Asynchronous video messaging promotes family involvement and mitigates separation in neonatal care

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ABSTRACT

Objective To evaluate the parent and staff experience of a secure video messaging service as a component of neonatal care.

Design Multicentre evaluation incorporating quantitative and qualitative items.

Setting Level II and level III UK neonatal units.

Population Families of neonatal inpatients and neonatal staff.

Intervention Use of a secure, cloud-based asynchronous video messaging service to send short messages from neonatal staff to families. Evaluation undertaken July–November 2019.

Main outcome measures Parental experience, including anxiety, involvement in care, relationships between parents and staff, and breastfeeding expression.

Results In pre-implementation surveys (n=41), families reported high levels of stress and anxiety and were receptive to use of the service. In post-implementation surveys (n=42), 88% perceived a benefit of the service on their neonatal experience. Families rated a positive impact of the service on anxiety, sleep, family involvement and relationships with staff. Qualitative responses indicated enhanced emotional closeness, increased involvement in care and a positive effect on breastfeeding expression. Seventy-seven post-implementation staff surveys were also collected. Staff rated the service as easy to use, with minimal impact on workload. Seventy-one percent (n=55) felt the service had a positive impact on relationships with families. Staff identified the need to manage parental expectations in relation to the number of videos that could be sent.

Conclusions Asynchronous video messaging improves parental experience, emotional closeness to their baby and builds supportive relationships between families and staff. Asynchronous video supports models of family integrated care and can mitigate family separation, which could be particularly relevant during the COVID-19 pandemic.

INTRODUCTION

There is growing appreciation of models of neonatal care designed to engage and empower families as primary caregivers. These models of family integrated care (FiCare) are associated with improved outcomes for patients, their families and service providers.

Unrestricted family access is a key component of FiCare. Ordinarily, families may be physically separated from their newborn due to work, to care for other family members, or because of lack of money, transport or on-site accommodation.

COVID-19 has brought new and unprecedented challenges in clinical care, including the delivery of FiCare. Strict infection control measures have created new barriers to family involvement in care, restricting the duration of visits and the number of family members who can visit.

Innovative solutions are required to mitigate family separation. Live video technologies are available but have practical limitations and potential unintended negative consequences. Asynchronous, recorded or ‘store-and-forward’ video may offer greater convenience and support relationships between families and staff. The vCreate asynchronous video service has been widely implemented in over 60 neonatal units in the UK. During the COVID-19 global pandemic, this digital service has been extended to additional neonatal, paediatric and adult critical care settings.

What is already known on this topic?

- Involving families as primary caregivers in the neonatal team improves outcomes for infants, their parents and services.
- Parental presence and supportive relationships with staff are key components of family-integrated care models.
- Live video services in neonatal care may be associated with parental and staff anxiety and increased staff workload.

What this study adds?

- This is the first evaluation of asynchronous video messaging to support neonatal care.
- Video messages sent from neonatal staff to families improve parental experience, involvement in care and relationships with staff.
- Video messages may mitigate the effects of family separation, including during restrictions associated with COVID-19.
AIM
This study aimed to evaluate the impact of a secure video messaging service on parent and staff experience of neonatal care.

METHODS
A multicentre service evaluation was performed in five UK neonatal care units (four level III, one level II) between July and November 2019. The vCreate Neonatal Video Diary service (vCreate, Windsor, UK) was developed in collaboration with neonatal patient families and the clinical team at the Royal Hospital for Children, Glasgow.

Families consented and registered to the use of the service. Neonatal staff recorded short videos (1–3 min duration) on a tablet device (Apple iPad, Apple, CA) and used the vCreate web-app to assign these to pre-registered parent accounts. Videos were stored in a secure cloud (Microsoft Azure, Microsoft, Washington, USA). Families downloaded, viewed and shared their videos using their personal login on any internet-enabled device. Guidance on creating video content was available in each unit. Specifically, videos were used to provide generic updates, not specific clinical information, and to capture significant moments in a baby’s life that the parents might otherwise have missed, for example, first feeds, successful extubation and first time dressed.

