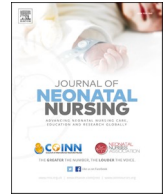


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Live stream webcams on the neonatal unit: ‘An additional responsibility’ for nursing workload?

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ABSTRACT

Introduction: Live stream webcams have been introduced to neonatal units to reduce the separation between parents and infants. However, this new technology has the potential to impact nursing workload. The aim of this study was to explore the impact of the new implementation of webcams on nursing workload.

Method: A survey was developed to explore webcam related nursing activity. Workload evaluations were completed by each nurse per shift, over a three-month period.

Results: A total of 85 nurses took part in the study, completing 765 workload surveys. Findings revealed 95% of camera related tasks took less than 15 min. Parent phone calls related to webcams and changes in workflow for infant handling were identified.

Conclusion: The introduction of webcams did not negatively impact nursing workload. Education for nurses and parents, and a technological support nurse or team would help lessen some of the challenges nurses experienced.

1. Background

Nearly 100,000 babies are admitted annually to neonatal units (NNU) in England, the equivalent of 1 in 7 births (RCPCH, 2019). The often unexpected admission of a baby for neonatal care may be distressing for parents naturally concerned for their baby’s health and survival, whilst struggling with the disrupted transition to parenthood (Caporali et al., 2020). Parental distress may be further compounded by a loss of parental role and the necessary cultural adaptation to the neonatal unit, accompanied by complex communication about their baby’s condition with neonatal healthcare professionals (Gallagher et al., 2018). More recently this was exacerbated by restricted access policies for both parents and extended family throughout the COVID-19 pandemic of 2020 and 2021 (Ciotti et al., 2020; Fonfe et al., 2021). For many parents, this may lead to anxiety, depression, and even post-traumatic stress (Shaw et al., 2013; Malouf et al., 2022).

To reduce the effect of separation and improve parental bonding and wellbeing, some neonatal units have introduced novel technology such as virtual diaries and live streaming video cameras. ‘Webcams’ enable parents to view their baby in ‘real time’ using their smartphone or tablet at times when they are unable to be physically present with their baby.

While studies have reported benefits for parents, including improved bonding and reduced stress and anxiety (Kubicka et al., 2021; Kilcullen et al., 2022; Psychogiou et al., 2020), nursing staff have identified concerns about the integration of webcam technology into routine care including concerns surrounding security and privacy (Hawkes et al., 2015), and increased nursing workload and stress (Kilcullen et al., 2020). In an evaluation of webcam implementation on a neonatal unit in the United States, Joshi et al. (2016) surveyed 42 nursing staff observing that time spent repositioning cameras, technological difficulties and receiving additional phone calls from concerned parents were perceived to negatively impact the quality of care provided to infants and their families. Additional tasks can increase stress for nursing staff and interrupt nursing workflow. Previous research has highlighted increased nursing workload is associated with missed nursing care and could raise patient safety concerns (Tubbs-Cooly et al., 2019).

The impact of live streaming technology upon the relationship between healthcare professionals and parents has also been questioned; neonatal healthcare professionals report perceptions of being ‘under surveillance’ when webcams are in use on the neonatal unit (Le Bris et al., 2020). However, in an interview study of 40 parents, “surveillance” was reported positively as parents considered this would increase

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staff vigilance of their baby during webcam sessions, improving the relationship between parents and staff (Reimer et al., 2021).

Few studies have focused on the impact of live streaming technology on clinical nursing practice, and none to our knowledge have explored the effect of webcams on infant handling, despite recommendations from the European Foundation for the Care of Newborn Infants (EFCNI, 2018) that neonatal units integrating webcams into clinical practice undertake an evaluation of their implementation. This study aimed to explore the impact of live streaming webcam technology on nursing workload. This is part of a larger programme of research exploring staff perceptions and parent experiences of webcam use in neonatal care.

2. Methods

2.1. Study setting

The Angel Eye Camera System (<https://angeleye.health>) was introduced to a 28-cot Level 3 tertiary neonatal intensive care unit in the UK in 2020. Initially the webcams were piloted in one nursery with four intensive care cot spaces. Toward the end of 2020 the webcams were made available for all cot spaces across the unit. The webcams were offered to parents following the admission of their baby to the neonatal unit. Written consent was taken from parents wishing to use the webcam technology, following which the webcam was set up on the side of the incubator/cot space and an online account created for parents by the nursing team. Live streams of the baby were made every day for 2 h in the morning and 2 h in the evening, with personalised viewing times available depending on individual family circumstances. The Angel Eye cameras on our unit transmit viewing only; no sound option is available.

