HEALTH INNOVATION North West Coast

North West Neonatal Operational Delivery Network

Chiesi

NHS

Neonatal Technology Enabled Care

CURRENT STATE, FUTURE OPPORTUNITIES

UK-CHI-2500189

PURPOSE OF THIS REPORT

This report presents the findings from a collaborative working project between Health Innovation North West Coast (HINWC), the North West Neonatal Operational Delivery Network (NWNODN) and Chiesi. It highlights the findings of a landscape review of technology enabled care (TEC) used within neonatal units across the North West. See Appendix 1 for further information.

The intended audience is NHS decision-makers, commissioners of services, digital and transformational leads, and healthcare professionals with an interest in improving neonatal services.

This report provides an overview of the challenges and barriers to implementing TEC within North West neonatal units. It sets out future recommendations and considerations that would support improvements within these services, based on healthcare professional and family experiences.

Collaborative partners within the project

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1 EXECUTIVE SUMMARY/ABSTRACT

This report examines the use of Technology Enabled Care (TEC) across neonatal units in the North West of England, highlighting current practices, challenges, and opportunities for improvement. Conducted collaboratively by HINWC, NWNODN, and Chiesi Limited, it aims to inform NHS decision-makers, commissioners, digital leads, and healthcare professionals interested in enhancing neonatal services.

Key Findings

Current TEC Landscape:

- TEC usage varies across the 22 neonatal units within the NWNODN. Common technologies such as Badgernet for patient records and vCreate for parent video sharing are in place, but their integration and functionality are inconsistent.
- Many units lack robust IT infrastructure, including reliable Wi-Fi, interoperable systems, and sufficient hardware.

Challenges Identified:

- Technology Gaps: Outdated paper-based records, fragmented systems, and non-integrated imaging tools hinder efficiency.
- Training and Support: Inconsistent staff training leads to low digital confidence, and lack of dedicated trainers exacerbates issues.
- Family Engagement: Digital exclusion due to language barriers, limited access to remote consultations, and inconsistent family communication reduces confidence and increases stress.
- Governance and Procurement: Decision-making without clinical input results in non-tailored solutions for neonatal care.

Opportunities for TEC:

- Improved remote consultation capabilities to minimise unnecessary baby transfers and enhance specialist access.
- Seamless image transfer across different organisation to support timely and expert diagnostics
- Contactless monitoring technologies to reduce stress for neonates.
- Unified Electronic Patient Records (EPR) to eliminate inefficiencies caused by duplicate entries.

Recommendations

National Level:

- Advance research into TEC solutions for predictive care, contactless monitoring, and family communication enhancement.

Regional Level:

- Promote co-production of TEC solutions with clinicians, families, and IT specialists to ensure alignment with user needs.
- Citizens are at the centre of service design and have access to a standard set of digital services that suit all literacy and digital inclusion needs. Therefore, we need to empower citizens.
- Recognise the unique needs of neonatal services and ensure their integration into broader IT and digital strategies.

Integrated Care Board (ICB) Level:

- **Develop interoperable systems to facilitate seamless data sharing across units and regions. Organisations maintain standards for safe care. They routinely review digital and data systems to ensure they are safe, robust, secure, sustainable and resilient.**

Organisational Levels:,

- **Foster collaboration between neonatal teams and IT departments, with dedicated digital champions for neonatal care.**
- **Invest in foundational IT infrastructure across neonatal units to support TEC and ensure reliable internet connectivity. Digital, data and infrastructure operating environments are reliable, modern, secure, sustainable and resilient.**
- **Standardise hybrid training models that include on-the-job, online, and face-to-face formats. A workforce should be digitally literate and able to work optimally with data and technology. Digital and data tools and systems should be fit for purpose and support staff to do their jobs well.**

Future Vision

To achieve equitable, efficient, and family integrated neonatal care, this report emphasises the importance of high-quality digital infrastructure, seamless system integration, and meaningful family and staff engagement in technology design and implementation.

By addressing the outlined barriers and leveraging TEC innovations, neonatal units could enhance outcomes, reduce stress for families, and empower staff, ensuring the highest quality of care for vulnerable infants.

Context

The North West is the third most populated region within the UK with a population of 6.1 million, and a birth rate of approximately 77,500 per annum. It also has some of the most deprived areas in the country,[1] and is amongst the most financially challenged NHS regions in the UK. Despite these challenges the region's neonatal teams have some of the best outcomes across England for some key metrics 'babies born in the right place', developing family integrated care and key optimisation measures following the successful implementation of a preterm optimisation bundle, which aims to improve nine key interventions to raise outcomes for premature babies[2].

Neonatal services within the North West are provided across the three subregional Integrated Care Board footprints: Lancashire and South Cumbria, Cheshire and Merseyside, and Greater Manchester and East Cheshire, which together form the NWNODN.

The NWNODN consists of 22 neonatal units, which have a total of 474 cots and admit approximately 7,400 infants per year[3]. Of the 22 units, seven are neonatal intensive care units (NICUs), 12 are local neonatal units (LNUs) and two are special care units (SCUs). In addition, specialist services are offered in two centres: Alder Hey Children's Hospital NHS Trust (standalone surgical unit) and Manchester University Foundation Trust – St Mary's Hospital (included in NICU numbers), catering for infants and children requiring sub-specialty medical, surgical, and cardiac services.

1 Ministry of Housing, Communities and Local Government. The English Indices of Deprivation 2019 [Internet]. 2019 Sep. Available from: https://assets.publishing.service.gov.uk/media/5d8e26f6ed915d5570c6cc55/IoD2019_Statistical_Release.pdf

2 Health Innovation NWC. Health Innovation North West Coast - Care bundle boosts outcomes for babies [Internet]. Health Innovation North West Coast. 2024 [cited 2024 Dec 2]. Available from: https://www.healthinnovationnwc.nhs.uk/news/Care-bundle-boosts-outcomes-for-babies

3 Neonatalnetwork.co.uk. [cited 2024 Dec 2]. Available from: https://www.neonatalnetwork.co.uk/nwnodn/wp-content/uploads/2024/10/NWNODN-Activity-Capacity-and-Demand-Report-23-24-1.pdf

Figure 1 – Visual overview of location of units within NWNODN

In November 2024, the government outlined its "three big shifts" that will underpin our 10-year plan for health: one of these being the shift from analogue to digital. This is further supported by the Innovation Ecosystem Programme recommendations which stated, 'There must be a major tilt towards technology to unlock productivity'[4].

[4] Darzi L. Independent Investigation of the National Health Service in England the Rt Hon. Professor the Lord Darzi of Denham OM KBE FRS FMedSci HonFREng [Internet]. 2024 Sep, pg 13. Available from: https://assets.publishing.service.gov.uk/media/66f42ae630536cb92748271f/Lord-Darzi-Independent-Investigation-of-the-National-Health-Service-in-England-Updated-25-September.pdf

The NHS uses the term Technology Enabled Care Service (TECS) to refer to technologies such as telecare, telehealth, telemedicine/ teleconsultation and selfcare applications, that help people manage and control chronic illness and maintain independence. For the purposes of this project, TEC extends this definition to encompass a variety of digital and technology tools that support the delivery of neonatal care. See Appendix 1 for additional information.

