COVER PAGE

Official title: Virtual Family-Centered Hospital Rounds in the Neonatal Intensive Care Unit: A Cluster Randomized Controlled Trial

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1) Protocol Title

Title: Virtual Family-Centered Rounds in the Neonatal Intensive Care Unit: A Randomized Clinical Trial

Protocol Version Date: 12/5/2022

2) Objectives

The overall objective of this study is to test the efficacy of virtual family-centered rounds (FCR) compared to standard rounds for NICU patients and to conduct an intervention evaluation of the virtual FCR intervention.

Aim 1: Evaluate the impact of virtual FCR on parental activation and wellbeing. The primary outcome will be FCR parent attendance proportion (number of round encounters with a parent present – either virtually or in person – divided by total number of round encounters). Increased parent FCR attendance would increase the delivery of best practice. We will also compare parent experience (Child HCAHPS)[28] and parent activation (P-PAM)[29,30] at discharge and parent distress andquality of life at 0, 30, 60, and 90 days from discharge between assigned trial arms. Parent wellbeing promotes neonatal wellbeing.

- *Hypothesis$_{1a}$: The virtual FCR (intervention) group will have a higher parent FCR attendance proportion compared to the standard FCR (control) group.*
- *Hypotheses$_{1b}$: Parents of virtual FCR neonates will report (a) better experience, (b) higher activation, (c) less distress, and (d) better quality of life compared to parents of standard-of-care neonates***.**

Aim 2: Evaluate the impact of virtual FCR on neonatal outcomes. We will compare breast milk feeding at discharge and 90 days from discharge, growth failure,[33] medical errors, and NICU length of stay between assigned trial arms.

- *Hypotheses$_{2}$: Virtual FCR neonates will have (a) greater breast milk feeding, (b) reduced growth failure, (c) fewer errors, and (d) shortened length of stay compared to standard-of-care neonates.*

Aim 3: Conduct a mixed methods evaluation of the virtual FCR intervention. We will measure all five RE-AIM dimensions using quantitative (chart review, surveys) and qualitative (observations, interviews) methods. Observations will be of NICU FCR; interviews will be with intervention arm parents and NICU providers. We will use a convergent design and merge data in the analysis and reporting phases.

3) Background

Family-centered rounds **(FCR)** are multidisciplinary bedside rounds for hospitalized patients with active engagement by the family.[1] FCR provides many benefits to patients, families, and providers, including fewer harmful errors, shortened hospital stays, reduced parental anxiety, improved family experience, and enhanced staff teamwork.[2-6] For these reasons, FCR is recognized as a best practice for hospitalized children.[7,8] However, because active family engagement is required, FCR has only been possible for patients whose families can physically be at the bedside during hospital rounds.

In the neonatal intensive care unit **(NICU)**, barriers exist that limit family presence at the bedside. Critically ill neonates may be hospitalized for extended

periods of time.[9] Their parents or guardians ("parents" hereafter) often live far from the hospital and have travel, financial, work, or childcare constraints that limit their ability to be physically present in the NICU.[10,11] These barriers are particularly challenging for rural and low-income parents.[12] NICU parents have high rates of depression, anxiety, and post-traumatic stress,[13-16] and reduced visitation with their infant can exacerbate their depression and inhibit parental-newborn attachment.[14] These parental factors impact the neonate, too. Early attachment impacts intelligence and emotional wellbeing later in life.[17] Parental psychological support and engagement can shorten the NICU hospitalization[18] and facilitate breast milk feeding.[19] Breast milk fed infants have improved near-term (e.g., lower risk of sepsis and improved cognitive development) and long-term outcomes (e.g., lower risk of hypertension, diabetes, and obesity).[20]

Telehealth is a potential solution to mitigate these challenges. Using existing secure technology, parents can be virtually present at their neonate's bedside to participate in FCR.[21] Prior pediatric and adult research suggests that virtual FCR is feasible and meaningful to patients, families, and clinicians.[22-25] However, these studies had many limitations in sample size, randomization, and outcomes measured. Therefore, we propose a rigorous virtual FCR efficacy trial to understand the impact of telehealth on neonatal and parental outcomes.