A workload survey was designed to capture the impact of the webcams upon nursing workload and infant handling. The survey was developed using previous literature and comprised 12 questions (appendix 1), which explored basic information relating to current workload (babies cared for per shift, presence of webcams per infants cared for), and any webcam related changes or additions to routine nursing practice (including repositioning the baby and/or camera, equipment set up and cleaning, dealing with technological issues, and webcam related parent phone calls). Content validity was ensured through review by clinical and academic neonatal experts, and piloting of the survey with a small group of neonatal nurses and practice educators prior to its official launch. Following review, two questions were reworded for clarity. The study was approved by the West of Scotland Research Ethics Committee (ID: 20/WS/0155), the Research and Development Department of the participating NHS Trust (ref: 134712) and registered under the National Institute for Health Research (NIHR) Portfolio.

2.1.1. Participant recruitment and data collection

Nursing staff were introduced to the study via email, presentation at ward meetings and one-to-one discussions with the clinical research nursing team. Participation included completion of one workload survey towards the end of each nursing shift worked, with the survey summing information for all infants cared for during that shift. All clinical nursing staff, including nurses and nursery nurses working in the neonatal unit during the study period, were eligible to take part (aside from those on the study team). Potential participants were invited to participate in the study and given written study information to consider. Signed consent was sought from nurses volunteering to participate.

Surveys were anonymous and available as paper copies which were distributed daily by the clinical research nursing team. An online version of the survey was also available on Opinio, hosted by UCL Information Services Divisions (ISD) infrastructure and meeting ISD standards. A link to the survey was available via a QR code or a survey link provided in email and on posters. Information collected on paper surveys was uploaded into Opinio by a member of the research team. Workload evaluations were collected over a 3-month period (1st February - 30th

April 2021).

2.1.2. Data analysis

Data were exported from Opinio directly into Microsoft Excel for analysis. Descriptive statistics were used to analyse frequency questions and content analysis used to analyse data from open-ended questions (Graneheim and Lundman, 2004). Content analysis is useful when conducting exploratory work as it allows for the categorisation of words into fewer content related themes (Elo and Kyngas, 2008). Frequency counts of recurring words/phrases provide a starting point for focussing on interpreting the underlying meaning of the words (Morse and Field, 1995). To optimise the rigour and trustworthiness of the qualitative analysis, two members of the research team (KC & KG) independently immersed themselves in the data through reading and re-reading the data, prior to coding the text to recognise basic concepts and subsequently overall themes reflecting the research questions. The researchers then discussed all coding and themes to determine the final results from the data.

3. Results

Ninety nurses were eligible to participate in the study; 85 consented to take part. Over the three-month period participants completed a total of 765 workload surveys; a completion rate of 30% based upon the number of staff and shifts available during this time. Nurses working in intensive care completed 354 (47%) surveys, followed by nurses in high dependency or special care ($n = 324$, 43%). The remaining surveys were completed by the nurse in charge or float nurse ($n = 85$, 10%). Most nurses were caring for one or two babies per shift ($n = 571$, 75%) and most infants ($n = 552$, 77%) had a webcam in use during the nursing shift. During the study period 16 participants reported caring for babies whose parents were isolating due to COVID-19 (2%), all of whom had webcams in use. No webcams were reported to have been in use during neonatal end-of-life care.

Nurses were asked to report the amount of time spent on individual webcam related tasks undertaken during their shift. Frequency analysis highlighted that the majority of these tasks (95%) took 15 min or less per shift (Table 1).

Nurses were invited to expand upon their responses for questions exploring their perceptions of the impact of webcams upon: (1) webcam related telephone calls (2) infant handling during and around webcam use, and (3) quality of nursing care provided to infants while webcams are in use.

1. Telephone calls

When asked about webcam related telephone calls, 20% ($n = 128$) of nurses reported receiving one or more telephone calls from parents per shift, with a small number of nurses (2.5% $n = 18$) reporting three or more telephone calls per shift. Nurses provided further information about the perceived content of the telephone calls through open-ended responses; frequency analysis of comments identified four themes and two subthemes: (1) parental expectations of service provision, (2)

Table 1

Time spent on individual webcam related tasks as reported by nurses, per shift worked.

Task	Time per webcam task (% of responses)			
	0	<15	15–30	30–60
	min	min	min	min
Initial explanation	80.4	16.9	2.4	0.3
Cleaning equipment	80.6	16.5	2.4	0.3
Interacting with families	35.5	63.2	1.3	0
Repositioning camera after phone calls	81.3	16	2.6	0.1
Resolving technical problems	71.4	25.1	3.2	0.3

parental concerns including (2i) infant comfort and (2ii) treatment queries, (3) technical difficulties, and (4) camera repositioning (Table 2).