The introduction of innovation into an already complex clinical environment should be guided by clinical and patient need rather than for its own sake[5]. TEC is proven to work in other clinical settings, but the interaction must be guided by need and complement systems already in use[6].

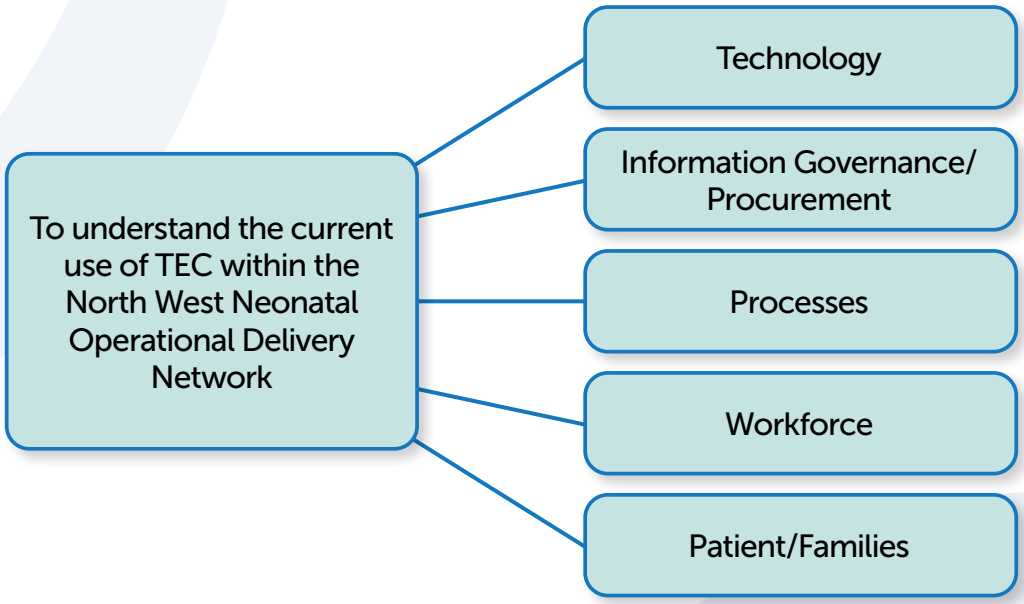
Project aims

The aims of the 12 month project were:

- **To undertake a comprehensive review (audit) on TEC within 22 Neonatal units within the North West to help understand the current situation or "current state." To understand the technology enabled care utilised within neonatal units (including communication, diagnostics and treatment) between sites by undertaking a series of workshops and questionnaire to unpick questions within key focus areas (see figure 2)**
- **To understand how the transport network fits into current telehealth technology system utilisation**
- **To understand future TEC requirements and needs, along with current challenges.**

We used a driver diagram (below) to give our research a logical structure.

Figure 2 – Image highlighting key drivers and considerations for this project



[5] The Consolidated Framework for Implementation Research – Technical Assistance for users of the CFIR framework [Internet]. cfirguide.org. 2022. Available from: https://cfirguide.org/

[6] NHS England» TECS Case study database [Internet]. www.england.nhs.uk. Available from: https://www.england.nhs.uk/tecs/improvement/tecs-cs/

Methodology

In order to complete a comprehensive qualitative and quantitative review, the framework chosen to capture staff opinion, was Appreciative Inquiry (AI) methodology[7]. In the project team's experience, AI promotes positive discovery conversations that enable meaningful stories and narrative to be captured. See Appendix 2 for additional information on Appreciative inquiry.

A stepped plan was put in place for this project:

Step 1 – Stakeholder mapping

A separate mapping exercised was not required due to the strength of the NWNODN and their existing relationships with all neonatal services in the region.

Step 2 – Engagement

Network meetings were used to engage and inform, and, most importantly, ensure all neonatal units within the network were aware of the project.

Volunteer "link workers" were requested at these meetings to provide a first point of contact for staff from units. To ensure link workers understood the project and their role and that a wide audience was reached, online, recorded, sessions gave more project detail, along with an information handout.

A key task for link workers was to engage their local units and create awareness of the project among a spectrum of colleagues, including (nurses, allied health professionals (AHPs), digital and administration).

Step 3 – Initial survey

A baseline survey:

- **Assigned as pre-work for link workers the survey was shared to establish a baseline of current TEC used in NW neonatal units, so that questions in the rapid insight sessions (RIS) could be more focused.**
- **Enabled the project team to understand the variety of TEC already in place neonatal units.**
- **(Including lifesaving equipment) Helped define what TEC would be in and out of the project's scope (see appendix 1).**

See Appendix 3 for a list of survey questions.

Step 4 – Rapid insight sessions (RIS)

The project ran six live online RIS, with invites sent out through link workers. Sessions were scheduled at a variety of times to suit NHS staff, including outside of 9am to 5pm working hours. For staff who were unable to attend any live sessions, a questionnaire of RIS questions still enabled them to contribute.

See Appendix 4 for a list of RIS questions and a brief overview of the method itself.

Step 5 – Validation of findings

The thematic analysis of the RIS findings were taken to a variety of units to clarify and validate the outputs of the RIS in workshop form.

The project team visited a variety of neonatal units, summarising for them the most common problems and suggestions which people had raised during the rapid insight sessions, then asking how these related to what they experienced in their own units. Due to scheduling, no Level 1 Neonatal Units were able to participate in this step.

Findings were also presented to, and validated by, an audience of approximately 250 perinatal stakeholders at the British Association of Perinatal Medicine (BAPM) annual conference in September 2024.

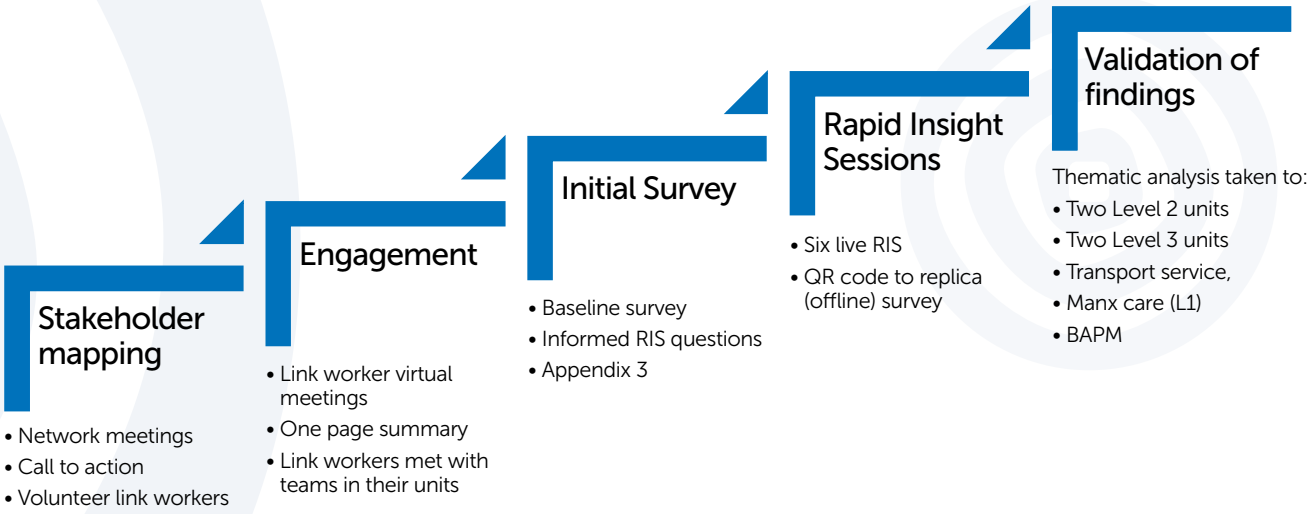
[7] Lewis S. Introduction to Appreciative Inquiry [Internet]. Available from: https://www.england.nhs.uk/south/wp-content/uploads/sites/6/2020/08/Appendix-7.2-AI-training.pdf

Family engagement

The project recognised the importance of ensuring the family voice was heard regarding the use of TEC during their baby's neonatal stay.