4) Inclusion and Exclusion Criteria

This study is a randomized trial to compare virtual family-centered rounds (**FCR**) to standard FCR for neonatal intensive care unit (**NICU**) patients. We will simultaneously conduct an intervention evaluation of this virtual FCR intervention. The unit of randomization is at the subject level (the neonate). The site is the UC Davis NICU. To gather necessary data on efficacy outcomes and on the 5 dimensions for the intervention evaluation (Reach, Effectiveness, Adoption, Implementation, Maintenance), *survey* data will be collected from the subjects' parent or guardian (referred to as "parent" hereafter), *electronic health record (EHR) data* will be collected from UC Davis, and daily *weekday FCR observations* will be performed. To gather necessary data for the intervention evaluation, *qualitative interviews* will be performed.

- INCLUSION: (NEONATES) Neonates aged <365 days admitted to UC Davis neonatal intensive care unit (NICU) during the study period who have one or more parent or guardian that self-reports their preferred language to be English. This parent must also be non-incarcerated and aged ≥18 years.
- EXCLUSION: (NEONATES) Age > or = 365 days. Neonates with visitation or information restrictions placed by child protective services. Neonates with more than one admission during the trial period will be included only on their first admission.

- INCLUSION: (QUALITATIVE INTERVIEWS) Parents/guardians of the eligible patients (described above) and NICU clinicians (e.g., nurses, physicians). Age 18 years and older.
- EXCLUSION: (QUALITATIVE INTERVIEWS) Age less than 18 years. Non-English speaking.

- INCLUSION: (SURVEY) Parents/guardians of the eligible patients (described above). Age 18 years and older.

- EXCLUSION: (SURVEY) Age less than 18 years. Non-English speaking.

5) Study Timelines

We anticipate this trial will begin ~2/1/2023. We will begin enrolling subjects at trial onset. We will enroll subjects (neonates) and assign to either the intervention or control arm for 12 months. Each subject (neonate) will be included for the duration of their hospitalization.

We will follow this 12-month period with 1 month of rounding observations for data collection. We will also continue to collect surveys at 0, 30, 60, amd 90 days from discharge. Therefore, survey data collection will continue until 16 months from the trial onset.

Regarding qualitative interviews for the intervention evaluation (Aim 3), those will continue for 18 months from the trial onset.

The estimated date to complete this study is therefore ~8/1/2024.

6) Study Endpoints

Primary study endpoint is completing 12 months of trial enrollment. Secondary study endpoints include (a) completing the 13 months (12 + 1 month after last enrollment) of daily weekday rounding observations of subjects; (b) completing the last survey for the last discharged patient (at 90 days from discharge); (c) completing qualitative data analysis and integration for the mixed methods intervention evaluation.

7) Procedures Involved

OVERVIEW: The overall objective of this study is to conduct a randomized trial comparing virtual family-centered rounds (FCR) to standard FCR for NICU patients and to conduct an intervention evaluation of the virtual FCR intervention. This study protocol involves the UC Davis NICU (n=447 neonates) and uses a 2:1 intervention-to-control arm ratio. The endpoint of the study includes completing the 12-month enrollment (intervention delivery) period plus the 1 additional month of rounding observation data collection plus the 90-day follow-up parent survey for neonates discharged home during the study period. Thus a 16-month total period (12 months + 1 month + 90 days). The end of the 16-month period will be when neonates will no longer be assigned to standard FCR (control) versus virtual FCR (intervention) and no more neonates will be eligible for the study (which occurs at 12 months) followed by completion of the additional 1-month rounding observation data collection followed by the last survey recruitment invitation (which occurs 90 days following the last eligible patient is discharged home to obtain 90-day outcome measures). Hypotheses include the following: (1) The virtual FCR (intervention) group will have a higher parent FCR attendance proportion compared to the standard FCR (control) group; (2) Virtual FCR neonates will have (a) greater breast milk feeding, (b) reduced growth failure, (c) fewer medical errors, and (d) shortened length of stay compared to standard-of-care neonates; (3) Parents of virtual FCR neonates will report (a) better experience, (b) higher activation, (c) less distress, and (d) better

quality of life compared to parents of standard-of-care neonates. To conduct the intervention evaluation, we will apply the 5 dimensions of the RE-AIM framework (Reach, Effectiveness, Adoption, Implementation, Maintenance) and use a mixed methods approach with a convergent design. Data integration will occur by merging data in the analysis and reporting phases.

