

Case story

Antenatal computerised CTG monitoring

Early Notification

Case story guidance

Background

In '[Resolution through collaboration](#)', [NHS Resolution's 2025-28 strategy](#), our second strategic priority is to contribute our unique data and insights to learn from harm and our third is to support maternity and neonatal safety improvements. Aligned with these aims we have gathered together learning from our Early Notification Scheme and produced a number of case stories to help support learning from harm identified through claims.

These resources

Our case stories are illustrative and based on recurring themes from real life events. These experiences have been highlighted and shared with you, to help identify potential risks in your clinical area, promote learning and prevent fewer incidents/claims like these occurring in the future.

How to use the case stories

There are various ways you may use the case stories, from individual self-directed learning to support continuous professional development to using them in a team environment. We have had feedback that some Trusts use the case stories as part of multidisciplinary mandatory training such as Drills and Skills/In situ simulation and also use them to support teaching for student midwives/medical students. The idea is that by learning from the experience of others, maternity unit staff will be able to change their approach to care. As you read or discuss the examples of incidents that we are sharing we ask you to consider the following:

- Could this happen in my organisation?
- What changes within my organisation or team might I consider after reading the material, including individual practice?
- What information should I share with the team?
- How can I share the learning from this case story?
- Who else needs to know?

Practical applications

1. Consider the key elements of the case story and through reflection apply the learning to influence your practice in the future.
2. Use this case study as a point of discussion at appropriate multi-disciplinary team meetings, safety huddles, and/or human factor's training.
3. Use this case study to create a multi-disciplinary simulation in the clinical area or on mandatory training.
4. Review your claims scorecard to identify whether there are any themes which relate to this case story and identify where improvements could be made.

Case story

This case story is illustrative based on a range of examples of real events. NHS Resolution is sharing the experience of those involved to help prevent a similar occurrence happening to patients, families and staff. As you read about this incident, please ask yourself:

- Could this happen in my organisation?
- Who could I share this with?
- What can we learn from this?

Topic

Appropriate antenatal use of computerised cardiotocograph (CTG)

Key points

1. Do not use computerised (Dawes-Redman) CTG in the presence of uterine activity¹.
2. If the trace is abnormal before 60 minutes, do not wait until the criteria are not met before requesting an urgent review.
3. You must take into account the whole clinical picture when interpreting a CTG.

Maternity story

Antenatal events

Ms A booked in her first ongoing pregnancy at ten weeks gestation. She had a history of a previous early miscarriage and some difficulties conceiving. Ms A's booking body mass index (BMI) was 39kg/m² and she did not smoke. She was highly concerned about the risk of another miscarriage but was reassured by a first trimester scan. She was booked onto a pathway for women with raised BMI with serial scans for growth and a glucose tolerance test. A fetal anatomy scan was normal at 20 weeks gestation, and there was an anterior placenta. She reported reduced fetal movements for the first time at 27 weeks gestation, but she was reassured by hearing the baby's heartrate when the midwife listened in. At 28 weeks gestation she had her first growth scan when the baby was plotted around the 30th centile on her growth chart. Ms A was screen negative for gestational diabetes. At 32 weeks gestation the next growth ultrasound identified normal growth at the same velocity.

At 33+2 weeks gestation Ms A called the maternity triage reporting reduced fetal movements and she was asked to attend the hospital as per national guidelines². There was no history of ruptured membranes, no vaginal bleeding and no uterine tightenings. All maternal observations were normal. The baby was monitored with a computerised CTG using the Dawes-Redman criteria¹ which were met at 34 minutes. Ms A felt her baby moving whilst the CTG was on and the midwife was able to reassure Ms A that the results were normal³. The importance of fetal movements

was reiterated before she was discharged home in the context of a normal antenatal CTG and normal fetal growth on scan a few days previously. She reported reduced movements again at 35+4 weeks gestation and was again discharged home, reassured by a normal computerised CTG.