A parent focus group was facilitated for the NWNODN by SPOONS[8], a neonatal charity. The focus group was attended by the project's network representative and parents were given more detail on project objectives and why their contribution was important. A similar structure to the RIS was followed to guide discussions with the facilitator. Detailed notes were taken at these sessions.

Figure 3 – A visual representation of the methodology used within the collaborative working project



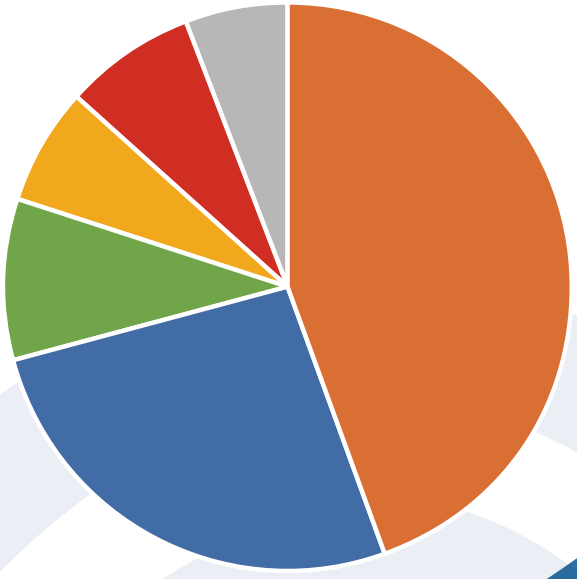
Results

Engagement

The project team worked to ensure insight represented a range of professionals in NHS services across the region. They also tried to capture as many responses as possible. Figures 4 and 5 illustrate this.

Figure 4: Type and number of people engaged

Medics	54%
Nursing	32%
Family	11%
Admin/Non Clinical/Management	9%
Other	8%
Digital IT	7%



[8] SPOONS Charity - Neonatal Family Support [Internet]. SPOONS Charity - Neonatal Family Support. Available from: https://spoons.org.uk/

Figure 5: Units providing feedback

Organisation Name	Neonatal Unit Level	Organisation Name	Neonatal Unit Level	Organisation Name	Neonatal Unit Level
Blackpool	LNU	Oldham	NICU	Whiston	LNU
Bolton	LNU	Ormskirk	LNU	Wythenshawe	LNU
East Lancashire	LNU	Preston	NICU	Wigan	LNU
Lancaster	LNU	St Mary's	NICU	Connect North West	Other - Transport service
Leighton	LNU	Stockport	LNU	Manx Care	SCU equivalent
Liverpool Womens	NICU	Tameside	LNU	SPOONS Family Peer Support	Charity
Alder Hey	NICU	Warrington	LNU		

Family Focus Group

Discussions with families via the facilitated focus group resulted in valuable, lived experience insight and recurring themes.

General themes:

- **Centralised documentation: There was a strong preference to have all information and support documentation on a single "landing page" – rather than being directed to multiple websites.**
- **Use of video: Families wanted support to feel closer to their baby's during neonatal stays and if their baby was moved between different departments or hospitals. Various video-centred technologies such as VCreate, Badger Diary, WhatsApp, Google, Facebook, and Facetime were highlighted. However, there were concerns about inconsistent updates from staff and data protection. The idea of CCTV in units was put forward as a potential deterrent against wrongdoing, but live streaming of babies was rejected due to concerns about privacy and mental health impacts.**
- **Virtual tours: Families said they would feel less anxious if there were visuals and virtual tours of units and ambulances for mothers and wider family that may visit. One person mentioned that virtual tours could help prepare young siblings of infants to visit the infant and may help form and strengthen the bond between them in the early days.**
- **Photography: Several of the group felt that photographs taken at the time of their babies' birth in the delivery room would be helpful. Many mothers are under general anaesthesia at the time of birth, while others mentioned that staff using the parents' phones to take photos was appreciated. It was also mentioned specifically by one person that a staff member taking their phone to NICU to capture photos of their baby, whilst they were too poorly to move themselves, was appreciated.**

- **Unit security: There was strong support for a biometric door entry system to reduce stress while waiting to enter the unit.**

Information sharing during the neonatal stay:

- **Family Inclusivity - Families suggested the ability to dial into ward rounds and have access to recordings or voice notes, would be an improvement.**
- **Reducing stress - Families felt that virtual appointments with specialists not available on site could reduce the stress of transporting babies and provide better access to care/information.**
- **Data sharing and access -**
  - An alert system for changes in care or baby transfers was also proposed. Concerns were raised about the reliability of paper records, with families advocating for electronic records to prevent loss or damage.
  - Virtual appointments, especially for multidisciplinary teams, were viewed positively, and a follow-up check-in with neonatal staff after discharge was suggested to help with post-discharge anxiety. They noted that this would help navigate other services and avoid repetitive questioning by doctors. There was some concern about security and the potential for hacking.
  - Training: Families felt that better resources and training for non-neonatal professionals would improve care continuity such as Health Visitors.
- **Neonatal Outreach - families valued the support and feelings of reassurance offered by the outreach nurses.**

Additional themes:

- **Staff -**
  - Need for staff training to address challenges in neonatal care.
  - Potential resistance to changes and TEC among staff
  - Accessibility -Remote delivery of support via a reliable internet connection could be beneficial.
  - Providing resources to help women recognise signs of preterm labour.
  - Incorporating neonatal care information into standard antenatal care.
  - Interest in developing a SPOONS app for accessing local support.
  - Addressing issues with internet access in some units.
  - Concerns about reliance on digital resources in case of power outages.
  - Ensuring accessibility for non-English speakers and individuals with additional communication needs.
  - Providing support for those at risk of digital exclusion.

NHS staff findings

Challenges and barriers:

The project used the RIS results to perform a thematic analysis. It was essential to group the kinds of TEC that respondents talked about, to see where TEC was, and was not, helping neonatal units.

Overview of type of TEC used in neonatal units
Recording, requesting and monitoring systems (e.g., Badgernet, Lorenzo, ICE-integrated clinical environment)
Image and video-sharing (e.g., vCreate, PACS-picture archiving and communication system)
Procedural administrative systems (e.g., Office 365, Eolas Medical, EPR-electronic patient record)
Communications systems (e.g., WhatsApp, PACS)

It was then possible to look at where staff experienced challenges involving TEC and what the barriers were to overcoming those challenges. The progress barriers were often common between different challenges. The project team assigned challenges and barriers to themes set out in the initial driver diagram.