ASSIGNMENT TO CONTROL VERSUS INTERVENTION: The unit of randomization is at the subject (neonate) level. The study statistician will generate a random allocation list and employ allocation concealment to assign eligible subjects with a 2:1 intervention-to-control arm ratio. During the 12-month enrollment (intervention delivery) period, a research coordinator will open the sequentially numbered assignments to invite parents of neonates assigned to the intervention arm to sign up for virtual FCR. Neonates of parents accepting this offer will be considered “subscribed.” For neonates with more than one eligible parent, separate subscription invitations will be used for to each parent.

DELIVERY OF INTERVENTION: We will use Extended Care as the software interface for virtual FCR. This secure platform meets HIPAA security rules and launches from the electronic health record. Parents will use the Extended Care application on their personal computer or smart device. The NICU medical team will use Extended Care on a computer on wheels with a speaker and camera. Virtual FCR will be available for parents of subscribed neonates to attend Monday through Friday. For neonates with a subscribed parent, a NICU team member will launch an ExtendedCare telehealth visit (“virtual room”) from the patient’s Epic chart. From ExtendedCare, a NICU team member will use the “invite” feature to invite the subscribed parent(s); the parents then receive a message to their email/cell phone that includes their child’s unique Extended Care link. The parent(s) can use this link, if desired, to enter the “virtual room.” If a parent joins, they will establish the live, bidirectional audio and visual connection. FCR will then proceed in usual fashion. Parents can participate in virtual FCR as much, or as little, as they choose. They can also participate in FCR in person (standard of care) or not participate at all.

QUALITATIVE INTERVIEWS: The stakeholder engagement team members will assist with recruitment of the interview participants. Stakeholders or a research team member will recruit eligible interview participants. They will hand-deliver a flyer to the parents/guardians of eligible patients at the time of [i.e., 2 days before the anticipated] hospital discharge. Alternatively, since parents are not often at the bedside for in-person recruitment, they will send a secure message from StudyPages or make a phone call to invite participants to participate in an interview. Non-respondents will be contacted once 7 days later by a research coordinator through StudyPages. Clinician (e.g., nurses, physicians) interview participants will be identified by stakeholder or research team members. Recruitment emails or Secure Chat messages will be sent to the clinicians. Repeat email/message outreach will be made to the clinician non-respondents at 2 and 4 weeks following initial outreach. Participants will receive $50 for participating in an interview. Interested participants will have one in-depth interview that lasts ~45 minutes. Interviews will be in-person when possible, but otherwise by telephone or videoconference. Interviews will be audio recorded, transcribed, and reviewed for accuracy by the interviewer. Transcriptions will be uploaded into ATLAS.ti.

DELIVERY OF SURVEY: Parents will be invited to complete their first survey at

the time of [i.e., 2 days before the anticipated] discharge. If a neonate has two eligible parents, separate invitations will be sent to each parent. Recruitment will occur via giving them a packet at discharge. The packet will contain a recruitment letter (flyer), a scannable barcode (to access the survey electronically if preferred), a website link (another alternative to access the survey electronically if preferred), and a paper version of the survey. Alternatively, since parents are not often at the bedside for in-person recruitment, the research assistant will send a secure message/email from StudyPages or make a phone call to invite participants to participate in an interview. Parents can complete the survey themselves or verbally with the research assistant who will directly input verbal responses into REDCap. The research assistant will make 3 daily attempts of outreach and follow up with non-respondents 7 days later. If a survey is not returned within 21 days of discharge, the survey will be considered a non-response. The survey delivery process from a Secure Chat message/email or phone call will occur at 30, 60, and 90 days to administer the subsequent survey packets (with 3 daily attempts and follow-up 7 days later and a 21-day response time limit). Electronic surveys will be conducted in REDCap. Paper surveys will be kept in a locked box in the locked physician workroom until collected by a research assistant, who will transfer the data into REDCap and then destroy the paper copy. For parents with more than one neonate enrolled in the study (i.e., twins/multiples), the parents will only receive one survey packet per child. The survey will be sent to the parents at the time that one of their children first discharges from the NICU (and each subsequent 30 day period will be based off that first child's discharge date). For subsequent siblings discharged at later dates, a research assistant will use StudyPages to message/call parents to obtain the responses to (a) questions #1 and 2 of the 30-day survey and (b) question #1 of the 90-day survey. These questions relate to the outcomes of (a) 30-day revisit/readmission and (b) 90-day breastmilk feeding. The research assistant will directly input the responses into REDCap.