The vCreate service is funded in individual units from local hospital or neonatal charities, with no additional costs to the health service provider (UK National Health Service, NHS) or to families. The service received information governance and information technology (IT) security approval in each centre and is an NHS Digital Library Trusted App.

Pre-implementation and post-implementation surveys were designed for staff and families. Staff pre-implementation surveys were distributed in two centres where the service was not yet in use. Parent pre-implementation and post-implementation surveys were distributed in three centres where the system was already in use as a component of standard clinical care. Surveys contained quantitative (9-point Likert scale, or closed-ended yes/no responses) and qualitative items (open comment boxes). Factors evaluated were parental stress and anxiety, breastmilk expression, involvement in care (parents and extended family), emotional closeness, sleep, visiting and phoning, relationship with staff, staff workload, ease-of-use of the service, barriers and concerns relating to the service.

Surveys were distributed in paper format by evaluation team members at each site to all eligible participant families and were returned by respondents anonymously to collection boxes. Only families who did not consent to use of vCreate were excluded. The sample size represents a convenience sample of parents and staff using the service and available to respond to the survey during the study period.

Quantitative data were analysed using GraphPad Prism V.8.4.2 and summarised as median, range and percentage. The impact of patient and video service-related variables on parental outcomes was assessed (length of use of video service, number of videos received at the time of evaluation, frequency of receiving videos and gestation of infant), using Mann-Whitney analysis to compare dichotomous groups. A coding dictionary was created and individual survey responses of all respondents were coded accordingly. Coded responses were aggregated to report themes from both parent and staff surveys.

RESULTS
Parent responses
Forty-one pre-implementation surveys were returned by families. Respondent’s infants had a median (range) gestation at birth of 33 (24–41) weeks. Parents reported high levels of satisfaction with family–staff relationships, but also high levels of stress related to separation, concern for their child’s health and fear of the unknown (table 1). Families felt that future use of the video messaging service would reduce stress (68%), improve their involvement in care (61%) and enhance emotional closeness (61%). All families (n=41, 100%) had access to a suitable internet-enabled device. Parental concerns related to security of the service and staff workload.

Forty-two post-implementation parental surveys were returned by families whose infants were a median (range) gestation at birth of 30 (23–41) weeks. Thirty-seven respondents (88%) were mothers. Sixty-nine percent of families had been on the neonatal unit for more than 2 weeks and 67% (n=28) of respondents had been using the service for more than 2 weeks. At the time of survey, the number of videos received per family were as follows: 19 (45%) had received <5 videos; 9 (21%) had received 5–10 videos; 10 (24%) had received 11–15 videos; 3 (7%) had received >15 videos; 1 had no response. Nineteen families (45%) would have likely to have received more video messages.

Thirty-eight (90%) reported an overall positive impact of video messaging on their neonatal experience; 3 (7%) were unsure; 1 respondent reported no overall benefit. Median parental ratings of impact (ranging from 1=greatest negative impact to 10=greatest positive impact) were as follows: for sleep, 7 (range 5–10); anxiety, 8 (range 5–10); breastmilk expression, 5 (range 5–10); extended family involvement, 7 (range 5–10); and relationship with staff, 9 (range 5–10) (figure 1).

Qualitative parental responses highlighted key themes of reduced stress and anxiety and increased feelings of reassurance, particularly at times when parents had to leave their baby. Parents also indicated that use of the service made them feel more involved in their child’s care in the neonatal unit by giving them a sense of inclusion when they could not be physically present and ensuring they did not miss out on significant moments. Parents also reported that visualising and seeing their child in the videos, when they could not be present, led to greater emotional closeness and stronger bonding (table 2).

Parent-reported measures of the impact of the video service were compared based on length of service use (< or >4 weeks), number of videos received (< or >10), frequency of receiving videos (< or >every 2 days) and infant gestation (< or >32 weeks); no significant differences were observed for any of these variables (table 3).

Families reported that receiving video updates did not affect the number of times they visited the neonatal unit, but that use of the service led them to make fewer phone calls to the neonatal unit.