Challenges	Barriers	Themes
Systems not used to full function	• Budget required to upgrade to full functionality. • Small digital teams spread across trusts who are unable to fully enable system functionality due to team capacity. • Some staff are not using the full functions of the technology due to inconsistent training and/or a lack of digital confidence.	Technology
Interfacing between different TEC difficult or non-existent, leading to wasted time, repetition, and higher risk of errors	• TEC initially purchased without full consideration for needs of neonatology. • Differing budgets and priorities across regions and networks leading to variations of systems that do similar jobs.	Information governance/ Procurement
Lack of and poor condition of hardware	• Insufficient budget to replace broken equipment and to upgrade to better versions. • Backlog of work for digital teams to test and replace broken hardware. • Relative size of neonatal unit compared to other departments in the trust – prioritisation of services working against neonatology.	Technology/Workforce

Challenges	Barriers	Themes
Infrastructure and connectivity issues – Wi-Fi very inconsistent across the network	• Neonatal staff used to connectivity issues have found workarounds and have sometimes stopped raising the issue. • Small digital teams spread across Trusts have often logged the work but have not yet got around to completing it. • Relative size of the neonatal unit compared to other departments in the trust – prioritisation of services working against neonatology.	Technology/Workforce
Digital exclusion of families	• Language barriers. • Poor Wi-Fi connections meaning TEC that would be aimed at parents is not always possible to use. • Lack of time for staff to train families. • Families not aware of TEC options available. • Strategy of family communication not set up to emphasise TEC. • Parents not given alternatives when TEC does not suit them.	Patients/families/ Processes
Digital exclusion of staff	• Lack of staff confidence with TEC. • Training delivery inconsistent across the region, times, and type of training vary. • No culture or relationship with trainers. • Clinical strategy does not always include TEC. • Change fatigue amongst staff.	Technology / Workforce

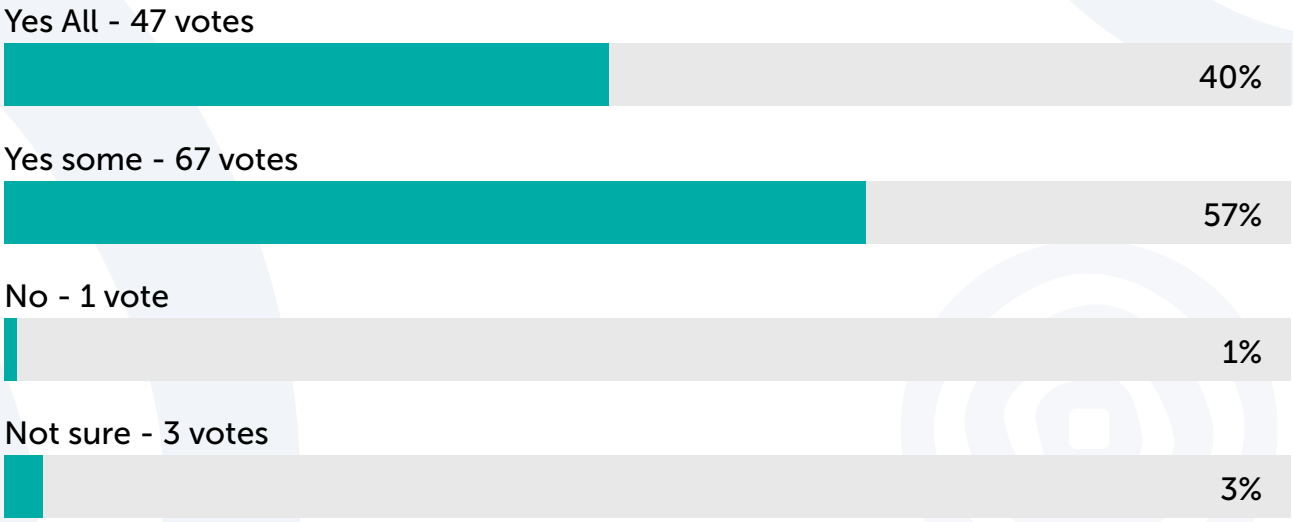
British Association Perinatal Medicine, September 2024

The initial findings of this report were shown at the British Association of Perinatal Medicine (BAPM) conference in September 2024. The project was invited, via the NWNODN, to present the project at BAPM. The value in this was a level of NHS staff validation beyond the North West region that was not originally planned into the validation step.

A live audience of 250 perinatal professionals were asked to vote as to whether findings resonated or not. The audience were also asked to provide additional responses to questions about a "future state."

Figures 6 and 7: Online live polling of the BAPM 2024 audience.

Do the findings resonate with you?



In one word/phrase how would you describe the function of technology in your clinical setting?

The 'future state' of neonatal care, as identified by staff, versus the current state that staff reported:

Discussion with staff in the in-person workshops made it clear that most neonatal units in the region lack the capacity to innovate. Fundamentally, the foundations for effective TEC are not fully in place, or not functioning as intended. For that reason, the future state, as envisioned by neonatal staff, is realistically one where those simple blockers are removed. While the project itself can make some recommendations based on this landscape review, it is important to note that the participants in this project from across staff groups would like the specific issues in the table below, to be a priority.

The project team have set out what the current state of TEC is, in relation to the challenges that staff reported. It is also important to relate the current state of TEC usage to what staff thought the future state should look like, because there are different challenges between fixing what does not currently work and attempting to implement the kind of future state that staff envisage.

Current State	Future State
• IT infrastructure is sometimes poor and is inconsistent across the network. • Wi-Fi strength varies from unit to unit.	• Modern and connected IT infrastructure, with quick and reliable Wi-Fi in all neonatal units.
• Families feel they are inconsistently consulted around improvements to basic experiences during episodes of care. • It is felt that this contributes to their own ability to understand the care their baby is receiving. • This inconsistent consultation with families can lead to digital exclusion and exacerbates stress.	• Regular communication with, and feedback from, families to inform digital and TEC developments and commissioning.
• Training is inconsistently offered and delivered. • This can lead to some staff feeling unconfident when using technology. • Training is sometimes seen as a tick-box exercise.	• Consistent, regular, competency-based staff training that is available in appropriate formats across the region.
• Contactless monitoring where infants are not physically touched is rarely used.	• Contactless monitoring is used in all units to reduce the need for physical checks.
• Imaging systems do not always integrate with systems in other departments in the same trust making the transfer or sharing of data difficult or not at all. Babies are commonly transferred between hospitals and there is variability of systems across different trusts meaning diagnostic images cannot easily be shared.	• Imaging systems are integrated across the North West.

Current State	Future State
• There was a feeling among staff in smaller units that they are escalating care when it may not be necessary – due to being unable to access a relevant specialist at the right time. If there were more remote consultation opportunities, this would allow staff in the smaller units to access specialist advice and may prevent the need to transfer babies between units.	• Remote consultation capabilities are consistent, enabling access to specialist support in smaller units, and reducing the need to transfer babies.
• Neonatal staff felt that neonatology was sometimes an afterthought in terms of digital development within trusts. • Staff are sometimes using systems that were procured with other departments in mind and are 'making do' with what they have. • This makes integration between different units rare and unreliable, creating a feeling that time is wasted. This also adds to the frustration felt by staff.	• Neonatal staff are included in trust digital systems and technology commissioning and procurement, a regional system approach is taken, and integration with existing trust systems is always prioritised.
• Staff do not have the time to consider innovation. • Staff time is tight and budgets small, meaning the environment does not always lend itself to staff-led innovation.	• Staff have dedicated time to meet with digital colleagues to identify and promote innovation.