DATA COLLECTION: Data collection will include daily weekday virtual FCR observations; parent surveys; and review of the EHR, incident reports, and helpdesk technical issues log. Outcomes (for Aims 1-3) will include the following: FCR parent attendance proportion (captured using weekday rounding observations), length of stay (captured using EHR data), breast milk feeding initiation and breast milk feeding at discharge (captured using EHR data) and at 90 days after discharge (captures via parent via parent/guardian survey), growth failure and growth velocity (captured using EHR data), time to first social work contact (captured using EHR data), temperature instability (captured from an existy NICU quality dataset), feeding difficulty (captured from an existy NICU quality dataset), central line-associated bloodstream infection (captured from an existy NICU quality dataset), central line days (captured from an existy NICU quality dataset), antibiotics days (captured from an existy NICU quality dataset), medical errors (captured using data from EHR, incident reporting system, and solicited reports), 30-day revisit and readmission (captured via EHR and survey) parent experience and family-centered care (captured via parent/guardian survey at discharge), parent activation (captured via parent/guardian survey at discharge), parent distress: depression and anxiety (captured via parent/guardian survey at 0, 30, 60, 90 days from discharge), parent sleep (captured via parent/guardian survey at 0, 30, 60, 90 days from discharge), and parent quality of life (captured via parent/guardian survey at 0, 30, 60, 90 days from discharge).

RE-AIM (Aim 3) implementation evaluation data collection will include the

following: subscribed vs. not subscribed parents among intervention-arm parents, heterogeneity of intervention effects (interactions between neonate/parent characteristics and the intervention effect), virtual FCR attempts with technical issues (sounds, video, other), trial-related 24/7 helpdesk line calls, ExtendedCare wait time when parent(s) join, ExtendedCare connection time, device model (e.g., iPhone, Android, etc.) that parent uses to connect to the ExtendedCare visit, interruptions requiring a break in rounds due to a delivery or new admission, and virtual FCR use with NICU parents post-trial (maintenance).

Data will be collected from both the intervention and control arm subjects. The EHR access for data collection will only occur in a retrospective fashion. The interaction with the control arm group parents will therefore include an invitation via letter (flyer) to participate in the surveys. The obeservtions of FCR will be conducted by either a research team member or a NICU team member who already participates in FCR as part of clinical care. The information being recorded from the observations is whether or not parent(s) are present at FCR, and if so, what type of attendance (in person vs. virtual).

8) Data and/or Specimen Management and Confidentiality

☒ I understand that if this study involves the use of the UC Davis Health Electronic Health Record (EMR/EPIC) also contains the clinical data for Marshall Medical Center (MMC). I understand that MMC patient data cannot be accessed for research purposes and that I must take the necessary steps to ensure that MMC data is not accessed, used, or disclosed for UC Davis Health research purposes.

☐ I undersand that if this study involves use of UC Davis students' educational records (including records in the PI's own possession such as course exams/assignments), I must consult with the Registrar's office to see if all requirements of the Family Educational Rights and Privacy Act (FERPA) are satisfied.

