



Health Services Safety
Investigations Body

Investigation report

Investigation report: Delays to intrapartum intervention once fetal compromise is suspected

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A note of acknowledgement

Thank you to the families affected by delays in intrapartum intervention who shared their experiences with us during the investigation into their care, which we write about in this report. We are grateful to them for generously giving their time and thoughts in the aftermath of such personal tragedy. We also thank the NHS staff and subject matter advisors who gave their time to provide information and expertise which contributed towards this report, and the stakeholder organisations and professional bodies that have supported the investigation.

Executive Summary

Introduction

A review of Healthcare Safety Investigation Branch (HSIB) maternity investigations was carried out to identify recurring themes. Delays in interventions during labour (intrapartum) once there were signs indicating that a baby may not be well (fetal compromise) was one such theme. The review identified issues such as inadequate staffing, poor infrastructure and high workload as contributory factors to the delays. Evidence from national reports confirms that such delays constitute a recognised patient safety risk.

The investigation explores this safety risk through the lens of organisational (as opposed to individual) resilience - that is, the ability of the system to successfully respond to changing circumstances. This is a recognised approach to understanding the safety and performance of a system. We consider systemic (system-wide) and contextual elements that may affect a maternity unit's capacity for resilient performance. The investigation visited two maternity units to aid understanding of the systems and context within which delays to intrapartum intervention once fetal compromise is suspected occur. The investigation makes one safety recommendation and presents considerations for trusts that may increase organisational resilience and therefore reduce the potential for harm.

Findings

- There has been a national focus on improving safety in maternity care over the last five years. This has resulted in the publication of multiple national reports, with multiple recommendations and multiple programmes of safety improvement work initiated as a result. There are recurring themes in the reports, such as loss of situation awareness (an awareness and understanding by staff of everything that is going on around them and its potential effects) and the importance of teamworking and multidisciplinary training.
- Situation awareness is often characterised in national reports as something that is under an individual's control. As a result, training is often proposed as a means of avoiding loss of situation awareness. However, situation awareness is more appropriately seen as the outcome of the interaction between staff and all the other elements that make up a work system and hence is an organisational issue.
- Without a shared understanding of what is happening across the whole maternity unit it is not possible for staff to effectively monitor performance or anticipate future requirements. The labour ward co-ordinator is expected to be supernumerary to facilitate this understanding. This is often not possible due to work demands. A role divorced from delivering hands-on care and dedicated to monitoring activity across the maternity unit and anticipating future events provides an organisational means to foster such understanding.
- Regular multidisciplinary ward rounds enable staff to monitor, anticipate and respond in a timely way to emerging problems. They promote a shared knowledge and understanding of the situation (known as a shared mental model). They also provide an opportunity for role-modelling values and standards of practice.
- Shared situation awareness can be promoted by activities such as safety huddles (short multidisciplinary briefings where staff focus on at-risk patients or potential/existing safety problems) and structured information sharing tools.
- The benefits of multidisciplinary training, including in-situ simulation have been highlighted in national reports and other studies. Such training supports three of the abilities necessary for resilient performance – response, anticipation and learning.
- Learning from experience is an important aspect of organisational resilience that requires time and resource.
- Management of the flow of patients between different parts of the maternity service is critical to resilient performance. Providing senior clinical review at triage assists with flow management by promoting an early and effective response and anticipating future needs.
- Having a second supernumerary labour ward co-ordinator to oversee elective and emergency workload may, in larger units, reduce delays in response to elective cases and so increase the resilience of the unit.

- Although it is difficult to change some aspects of a healthcare setting's physical infrastructure, there are some adjustments that can be made that may increase resilience, such as use of digital enhanced cordless technology (DECT) telephones and locating consultant offices on or near the labour ward.
- National reports have highlighted the negative impact of inadequate staffing and high workload on safe care. The effect may be ameliorated, to a degree, through organisational resilience created by other factors.
- Teamwork and psychological safety form the bedrock of resilient performance. The significance of these factors has long been recognised and there are ongoing national initiatives directed at assessing and improving teamwork and psychological safety.
- The Care Quality Commission is considering how to incorporate the assessment of factors such as teamwork and psychological safety in its regulation of maternity units.