Discussion

Technology

Paper-based records

The project discovered that a number of neonatal units remain predominantly paper based. These outdated methods not only hamper efficiency but also poses significant challenges and risks of staff errors when interpreting handwriting. The most significant issue with paper-based records that was discovered was during the transfer of babies to other units. In some cases, the transport service experienced long waits when waiting for specific images and documents, which increased the risk that the babies were being treated by transport staff, rather than simply being transferred. For staff to do their job well they need digital records and the technology to share records in real time between themselves and other organisations.

Duplicate EPR programmes

All services have Badgernet Lite (a standardised data collection system for elements of neonatal clinical care feeding into the National Neonatal Audit Programme to allow benchmarking of key metrics across neonatal services), but only a handful have its full Electronic Patient Record (EPR) system. The units with its EPR system are highly satisfied. Several of the units are scheduled to have this system installed, while others use their trust-level EPR system. This results in the need to make duplicate entries into both the local EPR and Badgernet Lite. This is both inefficient and it increases the chance of data discrepancies where mistakes are made and then wrongly reported.

Insufficient IT infrastructure

The lack of basic IT infrastructure and insufficient investment significantly hinder the way staff wish to work, stifling innovation. The key issues raised were:

- **Poor Wi-Fi connectivity,**
- **persistent firewall issues, and**
- **inadequate hardware**

These problems are not just technical nuisances but major impediments and risks to delivering optimal care. An example of this was given by a unit:

'Frequent transfer of babies from a NICU to an LNU (a normal pathway of repatriation to local unit following a period of intensive care treatment) can result in the LNU acting as an intermediary when ongoing support for treatment decisions is required from the NICU – such as paediatric subspecialty, a situation exacerbated by poor communication systems and inadequate IT support. This setup leads to subpar care for babies and heightened anxiety for families, who often feel disconnected from the original care team.'

Please see Appendix 5 for more quotes collected throughout the project.

Another live example was given by the transport service, who made it clear that it is very difficult to retrieve images to analyse echocardiograms, using PACS (Picture Archiving and Communication System) as they are videos rather than images which require adequate IT. The transport services are also often required to view and analyse cerebral function analysing monitor (CFAM) traces to support time critical decision making about therapeutic hypothermia treatment for babies. This trace is currently not possible to see remotely by the team and when on site a record of the trace is not possible to share with the receiving team due to inability to access and share these images. This can at times delay treatment decisions or lead to decisions being made based on verbal information shared rather than an objective review of the trace.

Information governance

How information governance is managed in individual hospitals, and between Trusts, appeared inconsistent. Clinical decisions are sometimes made by local units, because there is no timely way to speak to a specialist centre for advice, leading to inefficiencies and dissatisfaction among staff. This inconsistency is reflected in the way babies are transferred. Fewer babies would require transfers if clinicians were able to easily access specialist advice from colleagues at specialist centres. This inconsistency was brought up in consultation with clinicians who referred to decisions that had been made where an audit trail was not possible.

Procurement of Digital Solutions

Digital solutions are often purchased and rolled out as a 'one size fits all' solution within hospitals and trusts without regard to unique issues in neonatal care such as electronic prescribing systems. This is due to every trust having to stretch their budgets and make technology work for as many services as it can. This will often mean that larger services will benefit most and smaller service with specific requirement miss out on functionality. This can cause additional stress to staff, babies, and families. Solutions that are inappropriate for neonatal care also increase the likelihood of poor linkage between systems, potential clinical incidents where bespoke systems are not built for the specifics of neonatal care, and of frustration in the extra training time necessary for clinicians.

Change fatigue is another significant issue. Small IT teams are overwhelmed with constant changes, leading to a feeling of perpetual disruption among staff. Where the project was able to speak to IT staff, it was apparent that resources were stretched. In one case, the budget was less than 20% of what it had been five years ago. Staff feel changes are inflicted upon them rather than developed collaboratively, which can cause frustration and resistance. This fatigue is exacerbated by the fragmentation of IT systems, where different departments use incompatible software, complicating even the simplest tasks.

Suppliers can sometimes contribute to these challenges, becoming blockers rather than enablers. Non-responsive suppliers, especially at larger companies, hinder progress with sluggish engagement. For example, the Badgernet system was co-designed with neonatal needs in mind and is beneficial, however other systems are not as accommodating to neonatal care. The lack of a unified approach across regions means staff must navigate multiple systems, each with its own set of login credentials and expiration times. This complexity severely limits true innovation, as basic operational issues take precedence.

Workforce Training

The current neonatal workforce faces significant training challenges. While there is an abundance of training available, staff often lack the protected time to attend and embed what they have learned. The shift from face-to-face to online training has turned some elements into something to get through, rather than a meaningful learning experience. Training that was varied in delivery was highly spoken of. Training needs to be relevant, innovative, flexible, and easy to access. Additionally, the sporadic, often ad hoc, nature of training and entire clinical team around shift times and accessibility along with the lack of department-specific content exacerbated the issue. Superusers of TEC and on-call support can mitigate these challenges by providing timely, quality support, but a structured approach to training is necessary.

The future state envisions a network-wide approach to neonatal learning, with standardised equipment and a streamlined training process. This would ensure that staff moving between trusts do not have to undergo redundant training, making it a more efficient and less frustrating experience. Moreover, peer-to-peer training and on-the-job learning should be emphasised to foster a more collaborative and supportive environment.

Communicating with Families

Language and technological literacy are barriers to family engagement with neonatal services. Staff at St Mary's in Manchester said that during Covid investment in digital solutions was high. Innovations were implemented rapidly, such as a solution to overcome language barriers called Big Word, which allowed consultants to speak on the phone with patients and an interpreter, simultaneously. Staff told the project that Big Word worked well but it did not have its license renewed. Similarly, Attend Anywhere was used for video conferencing in clinics. Clinicians said it was particularly useful but also no longer in use. Financial pressures impacting innovation in every organisation should be supported by wider digital infrastructure and digital leaders to ensure family experience is at the heart of decision making.

Opportunities for improvement

The project has identified some opportunities for improvement, below.

Principles for improvement

The principles for improvement, as set out below, may be used by NHS decision-makers, commissioners of services, digital and transformational leads, and healthcare professionals with an interest in improving neonatal services, as ideas for the improvement of TEC use in neonatal care.

- **Information and data, including diagnostic imaging, should be shared seamlessly within an organisation and across the network.**
- **Evidence-based TEC that enhances patient care through monitoring should be prioritised.**
- **Remote consultation should be available to every unit to prevent unnecessary transfer of babies.**
- **Access to high quality Wi-Fi infrastructure should be a priority to improve the working experience for staff and the care experience for families**
- **Staff and families should be involved in the initial stages of system-wide TEC procurement.**
- **Where possible there should be a focus on procurement of TEC that is simple to use and does not require extensive training.**
- **Staff training should be consistent, and consistently delivered across the network, in a hybrid format.**
- **There should be early engagement with all suppliers by procurement teams, and, where possible, procurement teams should seek out responsive and innovative suppliers.**

Achieving these principles

To begin to achieve the principles set out above, the project recommends these steps:

Access to internet/Wi-Fi

Prioritise investment in quality hardware and reliable internet access. Fast and secure Wi-Fi should be available throughout each unit, benefiting not only staff but also families who rely on connectivity for communication, information and support. Routine maintenance and timely replacement of hardware should ensure uninterrupted access to essential systems. The project team's findings indicate that the foundation for the future state of neonatal care depends heavily on the availability of up-to-date and functional technology.