DATA ANALYSIS: We will analyze subject data according to their assigned group (intervention vs. control). We will use descriptive statistics to summarize subject-level characteristics. We will compare neonatal and parental characteristics between study arms using Pearson's Chi-square test for categorical variables, t-test for normally distributed continuous variables, and nonparametric equality-of-medians test for non-normally distributed continuous variables. Generalized linear models will be used to estimate effect sizes and to test hypotheses for study outcomes, using a binary indicator for intervention assignment as the independent variable of interest and including a parsimonious set of demographic and clinical characteristics as covariates. We will analyze all available data and anticipate high data completion rates, based on our pilot trial. We will conduct sensitivity analyses using multiple imputation approaches for missing data to complement the primary analysis.

SAMPLE SIZE: We specified effect sizes of interest for all the trial outcomes and determined the necessary sample size to satisfy each. The sample size estimation that satisfies length of stay requirements also satisfies requirements for all other outcomes of interest, except for medical errors (which are rare and

thus this outcome will be considered exploratory. Outcome distributional assumptions were based on data from our pilot trial or other relevant literature. Pilot trial baseline mean log transformed length of stay +/- standard deviation (SD) was 3.0 +/- 1.0 days. Minimally clinically important differences (MCID) were based on the literature when available or via consensus opinion elicited from NICU clinicians we consulted. For the length of stay outcome, experts specified that a 25% reduction in geometric mean length of stay was of interest. A randomized sample of 447 neonates (298 intervention, 149 control) subject to 4% attrition in each arm yields a sufficient sample size (429 neonates) to provide 80% power (under two-sided testing, alpha=5%) to detect this MCID. This estimated attrition is based on 4 of 110 randomized subjects in the pilot trial being excluded from final analysis (e.g., child protective visitation restrictions placed after randomization). Parent-reported outcomes assume a survey response rate of 75% (thus n=321 parents). Note: Regarding sample size for the interviews, we anticipate interviewing ~15 parents, ~10 nurses, and ~10 physicians. Consistent with standard qualitative methods, we will continue to sample interview participants until we reach thematic saturation, thus we cannot specificy a priori the exact number of interviewees.

All virtual FCR encounters will occur using an application platform that is approved by Information Technology at UC Davis Health System as meeting HIPAA and HITECH data security requirements. The only telehealth communication that will occur will be through the HIPAA-compliant application. No telehealth encounter will be recorded or stored in any way.

Participants will decide to what extent they want to participate in the interviews and surveys. There will be no personal or intrusive questions. In all steps of this pilot study, the risk of loss of confidentiality is very low given the measures described above to protect PHI.

Only trained UC Davis professionals will work directly with interview and survey participants. All verbal communication with interview participants will occur in private locations to protect the confidentiality of the material being discussed. Review of the interview recordings will take place in UC Davis private offices. Digital audio recordings will be stored using number identification that will be kept on a password-protected computer. The risk of loss of confidentiality is extremely low and is minimized by not including identifiable information in the fieldnotes as well as de-identifying the transcription data. Notes and transcriptions will be maintained in a locked cabinet in a locked UC Davis private office.

Only study personnel will have access to the study materials. The knowledge gained from this study will be disseminated in such forms as manuscripts and conference presentations; this disseminated information will contain no identifying information.

The possibility of any adverse effects on participants as result of the study intervention is minimal given the intervention (virtual FCR in the NICU) is a method of communication that has been demonstrated in prior research (a pilot trial) to improve care quality without causing harm. The difference for this present trial is that it is powered for hypothesis testing and includes additional outcome measures.

A Data Safety Monitoring Plan with an Independent Monitoring Committee will be used for this study to provide additional protection. The Independent Monitoring Committee will meet to independently review outcomes on a quarterly basis, and as needed based on any reported complications. Safety information will be collected by reviewing charts. The safety monitoring will begin when the

trial enrollment begins. The Independent Monitoring Committee will complete quarterly reports detailing the study progress, any adverse events, and any protocol deviations. The details are as follows:

- Definition: An adverse event is any untoward medical occurrence in a subject during participation in the study. An adverse finding can include a sign, symptom, abnormal assessment, abnormal occurrence, or any combination of these. A serious adverse event is any adverse event that results in one or more of the following outcomes: death, a life-threatening event, inpatient hospitalization or prolongation of existing hospitalization, a persistent or significant disability or incapacity, or an important medical event based upon appropriate medical judgment.
- Classification: Adverse events will be labeled according to severity, which is based on their impact on the neonate. An adverse event will be termed “mild” if it does not have a major impact on the neonate, “moderate” if it causes the neonate some minor inconvenience, and “severe” if it causes a substantial disruption to the neonate’s well-being.
- Attribution Scale: Adverse events will be categorized according to the likelihood that they are related to the study intervention. Specifically, they will be labeled definitely unrelated, definitely related, probably related, or possibly related to the study intervention.
- Adverse Event Reporting**:** Adverse events will be collected by the PI and forwarded immediately to the Independent Monitoring Committee. Events determined to be unanticipated, serious, and possibly related to the study intervention will be reported to the appropriate monitoring agencies, including the UC Davis IRB and the funding agency, within 10 days. Adverse events that are determined to be unrelated problems will be reported per IRB policy at the time of continuing review.

To conduct the intervention evalution that includes the RE-AIM dimensions, all eligible subjects will be included in the data collection process. Their data will be kept in secure REDCap databases containing only their study ID, and the link to their study ID and MRN will be kept in the “Participant Log” that is stored on a secure Excel database stored on the secure UC Davis servers.

This study is evaluating a systems-level intervention; a system-level intervention means that we are doing an intervention on how we deliver healthcare. In other words, our intervention is a test of change to the healthcare system. In this case, the system is how we deliver family-centered rounds. The study team will not be able to determine the feasibility and implementation of the pilot project without collecting the implementation data on all patients. It is important that we collect data on all eligible subjects, because we want to ensure that we include gathering data from underserved populations in order to learn how to better provide them with clinical services that meet/address their unique needs. This aspect is particularly relevant for telehealth interventions, whereby the ditigal divide is potentially designing/deliverying telehealth services that do not serve diverse populations. It is therefore important to have all of our diverse groups represented in our data in order to conduct our comprehensive intervention evaluation (Aim 3). We recognize the limitation that our survey-based outcomes (for Aims 1 and 2) will only gather data from those who complete the survey, and thus the conclusions from survey-based data will only be generalizable to similar populations as those represented in those surveys. However, our other outcomes (that rely on FCR observations and review of the EHR, incident reports, and

helpdesk technical issues log) will include all our subjects – and thus represent diverse groups.

Since this is a systems-level intervention, only collecting data on consented patients will provide Aim 3 (intervention evaluation) results that are biased and therefore not useful. We cannot understand how to refine and deliver our telehealth intervention (and thus improve this clinical service line) without having data on all eligible patients. Although we will need to collect data on every patient, the family members in the intervention group can choose if and how much to use the intervention (they can decide to never provide their cell phone number and to never use telehealth for FCR).

We will be using StudyPages, a secure web-based application developed by the UCD CTSC to maintain communication with study participants. All study personnel involved in this proposed project have received Human Subjects Protection and HIPAA education.

9) Data and/or Specimen Banking

N/A

10) Provisions to Monitor the Data to Ensure the Safety of Subjects

There is potential minimal risk. There is potential loss of confidentiality; however, for all data, only study personnel will have access to these materials. Although the research coordinator will view identifiable information from the health records, the data downloaded from REDCap to be used for analysis will all be de-identified. All data will be destroyed 7 years after completion of the study.

There is no risk to data security with regards to letting the parents use their personal device/computer to conduct virtual FCR, because the telehealth connection requires the download and use of the HIPAA-compliant application, Extended Care. This telehealth application platform to be used will be a secure platform that meets HIPAA and HITECH data security requirements. Therefore, since the telehealth intervention in this pilot trial will use a secure telehealth application to conduct virtual FCR, the communication will be secure. In this study, virtual FCR will only proceed using the HIPAA compliant application, since the videoconference connection is established through the HIPAA compliant application. No aspects of the virtual FCR encounter will be recorded nor stored in any way.

