−0.05 to 0.39	0.12	0.84	−0.09 to 0.32	−0.05	−0.34 to 0.25
10. I plan to breastfeed my baby	−0.30	1.60	−0.90 to 0.30	−1.25	1.97	−1.73 to −0.77	−0.95	−1.70 to −0.20
11. I plan to pump breast milk	−0.67	1.84	−1.36 to 0.02	−0.87	2.01	−1.35 to −0.39	−0.20	−1.03 to 0.62
12. I plan to exclusively breastfeed	−0.82	2.52	−1.80 to 0.16	−1.15	1.91	−1.61 to −0.68	−0.33	−1.40 to 0.75
13. I feel prepared for discharge	1.93	1.98	1.18–2.68	1.96	2.02	1.48–2.44	0.03	−0.86 to 0.91
14. I feel scared/anxious/worried about discharge	−1.41	2.35	−2.31 to −0.52	−1.23	1.94	−1.69 to −0.77	0.19	−0.81 to 1.18

Mean differences were calculated based on responses from first and second surveys using the Satterthwaite *t*-test.

CI, confidence interval.

Responses to each of the 14 survey questions were analyzed and no statistically significant differences were found with respect to FamilyLink usage as well as change in survey responses over the duration of the NICU admission, apart from two questions relating to plans to breastfeed and feelings involved in the baby's care. *Table 2* presents median response values and the interquartile range for each survey question, delineated by first or second survey and utilization of FamilyLink, as well as the number of respondents in each group. Responses to individual questions on the surveys were voluntary; therefore, few subjects chose to provide no response for various questions.

Welch–Satterthwaite *t*-test analysis revealed similar responses between groups for the majority of the survey questions, with few exceptions. For the survey statement "I plan to breastfeed my baby," median scores at discharge were higher in the FamilyLink group, indicating greater parental agreement with this statement ($p = 0.01$, *Table 2*). A different survey question with the statement, "I feel involved in my baby's care," showed a higher median response on the scale of 1–7 in the FamilyLink group, indicating a trend toward greater agreement with the survey statement ($p = 0.08$, *Table 2*).

Table 3 provides more detailed quantitative comparisons between the FamilyLink (video) and no FamilyLink (no video) groups by expressing the mean differences over time between the two surveys. This additional analysis of the change in parental responses to survey questions between first and second surveys again supported findings that were highlighted in the two survey questions of particular interest.

For survey question 10, all respondents reported a decrease in survey score over the course of the NICU admission, indicating decreasing agreement with the statement, "I plan to breastfeed my baby." Importantly, however, for question 10, the FamilyLink group demonstrated a smaller decline in score over time (–0.30 points, 95% CI: –0.90 to 0.30) compared with the no FamilyLink group (–1.25 points, 95% CI: –1.73 to –0.77) on a scale of 1–7. The FamilyLink group had a 0.95-point smaller mean decline (95% CI: –1.70 to –0.20, *Table 3*). In this study, nonusers had a statistically significant decline in their breastfeeding intentions, whereas the FamilyLink group did not have a statistically significant decline and, compared with nonusers, had significantly less decline in breastfeeding intention.

Survey question 7 revealed that all respondents reported higher scores over the time of hospitalization, corresponding to increasing agreement with the statement, "I feel involved in my baby's care." Again, examination of mean differences in scores over time between groups showed a mean increase of 0.97 points in the FamilyLink group (95% CI: 0.57–1.36) compared with an increase of 0.56 points on a scale of 1–7 in the nonuser group (95% CI: 0.33–0.79), but the between-group comparisons were not statistically significant (0.41; 95% CI: –0.86 to 0.05, *Table 3*). The remaining survey questions did not demonstrate significant differences between FamilyLink and no FamilyLink groups over time.

Table 4. Findings on Breast Milk Feedings at Enrollment and at Discharge

	VIDEO ($N = 30$), *N* (%)	NO VIDEO ($N = 70$), *N* (%)	*P*
Breast milk at enrollment	27 (90)[a]	59 (84)	0.27
Breast milk at discharge	25 (83)	46 (66)	0.03

Rates of breast milk feedings were similar between FamilyLink users and nonusers at enrollment. Rates of breast milk feedings at discharge are reported here.

[a]Expressed as the number of babies within either group who received any breast milk feedings at the two time points, followed by percentage within the group (video users vs. nonusers).

The enteral feeding type of each enrolled infant was also reviewed with respect to FamilyLink use. While baseline breast milk feeding rates were similar between the two groups of subjects, we found that babies were more likely to receive breast milk at discharge in the group of parents using video visits (83% vs. 66%, $p = 0.03$, *Table 4*).

Discussion

This study aimed to examine parents' self-reported perceptions regarding various aspects of the NICU experience, which can be an emotionally and physically taxing process for families and patients. The use of telehealth and cameras to help connect babies and their families has shown promise in alleviating some of this potential stress. Parents were offered the opportunity to utilize FamilyLink at the UC Davis NICU while providing directed feedback on certain aspects of their experience. A review of survey responses and demographic data indicates that participation by parents in video viewing of their infant in the NICU is associated with sustained intention to breastfeed spanning the length of the NICU admission. Parental responses also indicated a trend toward improved self-perception of involvement in the babies' care, which is an undoubtedly crucial aspect of the NICU journey.

Fittingly, infants in the FamilyLink group also experienced a higher likelihood of receiving any breast milk at discharge. The AAP, in its 2012 policy statement, refers to breastfeeding and human milk as the normative standards for infant feeding

and nutrition, citing short- and long-term medical and neurodevelopmental advantages.[31] This, combined with the well-recognized difficulties of sustaining breastfeeding, especially in the NICU environment, has led to numerous efforts to support breastfeeding in the NICU and beyond. As such, the potential implications of televisitation to support breastfeeding and provision of breast milk to infants are promising and may perhaps serve as an important tool in helping to sustain breastfeeding in the NICU.

This study is not without limitations. Because FamilyLink was a pilot program during this study, only 10 families in our 49-bed NICU were able to access FamilyLink at a time. This study was also limited by its observational nature as parents were given the choice to voluntarily use bedside cameras. Randomization to use or nonuse of FamilyLink was not feasible during the study period as cameras were not available at all bedsides, and one of the study aims of exploring parental perceptions over time effectively limited study enrollment to families of babies who were expected to require a more lengthy NICU admission.

Since the completion of this study, all 49 beds have been outfitted with FamilyLink cameras, and every family is now automatically offered access to FamilyLink upon admission. This may allow for future randomized studies pertaining to impact of FamilyLink usage. Future directions might include examination of the FamilyLink program on a larger scale as well as use of the cameras by breastfeeding mothers to watch their hospitalized babies while pumping breast milk. Given the potential to affect a positive impact (at multiple levels) on the experience of families and babies who require NICU admission, our findings here justify further study of video viewing in this high-risk parent and infant population.

Disclosure Statement

No competing financial interests exist.

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