A planned growth scan at 36+2 weeks gestation identified static growth from the previous scan, with normal liquor volume but raised pulsatility index (PI) >95th centile. An obstetric doctor reviewed the scan and explained there was a concern that the placenta was showing early signs of not working as well as previously and made a plan with Ms A for a repeat scan in a week for liquor volume and Dopplers. They reminded Ms A of the importance of monitoring her fetal movements. Ms A said she felt she did not want to keep coming to triage as everything was always fine and felt that she was in the way. She was reassured that they would prefer to see her if she had concerns.

Intra-partum events

At 37+1 weeks gestation, Ms A experienced lower abdominal cramping and reported concerns about reduced movements to triage and so was invited for immediate review. There was maternal tachycardia of 120bpm but otherwise all observations were normal. There had been no rupture of membranes but Ms A described passing a small amount of vaginal blood stained mucus overnight. There had been period type pains on and off through the night but these were not getting stronger. She also reported that she was most worried about the baby's movements as she had not felt any movements for a few hours now. A computerised CTG was started and Ms A was immediately relieved to hear the fetal heart rate. The midwife left the bay to attend another triage patient.

At 40 minutes Ms A used the call-bell to ask the midwife for some pain relief for her abdominal pain. The midwife noted the Dawes-Redman criteria were not yet met but that the trace looked normal. She provided some paracetamol for analgesia and identified uterine contractions approximately 2:10 minutes. They discussed a plan for getting a doctor to review the CTG and 30 minutes later an obstetric doctor came to review. The last growth scan was reviewed and the growth was determined to be within normal range. Ms A told the doctor that she was really worried about the lack of movements and that she was anxious about losing the baby after her previous miscarriage. The criteria had not been met at 50 minutes with abnormal short-term variability (STV). The doctor reviewed the Dawes-Redman result and could not see a clear pattern of an abnormal antenatal CTG classification apart from some reduced variability for 30 minutes and so requested the CTG be repeated with further review.

Nearly two hours later another computerised CTG was commenced after Ms A returned from a walk and refreshments. She reported more frequent contractions and enquired whether this could be labour. Although the CTG had been commenced five minutes previously, the baseline variability was markedly reduced and there were some decelerations. The criteria had not been met at this point and the team felt that the CTG had not been on long enough to enable the Dawes-Redman programme to produce a result. The timing of the decelerations was not remarked upon. The midwife asked for a doctor to review Ms A for progress and a vaginal examination was performed. Ms A's cervix was 6cm dilated, with the fetal head at

the ischial spines. The doctor summarised the history including static growth with abnormal Dopplers and recurrent reduced fetal movements. They did not classify the CTG but recommended continuous monitoring on labour ward and an artificial rupture of membranes (ARM) to review the liquor as she had now established in labour.

Ms A was moved to labour ward and a partogram was started in order to document active labour. A regular (non-computerised) CTG was commenced whilst Ms A was prepared for ARM. The midwife performed the amniotomy, there was blood stained liquor and progress to 7cm cervical dilatation. There were some decelerations present during the examination but when Mrs A was turned to a left lateral position these subsided although the reduced baseline variability persisted. The CTG findings were not classified or escalated immediately as the midwife was awaiting the ward round.

Thirty minutes later, during the routine consultant ward round, it was explained to Ms A that there were concerns about recurrent fetal heart rate decelerations and reduced baseline variability, which meant there was a risk of the baby being hypoxic (lacking oxygen). The parents and doctor discussed the option of continuing labour or expediting the birth by emergency caesarean section on the basis of the CTG with a background of a fetal growth concern. The parents opted for a caesarean birth, and a category 2 caesarean section was called. As Ms A was being moved from her room, there was a prolonged deceleration of the fetal heart rate that did not recover. The doctor upgraded the surgery to a category 1 caesarean section and it was performed swiftly under general anaesthetic. The baby was born in a poor condition; he was floppy and pale. The cord was immediately clamped and the baby given to the awaiting neonatal team.