Based on the above findings, HSIB asks maternity units to consider the following questions:

- Does your unit have a role, or another means, separate from the labour ward co-ordinator, dedicated to monitoring and anticipation of activity across the maternity service and troubleshooting, such as a roving bleep holder?
- Do you have regular multidisciplinary ward rounds throughout the day?
- Do you have regular safety huddles and multidisciplinary handovers using a structured information tool? • Do you hold multidisciplinary in situ simulation and facilitated debriefing that includes both technical and non-technical skills? Are scenarios and incidents encountered in your unit included in the training?
- Do you know what your staff's perceptions of teamwork, psychological safety and communication are within your unit? Are actions taken in response? How are midwifery staff empowered to contact consultants directly if they have concerns?
- Is time and resource dedicated to regular multidisciplinary forums that provide a safe space to openly discuss scenarios where things did not go well? Do these forums also include discussion and reflection on scenarios where things went well despite unexpected events?
- Are senior midwifery staff assigned to triage and assessment areas? Is there adequate medical presence in these areas?
- In larger units, is the workload on the labour ward separated into elective and emergency work? If so, are there separate labour ward co-ordinators for each?

- How does the physical infrastructure support work? For example, use of DECT telephones, availability of equipment, consultant offices on/near the labour ward, proximity of antenatal ward and neonatal unit to the labour ward.
- How are issues with staffing and workload escalated and responded to? Are senior trust personnel aware and involved?

HSIB makes the following safety recommendation

Safety recommendation R/2020/103:

It is recommended that the Care Quality Commission, in collaboration with relevant stakeholders, includes assessment of relational aspects such as multidisciplinary teamwork and psychological safety in its regulation of maternity units.

1 Background

1.1 Intrapartum intervention

1.1.1 The term intrapartum refers to the period of time spanning the commencement of labour, the birth of the baby and the delivery of the placenta and membranes.

1.1.2 This investigation uses the definition of labour set out by the Each Baby Counts programme (Royal College of Obstetricians and Gynaecologists, 2017). Each Baby Counts is the national quality improvement programme to reduce the number of babies who die or are left severely disabled as a result of incidents occurring during term labour (labour at at least 37 completed weeks of gestation). The definition of labour that applies to the Each Baby Counts programme includes:

- any labour diagnosed by a health professional, including the latent phase of labour [1] at less than 4cm cervical dilatation • when the woman called the unit to report any concerns of being in labour, for example (but not limited to) abdominal pains, contractions or suspected ruptured membranes (commonly known as waters breaking)
- when the baby was thought to be alive at induction of labour
- when the baby was thought to be alive following suspected or confirmed pre-labour rupture of membranes.

1.1.3 National Institute for Health and Care Excellence guidance (2014) details the intrapartum management and care of women along with recommendations for practice.

1.1.4 For the wellbeing of a baby and/or a mother, clinicians may advise one or more interventions as labour progresses. A clinical intervention is any intentional action designed to improve a situation or prevent it from getting worse (Eldh et al., 2017). Intrapartum interventions can range from medications (for example, to progress labour) and operations (for example, caesarean section) to performing manoeuvres during an emergency.

1.1.5 In this report the term 'suspected fetal compromise' refers to signs before or during labour indicating that a baby may not be well. Signs typically occur when a baby is not receiving an adequate oxygen supply. This can occur due to maternal, fetal (baby) or placental issues. Situations where the need for an intervention had not been identified but was evident in retrospect are outside the scope of this investigation.