Staff responses
Twenty-six staff pre-implementation surveys were completed by 15 nursing staff, 1 occupational therapist and 10 medical staff. Thirteen (50%) felt the service could potentially be implemented alongside current workload; three (12%) said no; and 10 (38%) were unsure. Fourteen (54%) felt it would positively impact
relationships with families. Eighteen (70%) were interested in future use of the service.

Seventy-seven staff completed post-implementation surveys; all were nursing staff. The median number of videos sent per respondent was three videos per week (range 1–10). Forty-one (54%) reported that they would like to send videos more frequently.

Median (range) staff ratings were as follows: for ease of use 3 (range 1–10: 1=extremely easy, 10=extremely difficult) and for workload 4 (range 1–8; 1=increased workload, 10=reduced workload). Fifty-five (71%) felt that the service had a beneficial impact on their relationship with families; 12 (16%) were unsure; and 10 (13%) felt it had no effect.

Qualitative staff responses confirmed themes of a modest increase in workload, satisfaction in sending videos for families, improved communication, and trust and appreciation between staff and families. Staff expressed a need to balance parental expectations against clinical workload. Technical issues and need for training were highlighted by a minority of respondents (table 4).

DISCUSSION
We evaluated family and staff experience of a secure asynchronous video messaging service in neonatal units.

Families reported that use of the service reduced stress and anxiety, increased involvement in care and emotional closeness, and improved relationships with staff. Staff reported high levels of satisfaction with the service, perceived a benefit for families and improved relationships with them, with only a modest increase in workload.

Need and barriers to implementation
Pre-implementation responses from families highlighted the underlying need for improved support when their newborn is receiving critical care. Families expressed high levels of stress, worry for the future and fear of the unknown, which are well recognised in these settings. Families did not report any barriers to using the service; they were technically prepared with universal smartphone ownership, and the majority perceived the potential benefits.

Similarly, the majority of staff were receptive to future use of the service. Concerns raised around additional workload and service security highlight these as important factors to address with new users. However, no issues with security were raised by users post-implementation.
### Table 2  Post-implementation parent responses

| Theme                              | Parent comments                                                                 |
|------------------------------------|---------------------------------------------------------------------------------|
| **Parent experience**              |                                                                                |
| Anxiety and stress                 | ‘It has reduced my stress levels, especially at night when I have left the neonatal unit’ |
|                                    | ‘I see my baby is safe, so my stress levels are reduced’                        |
| Reassurance                        | ‘It is reassuring to see she is being cared for when I’m not present. ‘It gives me peace of mind’ |
|                                    | ‘Being able to see my baby when I’m at home is overwhelming but reassuring that he is ok’ |
|                                    | ‘It helps if he’s been having a bad day to see that things have calmed down after we’ve left’ |
| Involvement in care                | ‘You feel included by being sent the videos and photos as you are being included in stuff that’s happening when you’re not there’ |
|                                    | ‘It helps us feel more included and that the staff are thinking of us’          |
|                                    | ‘Seeing moments we would maybe normally miss’                                  |
| Emotional closeness                | ‘It helps with the feeling of bonding as we see more of him’                    |
|                                    | ‘Despite distance, getting to see him makes us feel closer to him’             |
|                                    | ‘This makes me see how well my baby has come along and gives me a strong bond’ |
| Breastmilk expression              | ‘The very first one was hugely emotional and actually helped with my breastmilk!’ |
|                                    | ‘It really helps! One was entitled “ready for feeding” so the next day we tried her on the breast’ |
| Extended family                    | ‘We sent to family which helped them too as at that point they hadn’t even seen her’ |