2. Infant handling

Nurses were asked to report any additional handling of infants outside of routine care undertaken in relation to the webcams. A quarter of participants (25% n = 159) reported handling infants 1–2 times more often, with a very small number of participants (2% n = 14) reporting an additional 3–4 times of infant handling in relation to the webcam.

Nurses provided further information exploring the reasons for increased infant handling, when identified, through open-ended responses. Frequency analysis of comments identified 3 themes: (1) infant repositioning, (2) preparing baby for live streaming, and (3) nursing workload concerns (Table 3).

3. Quality of care

Nurses were asked about the perceived impact which integrating webcams into clinical practice had upon the quality of care they could provide to infants and families. Sixty eight percent of nurses reported an improvement (n = 17, 6%) or no perceived difference (n = 175, 62%) to the nursing care they were able to provide whilst the webcams were in use. In contrast, 89 responses (32%) indicated a reduced ability to provide quality nursing care to infants and families during webcam use. Nurses provided further information exploring the perceived impact upon nursing care through open-ended responses. Frequency analysis of comments identified 3 themes: (1) no impact, (2) negative impact and

Table 2

Themes representing the perceived content of telephone calls from parents related to webcam use during their working shift, as reported by nurses.

Theme	Frequency count of responses (n)	Illustrative quotes from participant responses
Parental expectations of service provision	42	<p>“The parents complain about not having webcams as we were busy with admission” (<i>parents called to ask</i>)</p> <p>“To start the webcam, I was suctioning so started it late”</p> <p>“Mum called for Angel Eye and blanket position, haven’t turned on the camera as the room is busy with monitoring and admission and transfer”</p>
Parental concerns		
• Infant Comfort	22	<p>“Mum called and wasn’t happy with the positioning of the baby – she was just worried”</p> <p>“Mum concerned baby was left side down on cannula side”</p>
• Treatment queries	15	<p>“Mum phoned saying that baby is trying to pull NGT”</p> <p>“Dad phoned and asked if we can suction the baby’s mouth as he can see saliva in baby’s mouth”</p>
Technical difficulties	20	<p>“Camera not working, took us more than half an hour but did not manage to set it up”</p> <p>“Screen not working so not sure if camera working or not”</p> <p>“Mum asked about webcam not working, I told her I am in the middle of checking the camera”</p>
Camera repositioning	14	<p>“Both parents phoned to ask for the camera to be repositioned”</p> <p>“Repositioning of camera when baby is wriggling, ‘why there is too much moisture on the incubator, can you wipe it clean, I can’t see the baby properly”</p>

Table 3

Themes representing additional infant handling related to webcam use, as reported by nurses.

Theme	Frequency count of responses (n)	Illustrative quotes from participant responses
Infant repositioning	57	<p>“Only to do mouthcare and improve positioning”</p> <p>“Moved baby onto opposite side so that they were facing the camera”</p> <p>“Repositioned as baby awake so parents could see”</p>
Preparing baby for live streaming	45	<p>“You prepare the baby well so that they will see the baby is positioned nicely and is comfortable”</p> <p>“Cares before camera turned on for comfort and reduce phone calls for parents”</p> <p>“Did cares early to cluster the cares and preparing baby for live streaming”</p> <p>“Doing BP, cares early, so I don’t interrupt parents time with baby”</p>
Nursing workload concerns	17	<p>“I need to make them settled as parents are watching on the camera and I don’t want them to think that I neglect their babies”</p> <p>“Extra hands needed for positioning and when baby is unsettled”</p>

(3) positive impact (Table 4).

4. Discussion

The aim of this study was to explore the impact of live streaming webcam technology on nursing workload on a tertiary level neonatal unit in the UK. Our findings highlight that nursing time spent per camera related task was generally low and there was minimal impact from the use of webcams upon perceived ability to provide quality nursing care to infants and families.

Our findings contrast with those from other studies, which highlight a perceived increase in nursing workload, and a perceived negative impact upon the quality of nursing care (Kubicka et al., 2021; Joshi et al., 2016). These differences could potentially be explained by the length of time webcams were in use per study; Kubicka et al. (2021) used webcams continuously, in comparison to our unit which had 2-h live

Table 4

Themes representing perceived quality of care during webcam use, as reported by nurses.