1.1.6 This report investigates the safety risk of delays to intrapartum intervention once fetal compromise is suspected.

1.2 National focus on improving safety in maternity care

1.2.1 Approximately 650,000 babies are born each year in England and Wales (Office for National Statistics, 2019); the vast majority are delivered safely. However, when outcomes are compared to other high-income countries, there are higher numbers of babies who are stillborn (The Lancet, 2016) and who die soon after birth (World Health Organization, 2017).

1.2.2 In 2014 the Royal College of Obstetricians and Gynaecologists launched a national quality improvement programme called Each Baby Counts. The aim of the programme was, by 2020, to reduce by 50% the number of babies who die or are left severely disabled as a result of incidents occurring during term labour. All local investigations by maternity units of incidents meeting the Each Baby Counts criteria were collated and analysed for common themes and actions that could be taken to improve the quality of clinical care. The data related to intrapartum stillbirths, early neonatal deaths (deaths that occur between zero and six days of life) and brain injuries occurring during term labour (and diagnosed within 7 days of life).

1.2.3 In November 2015 the Secretary of State for Health announced a national ambition to reduce the rate of stillbirths and neonatal and maternal deaths in England by 50% by 2030. Since Each Baby Counts and the national ambition, there has been a focus on improving safety in maternity care reflected in published national reports and initiatives. The key reports and initiatives are mentioned below to highlight the breadth of ongoing work in this area and recurring themes.

1.2.4 Many reports refer to 'situational awareness' and identify the loss of individuals' situational awareness as a failing that contributes to harm. This term derives from 'situation awareness' which was coined by Endsley (1988), who defined it as 'the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and a projection of their status in the near future'. That is, situation awareness is an awareness and understanding of everything that is going on around us and an anticipation of its effects. Endsley was clear about the need for systems to be designed to enable and enhance situation awareness. Hence, situation awareness should be seen as an outcome of the interaction between staff and the system. Thus, the loss of situation awareness should be seen as an organisational issue rather than an individual's responsibility or failing. Many factors can help or hinder situation awareness. Workload, fatigue, the design of environments and information technology are just a few examples. This report uses Endsley's term 'situation awareness' (unless quoting from a document that uses the term 'situational awareness') and focuses on how this may be enhanced or hindered by organisational factors.

1.2.5 In February 2016 the report of the National Maternity Review, 'Better Births – improving outcomes of maternity services in England' (NHS England, 2016a), set the strategy for improving maternity care. The report highlighted where further work was needed, for example, making care more personalised, ensuring continuity of carer, better multi-professional working facilitated by training together, and greater learning and improvement when things go wrong. It was proposed that providers and commissioners come together in local maternity systems to design the delivery of services, working to common agreed standards and protocols.

1.2.6 In March 2016 'Saving Babies' Lives. A care bundle for reducing stillbirth' was published by NHS England (2016b) to help maternity services meet the national ambition to halve the rate of stillbirths. The bundle brought together 'four elements of care that are recognised as evidence-based and/or best practice':

- reducing smoking in pregnancy
- risk assessment and surveillance for fetal growth restriction
- raising awareness of reduced fetal movement
- effective fetal monitoring during labour.

Version two of the care bundle was published in March 2019 (NHS England, 2019). This included an additional element of reducing preterm birth. In common with other reports, the bundle highlighted a need for 'all staff to undertake multidisciplinary training that includes situational awareness, human factors and communication' (NHS England, 2019).

1.2.7 In July 2016 the Maternity Transformation Programme (NHS England, n.d.) was launched to achieve the vision set out in the Better Births report by bringing together a wide range of organisations to deliver change. The Maternity Transformation Programme provides the umbrella under which sit the majority of improvement initiatives – for example, the work to support implementation of the Saving Babies' Lives care bundle.

1.2.8 In October 2016, the Department of Health published 'Safer Maternity Care – next steps towards the national maternity ambition' (Department of Health, 2016). This set out its action plan to achieve halving the rates of stillbirths, neonatal and maternal deaths, and brain injuries that occur during or soon after birth, by 2030. An expectation was set of a 20% reduction in these rates by 2020. The action plan has five areas of focus:

- leadership
- learning from investigations and sharing best practice
- teams – investing in the capability and skills of the maternity workforce and promoting effective multi-professional team working, in particular, through training and inclusion of aspects such as human factors
- data – improving data collection and linkages between maternity and other clinical datasets to enable benchmarking and drive improvement
- innovation – promoting and accelerating improvement and innovation.