### Table 3  Parent-reported outcomes of use of asynchronous video service and variables related to patient characteristics and service use

| Parent-reported outcomes, Likert score 1–10, median (range) |
|-------------------------------------------------------------|
|                                      | Stress | Involvement in care | Emotional closeness | Parent–staff relationship | Sleep | Anxiety | Breastmilk expression | Extended family involvement |
|--------------------------------------|--------|---------------------|---------------------|---------------------------|-------|---------|-----------------------|-----------------------------|
| **Length of use**                    |        |                     |                     |                           |       |         |                       |                             |
| <6 weeks (n=29)                      | 8 (5–10)| 8 (4–10)            | 8.5 (5–10)          | 9 (5–10)                  | 7 (5–10)| 8 (5–10)| 5 (5–10)             | 6 (5–10)                    |
| >4 weeks (n=13)                      | 8 (5–10)| 7 (5–10)            | 8 (4–10)            | 9 (5–10)                  | 5 (4–10)| 6 (5–10)| 5 (1–10)             | 7 (4–10)                    |
| P value                              | 0.77   | 0.26                | 0.47                | 0.28                      | 0.83  | 0.26    | 0.43                  | 0.85                        |
| **Number of videos received**        |        |                     |                     |                           |       |         |                       |                             |
| <10 (n=29)                           | 8 (5–10)| 8 (4–10)            | 8 (5–10)            | 10 (5–10)                 | 6.5 (5–10)| 8 (5–10)| 6 (5–10)             | 6.5 (5–10)                  |
| >10 (n=13)                           | 9 (7–10)| 8 (5–10)            | 8 (5–10)            | 8 (5–10)                  | 7 (5–10)| 8 (5–10)| 5 (1–10)             | 7 (4–10)                    |
| P value                              | 0.10   | 0.96                | 0.69                | 0.41                      | 0.74  | 0.95    | 0.15                  | 0.84                        |
| **Frequency of videos received**     |        |                     |                     |                           |       |         |                       |                             |
| <2 days (n=22)                       | 8 (5–10)| 8.5 (5–10)          | 9 (5–10)            | 9 (5–10)                  | 7 (5–10)| 7 (5–10)| 5 (5–10)             | 6.5 (5–10)                  |
| >2 days (n=20)                       | 8 (5–10)| 7 (4–10)            | 8 (4–10)            | 9 (5–10)                  | 6.5 (5–10)| 8 (5–10)| 5 (1–10)             | 7 (4–10)                    |
| P value                              | 0.33   | 0.22                | 0.54                | 0.95                      | 0.78  | 0.28    | 0.82                  | 0.56                        |
| **Gestation of infant**              |        |                     |                     |                           |       |         |                       |                             |
| <32 weeks (n=24)                     | 8 (5–10)| 8 (4–10)            | 8 (5–10)            | 9.5 (5–10)                | 7 (5–10)| 8 (5–10)| 6 (1–10)             | 7.5 (4–10)                  |
| >32 weeks (n=18)                     | 8 (5–10)| 8.5 (5–10)          | 8.5 (4–10)          | 8 (5–10)                  | 5 (5–10)| 6.5 (5–10)| 5 (5–10)              | 5.5 (5–10)                  |
| P value                              | 0.91   | 0.69                | 0.89                | 0.30                      | 0.13  | 0.10    | 0.21                  | 0.22                        |
Use of the vCreate service required individual information governance and IT approvals in each participating centre. The absence of a consistent, centralised process for review and approval of new digital services, or for sharing of these across multiple sites, is a potential barrier to clinical implementation and an ongoing inefficiency in health services.

Supporting family involvement in care
Families reported consistent benefits from use of the service, notably, reduced stress and anxiety and feelings of reassurance. Importantly, none expressed a negative impact. These benefits might be particularly relevant for families in critical care settings during the heightened concerns and mental health challenges associated with COVID-19.13–17

Families also reported that the service increased emotional closeness with their child and their sense of involvement in care. Both families and staff felt strongly that the service supported and strengthened their relationships with each other, building communication, appreciation and trust. These are core elements of FiCare models, indicating a key role for asynchronous video communication, appreciation and trust. These are core elements.

A subset of families additionally reported that video messages supported their breastfeeding and maternal health.20 21

Interestingly, the benefits of receiving asynchronous video did not appear to be related to infant gestation, duration of neonatal admission or the number of videos received. This finding suggests that all families in the neonatal unit may benefit from the use of the service.

