

Imperial College Healthcare NHS Trust provides acute and specialist healthcare for around a million people every year in north west London across five hospitals and a number of community services.

Imperial's maternity service delivers c10,000 babies per annum, providing care throughout pregnancy, labour, and the postnatal period. The maternity units provide birth centres, equipped with; pools, mats, bean bags, couches, stools and slings as well as labour wards to care for women with complex medical and obstetric problems. Expectant mothers are given a choice of giving birth in the birth centre or one of the labour wards, within the NHS or privately. The labour wards are for women who are confident that they want epidural pain relief during labour or have experienced complications during their current pregnancy, or a previous pregnancy or labour, where they will have access to equipment and facilities such as continuous fetal heart rate monitoring, which is advisory if certain risk factors are present at initial assessment or arise during labour. The primary reason why the baby's heart rate is monitored during labour is to detect signs of fetal distress, which usually relate to baby's supply of oxygen being compromised in some way. If this is detected early, clinicians can intervene to reduce the incidence of a near miss or an adverse event, potentially preventing complications.

The Challenge

When monitoring the fetal heart rate, the cardiotocograph (CTG) readings of the contractions and fetal heart beat were printed on a continuous fetal strip which the midwives would annotate with clinical information and observations. During the labour the midwives interpreted the CTGs with other clinical factors and made critical decisions about the management of labour. In order to limit the risk of misinterpretation of CTG readings the trust practiced a "fresh eyes" buddy system, whereby hourly checks were carried out by the midwife and a colleague who entered the delivery room every hour to check the CTG.

However, even with the hourly check, there was still a possibility that a CTG could be misinterpreted in the intervening time and the Trust wanted to take further steps to ensure that all CTG readings were being interpreted correctly and acted upon as soon as possible. Misinterpretation of and failure to act on cardiotocograph (CTG) readings can result in death or serious neurological injury to a baby during delivery and therefore this is one of the top risks in intrapartum care in maternity, as well as the source of both a significant number and significant value of litigation claims for the NHS.

The paper CTG readings would sometimes go missing from the patients notes and the likelihood of finding a lost CTG was highly unlikely. Although very few CTG related serious incidents (SIs) occur approximately 4 to 5 CTGs have to be viewed each day in relation to Datix incidents (SIs).

In instances of clinical negligence claims that related to CTG misinterpretation or failure to act on CTGs, one case in the last 5 years was not defended due to a lost CTG strip as the Trust could not prove whether the CTG was reviewed, at what point and what, if any, actions were taken at the time. Another issue which impacted on legal cases was that if the CTG had not been labelled it could not be used as a legal document.

The paper CTGs faded over time, also if a CTG was needed for training purposes or had to be reviewed as part of an investigation of a SI, staff had to spend time copying and scanning the CTG.

In past Clinical Negligence Scheme for Trusts (CNST) inspections, the maternity service achieved level 3 with compliance in 46 of the 50 criteria, however the notes spot check for continuous fetal monitoring did not demonstrate the required 75% compliance with the necessary record keeping standard. Consequently, two recommendations from the NHS Litigation Authority were to ensure that all staff were aware of, and complied with, the process requirements detailed in the Trust's Electronic Fetal Monitoring Policy and to continue to monitor and address issues of variability in staff compliance across the sites delivering maternity care.

AT A GLANCE

Solution: A maternal and fetal monitoring system that enables digital transmission from the CTG monitors into the EPR

Implementation: Staged across multiple phases

Funding: Global Digital Exemplar programme

Benefits:

- Safer as readings viewable outside the labour room to all treating clinicians
- Action can be taken immediately
- Interruptions kept to a minimum
- Integrated into the patient's health record
- Easier monitoring of multiple pregnancies
- Improved handovers
- No photocopying
- No lost or faded CTGs

In order to address these issues, all maternity staff needed the capability to view all CTG outputs across the labour ward so that concerning CTGs could be spotted and acted upon sooner, as well as being able to store all CTG outputs electronically to eliminate the risk of loss or fading of the paper printouts

The Solution

The trust chose to procure FetaLink, which is part of Cerner's PowerChart Maternity functionality and compatible with the Trust's current electronic patient record (EPR) system. FetaLink is a maternal and fetal monitoring system that enables digital transmission from the CTG monitors into the electronic patient record in real time and gives graphical display of the relationship between fetal heart rate and the mother's contractions which can be monitored remotely.

The relationship between the fetus' heart rate and the mother's contractions helps clinicians understand and react appropriately to the health of the baby during labour. The system allows for vital signs of the mother and baby to be monitored from any location, at the bedside, at the midwives' desk by the shift co-ordinator and also remotely by the consultant in other parts of the hospital. Additionally, clinicians can hide or display any waveforms, this is especially useful when viewing the readings of twins or triplets as an individual baby's reading can be selected to view. Clinicians can also quickly view annotations on the fetal strip.