1.2.9 In February 2017 the Maternal and Neonatal Health Safety Collaborative (renamed the Maternity and Neonatal Safety Improvement Programme in 2019) was launched as a three-year programme to support the aims set out in the Better Births report and the work of the Maternity Transformation Programme. Specifically, the collaborative was set up to help maternity and neonatal units across England develop quality improvement capability, and draw on quality improvement methodologies to implement projects to promote safe care (NHS Improvement, n.d.). Improvement tools and change packages were made available for trusts to use and adapt, for example, guidance to support the implementation of safety huddles [2], and a change package for the early recognition and response to deterioration of the health of mother or baby which included the need to have prompt escalation processes in place among other things. The collaborative's work is supported by 15 regionally based Patient Safety Collaboratives.

1.2.10 In 2017, to further support change, 44 Local Maternity Systems, overseen by the Maternity Transformation Programme, were set up across England to develop Better Births Implementation Plans for maternity services. The plans were expected to include actions which reflected the issues highlighted in the Better Births report. In relation to learning and improvement, it was expected that multi-disciplinary teams would have developed knowledge

and skills in quality improvement through the Maternity and Neonatal Safety Improvement Programme, and healthcare professionals would have a greater understanding of situation awareness and the systemic factors that can cause safety incidents.

1.2.11 In October 2017, the Each Baby Counts programme published findings relating to the care of babies born during 2015 (Royal College of Obstetricians and Gynaecologists, 2017). The report stated that 723,251 term babies were born in the UK in 2015. Of these, 1,136 fulfilled the Each Baby Counts criteria. In 727 reports there was sufficient information to make a judgement about the quality of care. In 556 cases (76%) it was concluded that different care might have led to a different outcome.

1.2.12 The analysis of these cases demonstrated 'the complex nature of maternity care'. Over 3,800 critical contributory factors to incidents were identified, with an average of six for each baby. The report made recommendations to improve care in three areas: fetal monitoring, human factors and neonatal care. Of note, the report stated that: 'Generally, Each Baby Counts reviewers interpreted 'human factors' as being 'human errors' and the means to overcome them as 'human factors training'. (Royal College of Obstetricians and Gynaecologists, 2017). Human factors is, in fact, a scientific discipline that encompasses all of the factors that can influence people and their behaviour. In a work context, these include environmental, organisational and job factors, as well as people's individual characteristics.

1.2.13 The Each Baby Counts reviewers identified 'human factors' as contributory to the outcome in 53% of cases where different care may have led to a different outcome. The most frequent factor identified was lack of 'situational awareness', which was identified in 44% of cases. Other human factor issues cited were stress (4%) and fatigue (2%). The key recommendations of the Each Baby Counts report relating to 'situational awareness' were that:

- 'All members of the clinical team working on the delivery suite need to understand the key principles (perception, comprehension, projection) of maintaining situational awareness to ensure the safe management of complex clinical situations.
- A senior member of staff must maintain oversight of the activity on the delivery suite, especially when others are engaged in complex technical tasks. Ensuring someone takes this 'helicopter view' will prevent important details or new information from being overlooked and allow problems to be anticipated earlier.' (Royal College of Obstetricians and Gynaecologists, 2017)

1.2.14 In the 53% of cases where different care may have led to a different outcome, 'failure to escalate/act upon risk/transfer appropriately' was identified as the 'critical contributory factor'. In 42%, it was 'delay in management of delivery'. Of these delays in delivery, 12% were due to staff/theatre availability; 1% were due to waiting for results (Royal College of Obstetricians and Gynaecologists, 2017).