Theme	Frequency count within responses (n)	Quote from responses
No impact	175	<p>“Nursing care continued with no reduced ability”</p> <p>“Did not have any issues with the webcam, so it did not affect my nursing care”</p>
Negative impact	89	<p>“If the baby was desaturating while the camera is on, I feel that the viewers might get anxious if stimulate baby without them knowing what is going on”</p> <p>“It is an additional responsibility for nurses. Hard to move due to weight and attached wires”</p> <p>“Having to troubleshoot the webcam on top of the routine nursing care can be difficult at times. It puts pressure on staff to fix the webcam”</p> <p>“I found myself unable to attend a crying baby with AE (<i>AngelEye</i>) on, found myself frustrated and feeling ‘failed’. I turn it off for shame”</p>
Positive impact	17	<p>“Vital for family centred care and bonding”</p> <p>“Helped to view baby using webcam without disturbing or touching baby”</p>

sessions each morning and evening, which also may reduce the amount of time nurses spent attending to webcam related tasks. It is also possible that the results from our study could reflect attitudes during the COVID-19 pandemic, when nurses appreciated the need to improve parent access to their babies, although the number of parents using webcams whilst in isolation during our study period was low. Nurses reported benefits to using the webcams as part of nursing care, including using the cot side screens to monitor infant comfort without lifting incubator covers, but reported concerns included increased handling in relation to parent phone calls and preparation for viewing outside of routine care times. In our study, nurses reported a tendency to turn off cameras during clinical procedures and routine cares (such as nappy changes, re-positioning, blood pressure measurements), or 'preparing' infants prior to starting the webcam; for example, reorganisation of the timing of infant cares to avoid doing them during the period of live streaming. Such actions indicate a perception that parents may not want to see procedures and cares, a finding which was similarly reported by Kilcullen et al. (2020). It is necessary to explore parents' attitudes towards viewing these activities, as parents may prefer to see their baby during routine handling to enhance feelings of inclusion.

Clear communication between nurses and parents around expectations and preferences for live streaming use could potentially help to address these issues. Parent concerns when the webcam start times were delayed and expectations surrounding this service provision were not always met due to clinical workload, that may be exacerbated with additional telephone calls. Nurses indicated a range of reasons for webcam related telephone calls in this study. Improving parent explanation when introducing webcams would help to manage initial expectations, reduce parental anxiety when infant viewing is later than anticipated, and therefore prevent additional strain on nursing workload.

The introduction of new technological innovations requires preparation, and the readiness of a team to take on new technology (de Veer et al., 2011; Hoffmann et al., 2022). Preparation and teaching may concentrate on the use of the technology, but also needs to address potential changes to workflow. Several challenges were reported relating to workflow interruptions, specifically technological difficulties. Increased workflow negatively influences stress for nurses, potentially resulting in increased opportunities for missed nursing care (Tubbs-Cooly et al., 2019). This could be exacerbated in neonatal units where nurse-to-patient ratios fall short of recommended levels (RCPCH, 2019). When new initiatives and technology are introduced into routine nursing practice, it is imperative that they are introduced in a safe and effective manner to minimise any effects on patient care and safety.

There were several limitations to this study. We explored nursing workload because typically webcams impact those at the cot side (Hawkes et al., 2015; Joshi et al., 2016), but their use may affect non-clinical staff members such as the equipment support team, ward clerks and housekeepers. Responses from nurses working in intensive care in comparison to high dependency and special care was proportionally much higher, but expected, given the staff ratio per shift in a tertiary neonatal unit. Previous research has suggested the higher the number of babies with webcams in a nursery, the higher the workload and therefore nursing stress (Joshi et al., 2016), so our results may be more representative of neonatal units with a higher intensity of care. Familiarity with the webcam equipment following the pilot study may have resulted in shorter durations to complete webcam related tasks, possibly biasing some nurses' responses. Our results may also be influenced by the duration of webcam use (only used for 2 h per shift), when making comparisons to studies that had the cameras on for longer durations.

Overall, we found that webcam use did not negatively impact nursing workload or affect quality of nursing care, but we were able to highlight some clear areas for improvement. Recommendations for neonatal units considering the provision of such live streaming technology include preparation for service changes in advance of webcam

implementation involving all staff, staff education and familiarity of new equipment prior to use, clear communication with parents to enhance their understanding, and the consideration of a dedicated person or team to manage inevitable technological challenges needed to sustain this service provision longitudinally.

5. Conclusion

The impact of webcams on nursing workload in the neonatal unit was low per camera related task. Benefits for parents were recognised, but nurses reported webcam-related changes to nursing workflow in terms of infant handling, concern for parents and other webcam viewers, and technological difficulties, all of which may be resolved through preparation, staff and parent education and good communication.

Author contributions

KG, KC JM and NM conceived the idea and obtained funding. KC wrote the first draft and produced the final version. KC, RHW, LH and PP collected data. Each has reviewed and contributed to this paper.

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Declaration of competing interest

None disclosed

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jnn.2023.04.011>.

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