Neonatal events

The baby was dried and stimulated but continued to be pale, have poor tone and poor respiratory effort. After inflation and ventilation breaths the baby was still requiring additional breathing support so was transferred to the local neonatal unit for additional assessment and management, where his reflexes were found to be abnormal. The Apgar scores were 0 (one minute), 0 (five minutes) and 3 (ten minutes). The paired umbilical cord gases showed arterial pH 6.77 with base excess -13.3mmol/L and the venous pH 7.04 with base excess -12.42mmol/L.

The baby met the criteria for cooling due to the ten minute Apgar score and abnormal neurological examination. The baby was transferred to the regional centre for ongoing care a few hours later. An MRI on day seven showed evidence of an acute event on a background of chronic hypoxia, diagnosed as stage 2 HIE. The baby required regular outpatient follow-up from several different teams⁴.

Learning Points

This case highlights the importance of ensuring that the whole clinical picture is assessed, even if a computerised CTG is used as a tool to aid diagnosis. In this case there was a delay identifying and escalating an abnormal antenatal CTG on a high risk background of reduced fetal movements and fetal growth concerns. Staff had

continued to use the computerised CTG when the woman was regularly contracting and had progressed in labour. CTG classification was not performed as the staff were waiting for the full 60 minutes for the Dawes-Redman programme to give a result. This led to a delay in recognition and escalation of the fetal heart rate problem.

Ms A had no fetal movements and was contracting when she was seen in triage at 37 weeks. The initial risk assessment should have identified the static growth and that this baby was already at risk of not coping with labour.

The Dawes-Redman analysis cannot be used in the presence of uterine contractions as this can be falsely reassuring. An early assessment and diagnosis of labour or any uterine activity should have led to monitoring using standard intrapartum techniques and standards. The persisting reduced variability and decelerations were not escalated. This was partly because no overall assessment was made of the whole clinical picture including multiple attendances for reduced fetal movements.

If Dawes-Redman criteria are not met, Trusts should have clear guidance in place about when and to whom findings should be escalated.

- The computerised CTG must NOT be used in the presence of any uterine activity as the results are not valid¹.

When the CTG was restarted after Ms A's walk, the CTG was not classified or escalated appropriately as it had not been identified that she was established in labour. Once Ms A was correctly identified as labouring and the CTG was classified with intrapartum factors, the team made a plan to urgently expedite the birth. However, the baby was already hypoxic.

Antenatal use of computerised CTG analysis is associated with a significant reduction in perinatal mortality⁵ and is recommended in the Saving Babies Lives (Version 3) care bundle⁷. However, a computerised CTG is only an aid to clinical diagnosis and should not be used in isolation; the whole clinical picture must be taken into account.

The computerised CTG is therefore a useful tool for antenatal monitoring particularly to reduce the risk of human error of misinterpretation of the CTG⁴. It is an objective CTG analysis based on signal loss, movements, basal heart rate, contractions, accelerations, decelerations and reactivity of the fetal heart. This reactivity is specifically identified by the STV. This is similar to baseline variability but over a much shorter time and cannot be assessed visually and the mean STV increases with gestation. Low STV (<4ms) values can indicate a compromised baby.

The analysis runs for up to 60 minutes and provides two outcomes:

- Criteria met
 - Can happen as soon as ten minutes
 - Indicates a normal trace
 - Aim to discharge home if all else normal
- Criteria not met

- This is an abnormal antenatal CTG
- A senior clinician should review this trace and the patient's history
- This can be used as an aid to manage the decision to deliver or wait

Like all CTGs, the computerised CTG should be reviewed in relation to the maternal and risk factors and escalated if it appears abnormal before the 60 minutes are complete.

The legal liability in this case was the delay in recognition and escalation of an abnormal CTG. The use of computerised CTG analysis led to staff unnecessarily waiting to classify the CTG and not taking a holistic view of Ms A's risk factors. The baby should have been delivered earlier which likely would have changed the outcome.