Two sensors are placed on the mother's abdomen, one for the ultrasound to measure the baby's heart rate and a second pressure sensor to monitor the mother's contractions. The following information is captured into the EPR:

- Fetal Heart Rate
- Maternal Heart Rate
- Fetal Movement Profile
- Fetal SpO2
- Fetal Oxygen Saturation
- Blood Pressure
- Heart Rate
- Maternal Temperature

Implementation/Deployment Overview

The roll out of FetaLink across the trust was staged across multiple phases. Initially, FetaLink was deployed on the labour wards of both Queen Charlotte's and St Mary's hospitals in June 2017. The deployment was staggered with one site going live a few days in advance of the other. This was to enable floorwalkers and Cerner technical staff to be concentrated in a single location prior to moving to the next, in addition to make most efficient use of the project's consultants, supporting midwives, project and change team resources.



It's good for handover, good for follow up, and alerts us to problems immediately, if we see something concerning on the CTG display we can go straight to the labour room to assist even before the emergency bell has been pulled
Paula Beckles, Midwife Labour Co-ordinator

I like the way it displays multiple pregnancies, as each baby's reading is clearly shown in a different colour on the display
Miss Sara Paterson-Brown, Consultant Obstetrician

Resulting Benefits to Staff and Patients

Maternity staff at Imperial College Healthcare NHS Trust can now view heart rates and contractions for all the mums and babies on their labour wards from anywhere in the trust, enabling them to follow a mothers and baby's progress as it is happening and providing them with critical information regarding a woman's labour and the health of her baby.

- The Obstetrician or Midwife in charge can identify where a mother is in difficulty without being at the bedside and action can be taken quickly. Clinicians have the information in real time to support colleagues and make informed decisions. Should any readings raise concern, a second interpretation can be provided instantly prior to a second midwife or obstetrician having to physically enter the labour room.
- If a Midwife has to leave the room of any reason for a few minutes, a colleague can still monitor the mother's and baby's readings on the screen from any fetal link PC.
- Interruptions are kept to a minimum as Obstetricians can also see when readings are normal without having to enter the labour rooms to check.
- Handovers are improved as Obstetricians can easily review the history during the handovers

LESSONS LEARNT

Planning and dependencies

- Ensure sufficient time for planning to flush out key dependencies early.
- Make sure that all contributing stakeholders are fully involved in the planning and delivery from the outset. This project was one of the initial projects for the Trust that combines medical devices and IT. The support structure was originally based around these traditionally being separate entities, with separate support teams. We found that wiring requirements meant a high dependency on Estates; the complexity of the project needed not simply plug sockets and network connections but wall mounting of scanners, central monitors, CCE boxes. Activating mobile connection points and extra timelines were needed for a stable CCE connection.
- Plan for sufficient time for explicit logins to be set up by the Registration Authority.

Logistics

- Lots of equipment will be arriving, ensure that your stores colleagues are aware of delivery dates and final destinations for the equipment.

Hardware and software requirements

- Test the new kit and how it is going to work in practice in a labour room. We found that the right kit for the right environment evolved from using FetaLink in action. Wall mounted screens take up less space in the room, as cables are carts can be a little "messy". Ideally screens should have an adjustable height setting.
- If existing kit is used, ensure that it is fully tested to be fit for purpose.
- Ensure there is sufficient bandwidth for IP addresses to operate simultaneously and discuss with existing infrastructure owners that it will work with extra demand.

Build issues

- Test the sequencing of the room numbers displays correctly and does not vary by site.

Training

- Ensure all staff are able to and have the time to undertake full comprehensive training. Although the system is user friendly some functions such as correcting associating and disassociating errors is an extremely complex process. This emphasized the importance of detailed training to ensure the correct patient is associated to the correct device upfront.

Support

- Be aware of the level of support that outside organisations can provide. The team found it difficult to have real time support as Cerner resource was based in USA, however the Cerner team are now building FetaLink expertise within UK.



Now there are always two pairs of eyes on a CTG
Nicola Sale,
Co IT Midwifery Lead

We can see on the displays when things begin to change, anticipate and react earlier
Miss Sara Paterson-Brown, Consultant Obstetrician

- Monitoring the readings for multiple pregnancies is easier as each baby's CTG reading is in a different colour, enabling maternity staff to clearly differentiate between each individual baby.
- Clerical staff no longer have to spend time looking for lost CTGs or producing copies of CTG's
- Electronic storage of CTG traces eliminates the risk of lost or faded paper strips. FetaLink stores the CTG output in an electronic format which can be accessed at any time. NICE guidance states that electronic fetal monitoring traces should be kept for a minimum of 25 years and that systems should be developed to ensure the electronic storage of CTG traces (NICE, 2003). As electronic CTG traces do not go missing or fade, the ability to defend medical negligence cases based on CTG misinterpretation or failure to act is no longer compromised.

Future Plans

The Trust plans to roll out Fetalink to multiple other maternity locations.

The subsequent phases include the Lindo wing, both intrapartum and antenatal.

The Trust's antenatal locations on both sites will gain FetaLink within its triages, antenatal wards and day assessment units.

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