There are no anticipated risks to patients with regards to assignment to the intervention (virtual FCR). The intervention places no pressure on clinicians to alter clinical management. Rather, the intervention assigns the use of telehealth as an additional mode of communication to enhance the in person standards of FCR.

The alternative to virtual FCR is standard in person FCR or to not attend rounds at all. The benefits of in person FCR are not needing to communicate using a technology interface. However, the risks of in person FCR include the inability of the family to be able to physically be in the NICU during rounds, and thus to participate in FCR at all.

For the qualitative interview participants, there is potential minimal risk. Parents (or clinicians) might experience distress discussing their experiences during the NICU hospitalization of their child. However, this research team has previously conducted qualitative interviews with NICU parents who were asked to

reflect on their experiences when their child was hospitalized. In these interviews, informants did not report or demonstrate any distress. It is thus unlikely that such distress will occur with the proposed study. There exists a minimal risk of loss of confidentiality.

11) Withdrawal of Subjects

Subjects will only be withdawn if they no longer meet inclusion criteria. For example, this might occur if a neonate (subject) is enrolled but then has a CPS placement of visitor restrictions. At that point, we will inform the recruited parents, if applicable, that they no longer meet criteria to participate in the trial. This circumstance would be no different than their routine care, since a CPS restriction would prohibit them from joining FCR; so we would similarly restrict then form joining virtual FCR.

Families randomized to use the intervention can choose to use or not use the intervention as they see fit, and it will not impact their participation in the study. Families will be free to choose to complete or not complete the surveys the week of discharge.

12) Risks to Subjects

There is potential loss of confidentiality; however, for all data, only study personnel will have access to these materials. Although the research coordinator will view identifiable information from the health records, the data downloaded from REDCap to be used for analysis will all be de-identified. All data will be destroyed 7 years after completion of the study

13) Potential Benefits to Subjects

It is possible that families who have the intervention available to them find benefit in being able to participate in family-centered rounds while not being present in the NICU.

14) Multi-Site Research

N/A

15) Community-Based Participatory Research

N/A

16) Sharing of Results with Subjects

Results will not be shared with subjects. Summary of findings will be reported in the form of manuscripts and presentations at scientific meetings.

17) Prior Approvals

N/A

18) Provisions to Protect the Privacy Interests of Subjects

All information will be kept in secure REDCap or Excel databases and the only link between the patient and the REDCap will be a Study ID. We will use a "Participant Log" excel file to store data that links the Study ID with the subject. This log will include the following information: Study ID, patient name, MRN, CSN, intervention vs. control arm, admit date, enrolled date, parent identify (e.g., "mom"), parent cell/email preferred contact, subscription status, and disposition. This "Participant Log" will be stored on the secure UC Davis server.

Families will be free to use the intervention if/when it works for them. Families randomized to the intervention can opt out of using it entirely, with no penalty to them or their child. Families are free to answer (or not answer) the surveys the week of discharge and at 30, 60, and 90 days after discharge, with no penalty to them or their child.

Only members of the research team will have access to the data.

19) Compensation for Research-Related Injury

N/A

20) Economic Burden to Subjects

N/A

21) Drugs or Devices

N/A

22) Review Requirements

Are there any contractual obligations or other considerations that require IRB review of this research, or review at intervals other than those required by the Common Rule or FDA? If yes, check box:

☐ Yes

✖ No

STATISTICAL ANALYSIS PLAN

Statistical methods for primary and secondary outcomes

Our primary analysis strategy will analyze all available data from participating family units and their members, with groups defined according to the randomized assignment (intervention versus control) for that family unit. We will use graphical and analytical descriptive statistics to summarize infant, parent, and family unit characteristics. We will use methods for clustered survey data to adjust confidence intervals for family units with multiple parental respondents. We will not use cluster-adjusted confidence intervals for family units with multiple infants unless the mean number of infants per family unit unexpectedly exceeds 1.10.