In summary:

- This baby had hypoxia at birth and required cooling. The MRI showed evidence of HIE
- Remember, you should not use computerised CTG findings in isolation and must take into account the whole clinical picture when interpreting a CTG
- Do not use computerised (Dawes-Redman) CTG in the presence of uterine activity^{5,6}
- If the trace is abnormal, do not wait for the full 60 minutes if the criteria are not met before getting help

Considerations for your hospital

- Implementation of Element 3 (Raising awareness of reduced fetal movements) of Saving Babies Lives (Version 3)⁷ encourages trusts to use computerised CTG to reduce the number of ultrasound scans needed for people reporting reduced movements. Computerised CTGs are recommended over and above the visualised CTG due to the potential to reduce the risks of human error.
- Do your antenatal guidelines have an easily accessible and understandable workflow for using computerised CTG? This should include a clear pathway for escalation and summoning assistance – a flowchart is a clear visual pathway that can be displayed in relevant areas.
- Does your hospital include interpreting computerised CTG findings in regular mandatory training for midwives and doctors? The Maternity Incentive Scheme outlines ten maternity safety actions for full compliance. In this case, safety actions 6 (compliance with Saving Babies Lives Version 3 all six elements)⁷ and 8 (90% of maternity staff should attend fetal monitoring training)⁸ would be relevant.
- Do you audit and then disseminate learning of appropriate use of computerised CTG?

What has happened as a result?

This case story is illustrative. If a similar case were to occur, then it would be referred to the Healthcare Safety Investigation Branch (HSIB) and to the NHS Resolution Early Notification Scheme. Once the HSIB investigation has been completed, the trust would share the report with NHS Resolution. Their in-house, specialist team would review all available information about the care received, to decide whether there is any evidence of substandard care which could potentially result in compensation.

The expertise of NHS Resolution staff is used to proactively assess the legal risk, investigate care, and provide early support to families where liability is established.

NHS Resolution supports an open, transparent discussion between clinicians and families following adverse events⁹. The scheme is also designed to improve the experience for NHS staff by time limiting the need for protracted involvement in the legal process and rapidly sharing learning from avoidable harm.

It is very important to note that no amount of money is comparable with the loss of a child or a child living with lifelong neurological injuries. Where poor outcomes occur as a result of deficiencies in care, NHS Resolution aims to resolve all such claims or cases fairly and as quickly as possible.

The current compensation cost to the NHS for a baby who has long term severe brain injury is on average £13.5 million. The human costs to the babies, families and clinical teams involved are immeasurable.

Resources:

1. C Redman, D Stanger et al. Computerised analysis of the antepartum cardiotocogram (CTG) for care of the compromised fetus. Pregnancy Hypertension: An international Journal of Women's cardiovascular health Volume 7 Jan 2017 p58 <https://doi.org/10.1016/j.preghy.2016.10.010>
2. Royal College of Obstetricians and Gynaecologist. Green-top Guideline 57 (2011) Reduced Fetal Movements. [Reduced Fetal Movements \(Green-top Guideline No. 57\) | RCOG](#)
3. NICE Guideline CG 190 Intrapartum Care (2017) [Overview | Intrapartum care for healthy women and babies | Guidance | NICE](#)
4. Early Notification Criteria [Early Notification scheme Reporting criteria \(resolution.nhs.uk\)](#)
5. R Grivell, Z Alfirevic et al. Antenatal cardiotocography for fetal assessment. Cochrane Database of Systematic Reviews 2015
6. Computerised CTG (NHS England, 2019). (HSIB maternity team)

7. NHS England (2023 updated April 2025) Saving Babies' Lives version Three – a care bundle for reducing perinatal mortality.[online] Available at: [NHS England » Saving babies' lives: version 3](https://www.england.nhs.uk/savingbabieslives/version3/) (england.nhs.uk)
8. Maternity Incentive Scheme [MIS-Year-7-guidance.pdf](#)
9. NHS Resolution Saying Sorry June 2017 [Saying Sorry](#)



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