Accessible telemedicine setups integrated into as many cot spaces as possible could enhance response times and improve patient care. However, this requires reliable IT infrastructure capable of supporting video consultations, real-time data sharing and monitoring across the network.

Remote technology

Remote participation in ward rounds by families could be a major step in improving care and efficiency. Reliable systems could allow families to join consultations and receive video updates, ensuring they remain informed and involved in their baby's care even when not physically present. Remote monitoring tools can also support consistent communication with specialists, ensuring families remain integral to their baby's care when transfers are necessary. Remote consultations could allow parents to receive expert guidance from home. This may reduce stress on families and ensure the care system remains focused on those requiring immediate in-person attention.

Implementing advanced monitoring technologies that minimise physical contact with babies may reduce stress and discomfort for neonates. Systems that analyse health data trends could alert staff to emerging issues before they become critically unwell, enabling timely and effective interventions.

Training

A standardised training program across the network, delivered in a hybrid format, could ensure staff competency in using innovative technologies. This should include a blend of face-to-face, online and on-the-job training, along with ongoing refresher courses to keep staff updated on best practices and innovations.

Creating a network of "superusers" and on-call trainers could foster confidence in new systems. This approach could create a collaborative learning environment to benefit all staff.

Technology could also be used to empower families by improving their understanding of their baby's condition and care. Interactive educational tools and virtual resources during pregnancy and postpartum periods can build trust and cooperation between families and healthcare providers. This could include virtual tours of neonatal units.

Early engagement with innovative vendors is critical to developing user-friendly and responsive solutions. These partnerships should prioritise the procurement of technology that require minimal training, are intuitive for staff, and are adaptable to the specific needs of neonatal units. By involving both staff and families in the initial stages of system development and procurement, the resulting tools should better align with user needs and improve adoption rates.

Governance

Technology must enable the same standard of care across all units. Standardised protocols, supported by interoperable systems can help ensure that transferred patients receive consistent, high-quality care, regardless of their location. Tools that support seamless information transfer during patient handovers can significantly enhance outcomes and family satisfaction.

By adhering to these principles, neonatal units could start to improve the current system in terms of patient comfort, staff efficiency and family involvement, ultimately ensuring the best possible outcomes for every infant in their care.

NHS System calls to action:

National level

In the view of the project team, it is clear that neonatal teams think that emerging technologies could help improve neonatal care by enabling families and teams to share information and provide care less intrusively, faster, more efficiently and safely. There is a need for further research in three specific challenges:

- **Communication with parents and families could improve. Joint ward rounds with clinicians and families, with appropriate technology would facilitate improvement. We recommend that further work is done, in a study around specific technology.**
- **TEC that reduces the need for babies to be physically touched should be investigated, as not enough is yet known about the additional implications of the stress of this in babies.**
- **Predictive and proactive care should also be investigated, where trends can be seen sooner, and mitigations put in place. If this capability already exists, that training needs to be better and more consistently disseminated.**

Regional level

Ensuring babies are cared for in the right place, facilitating transfer only when TEC cannot offer a solution, and enabling expert advice and support is limited/ hampered by the multiple different IT systems. The need for paper records to be copied delays transfers, and hampers communication. This also supports the Ensuring Smart Foundation part of What Good Looks Like - Digital, data and infrastructure operating environments are reliable, modern, secure, sustainable and resilient.

- **Neonatal systems need to be able to communicate across regions and in some cases borders, as Specialist services are provided for babies born in other parts of the UK, such as the Isle of Man and North Wales. More research is needed on the most suitable forms of technology that would facilitate this, which would need to be co-produced with clinicians, digital, information governance, operations, families, and suppliers, therefore delivering a system that is designed by the users, for the users.**

Organisational level

The underlying problem preventing innovation and adoption in neonatal services, specifically TEC, is the lack of basic IT infrastructure. Good IT infrastructure creates a solid foundation for innovation, enables safer care and releases time back to care (efficiencies).

- **We recommend investment in basic IT infrastructure that covers neonatal units and supports the use of TEC and other basic IT needs.**

It was recognised that trust digital teams are not always engaged with some of the smaller services, like neonatology. They are also under resourced and must focus on the trust's priorities.

- **Neonatal clinicians should be included in early discussions around IT system changes to ensure all clinicians can access it when required.**
- **An existing member of an IT team could be nominated as a champion for neonatology, ensuring the department has a named contact.**

The IT needs of specialist neonatal services have not been well integrated into plans that address the needs of larger specialities. This would also support the move towards safe care as outlined in What Good Looks Like[9] ensuring digitally enabled outcome-driven transformation is at the heart of safe care. Neonatal services have specific requirements that need to be addressed to care for some of the most vulnerable patients in our care.

- **Trust neonatal and digital teams should work together to identify mechanisms and solutions that ensure regular and meaningful communication between each other.**

Training is not always working effectively for teams. This is also outlined in What Good Looks Like[10]. Your workforce should be digitally literate and should be able to work optimally with data and technology. Digital and data tools and systems should be fit for purpose and support staff to do their jobs well.

- **Hybrid training methods are more successful and should be encouraged. Face-to-face, online, on-the-job with reminders in easy-to-reach places where a particular piece of TEC is not used often, and refreshers may be needed.**

[9] NHS England. What Good Looks Like framework [Internet]. NHS Transformation Directorate. 2021. Available from: https://transform.england.nhs.uk/digitise-connect-transform/what-good-looks-like/what-good-looks-like-publication/

[10] NHS England. What Good Looks Like framework [Internet]. NHS Transformation Directorate. 2021. Available from: https://transform.england.nhs.uk/digitise-connect-transform/what-good-looks-like/what-good-looks-like-publication/

Families separated from their baby have to wait for a member of staff to let them in, and this increases their anxiety as they know that people wait longer when staff are busy providing care. This also pulls neonatal professionals away from direct care.

- **One solution identified by families is to provide biometric access to the unit for families. It could remove this challenge and releases staff time back to care.**

Lessons learned

The project team have identified ways the project may have benefitted from being conducted differently. These are set out in the appendix section as 'Lessons Learned', Appendix 6. However, there is a high level of confidence that the results are valid and representative of the consultations with all those engaged by the project.

Conclusion

The findings from this study underscore the importance of investing in and optimising TEC within neonatal units across the NWNODN. The current disparities in digital infrastructure, integration of systems, and workforce training highlight significant barriers to achieving equitable, efficient, and family-integrated neonatal care. Addressing these gaps through basic IT improvements, collaborative procurement strategies, and robust, standardised training programs will enable neonatal teams to focus more effectively on delivering high-quality care.