We will use generalized linear models to estimate intervention effect sizes and confidence intervals and to test hypotheses for outcomes. Independent variables will include a binary indicator for intervention assignment along with a parsimonious set of subject characteristics as covariates (parent age, race, ethnicity, gender, education, transportation security, marital status, other children dependents, digital literacy score). We will specify the generalized linear mixed models as linear, logistic, or Poisson regressions, according to the outcome type. Random effects will be specified to accommodate the multilevel structure of the data and the nesting of longitudinal measurements, when applicable, within parents and the nesting of parents and infants within family units.

To account for increased exposure among subjects with longer neonatal intensive care unit (NICU) stays when analyzing the primary outcome, we will use Poisson regression to compare rates for the family-centered rounds (FCR) parent attendance outcome between intervention vs. control group subjects, using the numerator for this outcome as the dependent variable and using the logarithm of the denominator as an offset term. We will also use Poisson

regression for analyzing the error rate outcomes, with the offset being the logarithm of the number of days in the NICU. The exponentiation of the Poisson regression coefficient for the treatment indicator will thus represent an adjusted between-arm rate ratio for FCR parent attendance.

For parent experience and family-centered care, we will use the top-box scoring method and assess intervention effects on the individual items as well as on the summary scores. For parent health-related quality of life (HRQOL), we will similarly assess the intervention effects on the PedsQL™ Family Impact Module 36 items, eight subscales, and summary scores (overall total score, Parent HRQOL Summary score, and Family Functioning Summary score). To accommodate the longitudinal data collection for the HRQOL outcomes, we will use generalized linear mixed models that include main effects for time, study arm, and the interaction, to estimate timepoint-specific intervention effects. We will also evaluate the effect of the intervention on the remaining outcomes.

Interim analyses

Interim analyses will not be conducted during this trial.

Methods for additional analyses (e.g. subgroup analyses)

We will conduct mediation analysis to evaluate relationships between parent activation and the other secondary and exploratory outcomes. We will also evaluate relationships between FCR attendance and the other outcomes. For example, the intervention effect on HRQOL may be mediated by FCR attendance with a dose-response relationship. Thus, if we find a positive intervention effect on HRQOL, we will explore FCR attendance mediation using similar methods. We anticipate that the intervention effect on the following outcomes will be mediated by FCR attendance with a dose-response relationship: parent experience, family-centered care, parent activation, parent HRQOL, length of stay, and breastmilk feeding.

We will explore heterogeneity of the treatment effects, using rigorous analyses based on including interaction terms for the candidate effect modifier and the intervention effect term(s). Candidate effect modifiers will include residence-to-NICU distance, neighborhood health conditions, parent race and ethnicity, parent transportation security, other children dependents, parent computer/smart device access, parent internet access, and parent digital literacy score. For these terms, each will be evaluated without correction for multiple discovery. Other candidate effect modifiers will be evaluated as part of a comprehensive examination of intervention effects and for these, we will control the false discovery rate at 10%.

We will decompose the FCR parent attendance outcome measure by the type of attendance to separate the in-person and virtual components. We will explore the type of attendance as an outcome variable and as a predictor of the secondary outcomes. We will include a statistical exploration within the intervention arm for whether higher virtual FCR attendance is associated with differences in in-person FCR attendance. Additionally, we will fit regression models for each secondary outcome that simultaneously include measures of both virtual and in-person FCR attendance, allowing us to assess and compare whether the incremental benefits of higher FCR attendance are similar between both types of attendance.

Methods in analysis to handle protocol non-adherence and any statistical methods to handle missing data

The primary analysis strategy – a modified intention-to-treat analysis – differs from intention-to-treat only in that it will not require replacing missing data with imputed values. This 'complete-case' analysis strategy assumes that missingness is at random. Sensitivity analysis using multiple imputation will be performed to assess the potential impacts of nonignorable missingness and alternative approaches for handling infants whose disposition is not to the home

and thus for whom the outcome may not be as applicable. In particular, for the few infants who transfer to another unit or hospital, the parent-reported outcomes and the 30-day revisit/readmission outcomes are of limited applicability. Our modified intention-to-treat analysis will include these subjects, but alternative analysis that excludes such outcomes from infants not discharged to home would be warranted. We will also estimate alternative treatment effects, such as per-protocol and as-treated.