Staff expressed strong satisfaction with the service as a tool enabling them to support families. This also has particular relevance for models of FiCare in which staff become teachers and mentors to families, reinforcing them as partners at the heart of care.22 This benefit of the service may be especially important in critically ill patients where survival is uncertain. In these circumstances, video messages may allow staff to provide an additional support to families, with potential benefits to parent and staff well-being.23 24

Workload and expectations
Our findings highlight the need to balance staff availability to make and send videos against families’ desires to receive more. Parents themselves recognised the potential risk of distracting staff from other clinical duties. In our experience, videos can be made in less than five minutes, though this was not formally assessed in the evaluation. Setting and managing families’ expectations of the number and timing of videos is important. In our practice, we encourage staff to discuss with families when they would like to receive a video, what content they like to receive, and reassure them not to worry if they do not receive a video.

Importantly, receiving videos did not affect how often families attended the neonatal unit but did reduce the number of phone calls they made, potentially reducing disruption to care delivery by busy staff.

Table 4  Post-implementation staff responses

| Theme                             | Staff comments                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------|
| Satisfaction                      | ‘I really enjoy sending these videos as much as families love to receive them’  |
|                                   | ‘Think it’s a great service we can offer to parents/families and I enjoy making the videos individualised to babies’ |
|                                   | ‘It is a very nice service for parents and allows the nurses to be creative’ |
| Workload                          | ‘It’s an extra task to do at the end of your shift but it’s a task that I want to do. It doesn’t take long’ |
|                                   | ‘A little extra but not difficult and rewarding for parents’ |
| Relationship with families         | ‘Sometimes there’s an expectation to receive regular updates which isn’t always possible if the unit is busy’ |
| Communication and trust           | ‘If video fails to load, have to repeat again’                                |
|                                   | ‘Wifi can be an issue resulting in loss of video’                             |
| Appreciation                      | ‘More training will make me more confident and will make it quicker for me to do’ |
technologies, but potential differences include a need for more hardware, reliable WiFi connectivity and increased cost of live video services.

Extended use of the asynchronous service during COVID-19
Our evaluation was conducted in the months preceding COVID-19. Unprecedented new restrictions on hospital visiting have now heightened the need for innovative, convenient solutions to connect patients, families and staff. The video service has been rapidly extended to additional neonatal, paediatric and adult critical care areas, and is being adapted to support patient-to-clinician outpatient communication in adult and paediatric services. Further evaluation will be required to understand the impact of the service in these additional settings during this pandemic.

Limitations
Pre-implementation and post-implementation surveys were not administered to the same staff or families. Surveys were distributed to all eligible participants and returned anonymously; therefore, we are unable to report specific response rates. Video content was not evaluated, nor was any potential ‘dose-response’ of the number of videos received. Additional potential confounders include nature or severity of the infants’ conditions, duration of admission at the time of response, staff and family age and previous experiences. We did not evaluate the impact in non-English speaking families; however, use of the system has been explored in centres in non-English speaking countries. Investigators at one evaluation site provided clinical input during the development of the video service, introducing a potential bias. Future evaluations could include other staff groups, including allied healthcare professionals, and subgroup analysis based on additional infant and family characteristics.

CONCLUSION
Asynchronous video messaging from healthcare workers to families in a neonatal care setting supports family involvement in care and parental well-being, and strengthens positive relationships with staff. This service could be an important practical component of family-integrated models of care and of particular benefit in mitigating family separation during COVID-19.

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Contributors
NP, MGC, LS developed the concept and designed the evaluation surveys. LS, SS, CA, KT, RG, NB and JO distributed surveys and collated results in their centres. SK and LS combined all survey data and performed the analysis, with support from MGC and NP. All authors contributed to authoring the manuscript.

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NP developed the concept of video messaging and provided clinical input on development of the service. He has no financial or other interest in the service.

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Data are available upon reasonable request. All data, including raw data used for all figures and analysis, are available upon reasonable request from the corresponding author.