Families play a pivotal role in neonatal care, and their experiences reveal a pressing need for inclusive, accessible digital solutions. Enhanced communication tools, remote consultation capabilities, and innovative technologies like contactless monitoring could significantly improve family involvement and reduce stress. Additionally, co-production efforts that include families and clinicians in TEC development will ensure that systems meet the unique needs of this patient population.

A seamless, technology-enabled neonatal care network is achievable, but it requires coordinated action across national, regional, and organizational levels. By fostering a culture of innovation and prioritising neonatal-specific digital solutions, we can build a system that better supports vulnerable infants, empowers healthcare professionals, and reassures families during challenging times.

This report provides principles for transformation, emphasising the need for strategic investments, sustained collaboration, and a commitment to aligning digital innovation with clinical excellence. The recommendations outlined offer practical steps to guide future efforts, ensuring that neonatal care remains at the forefront of healthcare innovation.

APPENDIX 1

Technology Enabled Care

The NHS has used the term Technology Enabled Care Services (TECS) to refer to technologies (such as telecare, telehealth, telemedicine/ teleconsultation and self-care apps) that help people to manage and control chronic illness and sustain independence. For the purposes of this project, Technology Enabled Care (TEC) extends this definition to encompass a variety of digital and technology tools which support the delivery of Neonatal care and contribute toward achieving the vision for neonatal services, as set out in the NCCR. It aligns with the expectation that, "high quality neonatal care will be networked together across England, to improve outcomes for all families, provide safe expert care as close to their home as possible, and keep mother and baby together while they need care"

In relation to neonatal services, examples of TEC broadly fall into two categories:

Clinical (out of scope for this project)

- **Ventilators / respiratory devices**
- **Thermoregulation devices**
- **Blood gas / glucose devices**
- **Phototherapy devices**
- **Humidifiers**
- **Syringe pumps**
- **Cerebral Function Monitoring (CFM) devices**

Non-clinical (in scope for this project)

- **Picture Archiving Communications Systems (PACS) & image / video sharing platforms (for parents)**
- **Electronic Patient Records (EPR) e.g. Badger Net / Lorenzo**
- **Newborn Infant Physical Examination (NIPE) Screening Management and Reporting Tool (SMART)**
- **Laptops and iPads**
- **MS Teams**
- **WhatsApp**

How Technology Enabled Care can be used in Neonatology

- **Realtime interactive clinical advice to support decision making around clinical care and transfer.**
- **Supporting equitable access to specialist multi-disciplinary review**
- **Sharing diagnostic imaging to support timely diagnosis and clinical decision making.**
- **Accessible staffing through innovative workforce modelling**
- **Training and education**
- **Improving patient and family experiences**
- **Communication – access to specialist expertise without travel/transfer**
- **Transition – supporting pre-transfer or discharge home.**
- **Separation – maintaining the family and baby bond.**
- **Peer support – accessing lived experience peer support during inpatient journey.**

APPENDIX 2

High Reliability Tactics - Appreciative Inquiry

Appreciative Inquiry

Why is appreciative inquiry important?

Appreciative inquiry is essential for a healthy culture. When leaders ask open-ended questions and sincerely listen to people's responses, they help create an environment that fosters trust and transparency. Leaders are personally accountable for the culture around them. By consistently using appreciative inquiry, you can enhance psychological safety, encourage two-way communication, and ensure everyone's voice is heard. By weaving these skills into your daily interactions, you can improve your leadership effectiveness.

Best practices for appreciative inquiry

Start with self reflection

- How often do I listen and **fully hear** what the other person is saying?
- When they talk, how do I respond?
  - Positively or negatively?
  - With encouragement or criticism?
  - Do I listen until they are finished speaking, or do I interrupt?
  - Do I welcome ideas about improvement and innovation, or do I prefer to maintain the status quo?
  - Do I seek to understand, or do I seek to be understood?

[11] Part of training delivered by High Reliability Academy, Creating a High Reliability Healthcare Organization (HRO) | VizientInc.com [Internet]. www.vizientinc.com. Available from: https://www.vizientinc.com/our-solutions/care-delivery-excellence/reliable-care-delivery

For more information visit **safeandreliablecare.com** or call **424-888-0847**

Be mindful during conversations

- Remove distractions and do not multitask
- Be conscious of your body language and reactions
- Listen more than you talk
- Be attentive and identify if there is an emotional component at play
- Be aware of your own biases and assumptions
- Acknowledge that you are listening

Pause before responding

- This is an opportunity to use **appreciative inquiry and open-ended questions**, such as:
  - I hear you
  - Say more...
  - Help me understand...
  - What I heard you say is...
  - I'm glad you shared this...

Ask for clarification when needed

- If something is confusing, invite the speaker to explain further
- This gives the speaker the opportunity to elaborate and clarify
- Gives you the opportunity to identify anything that is unclear and double check the accuracy of your understanding
- If you still don't understand something, don't pretend you do. Ask more questions.

Reflect back what you hear

- Relaying what was said back to the speaker shows that you have an understanding of how they feel about something
  - This deepens understanding of perspectives and content
  - Allows the speaker to see that you are trying to understand their perspective and message

Summarize what you learned

- Allows you and the speaker to hear again what was said
- Helps both parties identify what was most important to the speaker in the discussion
  - Helpful language when summarizing:
    - Let me summarize what I heard so far...
    - I've heard several things that seem to be important to you, first____, second____
    - It sounds like there are a couple of things that matter most to you...

Appreciate and acknowledge

- Thank the speaker for sharing their feelings and acknowledge their courage if the topic is sensitive and has an emotional component

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What's next?

Over the next week,

- Reflect on your conversations. Are you actively listening? Do you respond with appreciative inquiry questions? Is your behavior promoting collaboration and psychological safety? How well are you applying these skills and behaviors with your teams? Your peers?
- Ask a peer to reflect on your skills and give honest feedback on improvement areas
- Activate on improvement opportunities after you review your learnings
- Practice... Practice... Practice!

High Reliability Reflection

As you and your teams implement active listening and appreciative inquiry skills, ask yourselves:

- How does active listening and appreciative inquiry create a healthy culture?
- How do they promote transparent use of knowledge?
- How are we using active listening and appreciative inquiry to drive continuous learning?
- What role do you as a leader play in making active listening and appreciative inquiry successful?
- What personal skills and behaviors would improve your active listening and appreciative inquiry?
- How does active listening and appreciative inquiry help patients and families?
- How does active listening and appreciative inquiry help care teams?

APPENDIX 3

NTEC Project pre-work

file:///C:/Users/dnutt2/Documents/Neonatal/NTEC%20Report%20Appendix%203%20-%20Pre-work%20pdf.pdf

Form designed by HINWC for this project, example below.

NTEC Project - Pre-work

Please include as exhaustive a list as is possible, of all the tech that is currently used on your unit. This can include anything from a robotic monitoring machine, to mobile phones, specific apps, fax machines, etc. There is no wrong answer here.

This work is part of a collaborative working project in conjunction with Health Innovation North West Coast, NWNODN and Chiesi Limited. For further information please see the project executive summary which can found https://www.chiesi.uk.com/collaboration.