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REFERENCES
1. Davidson JE, Askalon RA, Long AC, et al. Guidelines for Family-Centered care in the neonatal, pediatric, and adult ICU. Crit Care Med 2017;45:103–28.
2. Brown SM, Rozenblum R, Aboumatar H, et al. Defining patient and family engagement in the intensive care unit. Am J Respir Crit Care Med 2015;191:358–60.
3. Ludmir J, Netzer G. Family-Centered care in the intensive CareUnit:What does best practice tell us? Semin Respir Crit Care Med 2019;40:648–54.
4. Kleinpell R, Zimmerman J, Vermorken J, et al. Promoting family engagement in the ICU: experience from a national collaborative of 63 ICUs. Crit Care Med 2019;47:1692–8.
5. O’Brien K, Robson K, Bracht M, et al. Effectiveness of family integrated care in neonatal intensive care units on infant and parent outcomes: a multicentre, multinational, cluster-randomised controlled trial. Lancet Child Adolesc Health 2018;2:245–54.
6. Banerjee J, Alloysius A, Mitchell K, et al. Improving infant outcomes through implementation of a family integrated care bundle including a parent supporting mobile application. Arch Dis Child Fetal Neonatal Ed 2020;105:172–7.
7. Roule J-M, Kuhn P, Lopez Maestro M, et al. Eight principles for patient-centred and family-centred care for newborns in the neonatal intensive care unit. Arch Dis Child Fetal Neonatal Ed 2017;102:F364–8.
8. Ferrando P, Gould DW, Walmsley E, et al. Family satisfaction with critical care in the UK: a multicentre cohort study. BMJ Open 2019;9:e028956.
9. Bliss. Families kept apart: barriers to parents’ involvement in their baby’s hospital care, 2016. Available: http://www.bliss.org.uk/families-kept-apart
10. NHS. Visiting someone in hospital. Available: https://www.nhs.uk/using-the-nhs/nhs-services/hospitals/visiting-someone-in-hospital/
11. RCPCH / BAPM. COVID-19 – guidance for paediatric services, 2020. Available: https://www.rcpch.ac.uk/resources/covid-19-guidance-paediatric-services#working-in-neonatal-settings
12. Banerjee J, Alloysius A, Platonos K, et al. Innovations: supporting family integrated care. J Neonatal Nurs 2018;24:48–54.
13. Kerr S, King C, Hogg R, et al. Transition to parenthood in the neonatal care unit: a qualitative study and conceptual model designed to illuminate parent and professional views of the impact of webcam technology. BMC Pediatr 2017;17:158.
14. Obedat HM, Bond EA, Callister LC. The parental experience of having an infant in the newborn intensive care unit. J Perinat Educ 2009;18:23–9.
15. Mental health and psychosocial considerations during the COVID-19 outbreak, 2020.
16. Bai X, Wang J, Jin D, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open 2020;3:e203976.
17. Liu H, Yao Y, Huang X, et al. Mental health considerations for children quarantined because of COVID-19. Lancet Child Adolesc Health 2020;4:347–9. https://doi.org/
18. Patel N, Ballantyne A, Bowker G, et al. Family Integrated Care: changing the culture in the neonatal unit. Arch Dis Child 2017;92:1–6.
19. Lee SK, O’Brien K, O’Brien K. Family integrated care: changing the NICU culture to improve whole-family health. J Neonatal Nurs 2018;24:1–3.
20. Victora CG, Bahl R, Barros AJD, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet 2016;387:475–90.
21. Chowdhury R, Sinha B, Sankar MJ, et al. Breastfeeding and maternal health outcomes: a systematic review and meta-analysis. Acta Paediatr 2015;104:96–113.
22. Broom M, Parsons G, Carlisle H, et al. Transition to parenthood in the neonatal unit: impact on nursing workflow. Clin Med Res 2016;14:1–6.
23. Kleinpell R, Zimmerman J, Vormloer J, et al. Neonatal nurses’ perceptions of using live streaming video cameras to view infants in a regional NICU. Journal of Neonatal Nursing 2020;26:207–11.
24. Ting D, Carin L, Dzau V, et al. Digital technology and COVID-19. Nat Med 2020.