* Required

1. Which Neonatal Unit do you represent? *

2. What is your name? (not a required answer, can be left blank)

3. What technology do you use on your unit? Please include brand names where possible. *

4. What are these individual bits of equipment/areas of technology, used for? *

5. Who uses each bit of tech on the unit? We are looking for job roles here, ideally. *

APPENDIX 4

Questions for RIS and information on overview of the method

What TEC do you use the most in your unit and why is it used?
What other TEC solutions are you aware of elsewhere? How might you imagine using TEC you already have differently, to get better results?
What obstacles or problems might adequate and effective TEC be able to help you manage or eliminate?
What makes it hard to use TEC effectively and efficiently? What barriers are you facing when it comes to using TEC?
How might the best use of TEC make things better for:
Neonatal Unit Name?
Role Description?
Name (please leave blank if you'd like to remain anonymous)?

As part of the Appreciative Inquiry model, RIS were chosen as a way for all staff to have their thoughts heard. The intention here was that RIS provide a confidential way for a large amount of people to contribute, while feeling less pressure to contribute than if they were asked to speak out loud. In that way, it should also drive up the rate of contributions.

Rapid Insights Sessions are online workshops where participants answer questions within a prescriptive 'thinking time/writing time' framework. The sessions can be run with anywhere from two people, to over a hundred. Participants are asked to mute microphones and questions are only available to answer after a period of thinking time has elapsed. This was done via Sli.do surveys in the case of the NTEC project, as Sli.do has an option to create and run live surveys with control over when questions can be answered. All data is then accessible for the project team to utilise. HINWC utilise Sli.do for many live workshops and for surveys.

RIS were run by two members of the project team. One would present the slides, ask the questions and prompt for thinking time and writing time. The other would look after the running of the online call in the background, monitor the chat, and run the Sli.do. Before each question, parts of answers were read out by one of the project team, so that participants had confidence that their answers were a) able to be seen, and b) in a similar vein to others in terms of subject and format.

APPENDIX 5

Quotes collected from the NTEC Project

These anonymised staff quotes from in-person workshops and RIS provide insight into their thinking.

- "Many innovative suppliers are naïve to information security and are a hacker's dream."
- "It feels like the NHS innovated in terms of IT 15 years ago, and nothing has moved on since".
- "We should prioritise TEC, in terms of patient care, that can monitor babies without poking and prodding them. We do not properly know what that stress does to a baby."
- "The use of video consultation in neonates can be a good one to explore. This will help in improving parent experience of consultation without leaving the environment, especially for a stable patient at risk of developing severe infection with a viral illness."
- "Effective and seamless interface between various digital platforms currently in use should help avoid duplication and improve efficiency and thereby improve staff engagement by ensuring TEC actually helps rather than hinders the delivery of fast and efficient clinical care."
- "Our basic internal governance arrangements and processes are way behind."
- On 'what barriers are units facing when it comes to using TEC': "Machines not connecting easily to any of our central storage systems. The CFM machine in particular has been an issue in most units as there appears to be no straightforward way to do this."
- On 'how might better use of TEC make things better for babies, families and clinicians?': "Sharing data and information between units caring for babies at different stages of neonatal stay makes it easier for our own and other teams to assess baby and improves quality of care - Rapid Insights Session response.
- "We've been waiting for an integrated EPR for ages, and whilst a business case is being written now, we're not ready to go out to the market yet."
- "Having a trainer on call would be ideal for when we are short staffed, as there is a lot that we don't learn well during our basic, online training."
- "If we had better links to tertiary centres, more infants would be able to stay on the island and not be transferred in our fixed-wing aircraft."

APPENDIX 6

Lessons learned

Survey Response and Participation

The initial survey achieved a response rate of 17 out of 22 units. Despite persistent follow-up efforts, five units did not complete the survey, and two of these failed to engage with any communication from the project team.

Engagement Through Appreciative Inquiry and Rapid Insight Sessions

The Appreciative Inquiry model, paired with Rapid Insight Sessions (RIS), proved to be a suitable method for engaging a large group. Seventeen out of 22 sites contributed, encompassing a variety of roles, including administrators, doctors, nurses, and some department leads. However, participation from was notably lacking.

Potential Reasons for Limited IT and Digital Participation:

- **Engagement Gaps: IT colleagues were not adequately engaged by link workers, highlighting a broader issue of insufficient integration between IT/Digital support and Neonatal care.**
- **Priority Challenges: IT/Digital staff did not prioritise participation, possibly due to limited relevance or visibility of the project to their roles.**

While project staff offered multiple reassurances through emails and on surveys that all responses were valuable and encouraged further discussion, these efforts did not overcome the barriers to engagement from IT/Digital staff.

Challenges with Session Logistics:

The project aimed to conduct face-to-face sessions across all levels of neonatal care units:

- **Level 1: Special Care Baby Units (SCBU)**
- **Level 2: Local Neonatal Units (LNU)**
- **Level 3: Neonatal Intensive Care Units (NICU)**

Sessions were successfully held with Levels 2 and 3 units. However, due to care pressures, Level 1 units were unavailable for in-person visits. To address this, the team conducted a remote session via Microsoft Teams with the Manx Care Neonatal Unit (comparable to a Level 1 SCBU) and engaged with the Connect North West Neonatal Transport Team. These efforts ensured diverse and relevant data validation.

Lessons for Future Projects

- **Session Attendance Challenges**
  - Attendance at RIS sessions was often only 50% of those registered. Many participants were clinicians who work shifts and clinical priorities conflicted with session timings.
  - The project team offered varied time slots and dates to accommodate schedules, but clinical demands remained a significant barrier.
- **Technical Issues**
  - One RIS session was cancelled due to a failure to update Zoom software, an issue requiring IT intervention. While all attendees were able to join later sessions, the team learned to pre-empt such technical hurdles in future planning.

  - Some participants logged into RIS sessions with colleagues due to a lack of individual IT equipment. This led to incomplete data capture, as differing responses were only recorded if participants used separate devices or accessed Sli.do via mobile phones.

- **Underutilization of Sli.do Surveys**
  - The project utilised two Sli.do question sets: one live during RIS sessions and another as a standalone survey. Despite reminders and encouragement to share survey links with colleagues, uptake of the standalone survey was minimal.
  - Limited engagement with the survey was attributed to insufficient promotion by link workers, time constraints, lack of familiarity with the project, or limited access to laptops and desktops for survey completion.
- **Miscommunication Among Link Workers**
  - One link worker mistakenly believed that completing the initial survey fulfilled their responsibilities, highlighting the need for clearer communication and follow-up.

Mitigation Strategies for Future Projects

To address these challenges, the project team recommends the following improvements:

- **Personalised Engagement: Offer one-on-one meetings with link workers (in-person or online) to explain the project and emphasize its importance. This personalised approach could enhance understanding and foster stronger engagement.**
- **Improved Technical Preparedness: Conduct pre-session technical checks to prevent issues like software updates from disrupting planned activities.**
- **Enhanced Accessibility: Provide additional resources and equipment where possible to ensure that all participants can engage fully, minimising reliance on shared devices.**
- **Increased Awareness: Develop clearer, more concise communication materials to boost awareness of the project's relevance and encourage participation from all roles, including IT/Digital staff.**

These lessons provide valuable insights for improving the design and execution of similar initiatives in the future.

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Thank you to the families that kindly agreed to provide images of their babies via NWNODN, for use in this report.