1.2.15 A review by NHS Resolution (2017) of five years of cerebral palsy medical negligence claims also highlighted delay in delivery once fetal compromise was identified stating: 'Not only is rapid escalation, assessment and decision-making important but so is the multidisciplinary teamwork required to ensure quick action is taken once a decision has been made.'

1.2.16 The 2017 Each Baby Counts report (Royal College of Obstetricians and Gynaecologists, 2017) identified a link between high workload and loss of situation awareness resulting in a failure to escalate the need for help. Similarly, high workload was noted to contribute to stress and fatigue. These findings highlight that loss of situation awareness, as with human factor issues such as stress and fatigue, is an outcome of high workload.

1.2.17 Fetal monitoring was identified as a critical contributory factor in 74% of the Each Baby Counts cases where it was considered different care might have led to a different outcome (Royal College of Obstetricians and Gynaecologists, 2017). The significance of fetal monitoring as a contributory factor in adverse outcomes is mirrored in other reports (MBRRACE-UK, 2017; NHS Resolution, 2017; NHS England, 2016b). The equipment used for fetal monitoring is the subject of a separate HSIB national investigation.

1.2.18 The 2017 Each Baby Counts report considers delay in delivery once fetal compromise is identified or suspected. It suggests the following action for trusts: 'A robust system should be developed locally to ensure that the urgency of a delivery is communicated effectively between all teams involved in the mother's care. Any delay in delivery must be flagged up to the most senior obstetrician in charge and action should be taken immediately to reassess the necessity and potential impact of such a delay.' (Royal College of Obstetricians and Gynaecologists, 2017)

1.2.19 In November 2017 the MBRRACE-UK report 'Perinatal Confidential Enquiry into term, singleton, intrapartum stillbirth and intrapartum-related neonatal death' was published. The enquiry identified that in nearly 80% of the cases reviewed [3], different care might have made a difference to outcome (MBRRACE-UK, 2017), echoing the findings of the Each Baby Counts report earlier that year.

1.2.20 The MBRRACE-UK enquiry also identified loss of situation awareness as a key finding when reviewing intrapartum care: 'Failure to recognise an evolving problem, or the transition from normal to abnormal, was a common theme. It was rarely due to a single issue, more commonly appearing to arise from a more complex failure of situational awareness and ability to maintain an objective overview of a changing situation' (MBRRACE-UK, 2017). One of the enquiry's recommendations was that there should be multidisciplinary training in situation awareness and human factors for all staff caring for women in labour.

1.2.21 System capacity was identified as a problem in just over a quarter of the cases (21 cases). In a further seven cases, the notes identified issues that could be related to problems with staffing capacity (such as lack of one-to-one midwifery care, or problems contacting 'on-call' consultants), making a potential 28 cases (35.9%). Most issues were identified during the intrapartum period (in 17 cases); the reviewing panel judged delivery suite capacity issues as having played a contributory role to the poor outcome in the majority of these cases (10 cases).

1.2.22 The MBRRACE-UK enquiry cited examples of how workload, staffing and capacity issues had resulted in delays. In particular delays occurred in the transfer of the mother from either an antenatal setting or a midwifery-led unit to the delivery suite, due to either lack of a room or increased activity levels and a lack of staff. Other examples included delays in induction of labour or in performing an artificial rupture of membranes because of increased activity on the unit. These findings mirror those of HSIB maternity investigations. The enquiry concluded: 'Such delays suggest that during periods of high activity the ability of the wider maternity service to cope with the demand for one-to-one care and/or timely review by obstetric or medical staff is sometimes compromised'. (MBRRACE-UK, 2017)

1.2.23 One of the key recommendations of the MBRRACE-UK enquiry was that capacity concerns needed to be addressed. Another was that women undergoing induction of labour 'should have regular review by obstetric staff, perhaps as part of delivery suite rounds, with a clear plan for progress at each review. Senior medical and midwifery staff... need an overarching view of activity across the whole unit...' (MBRRACE-UK, 2017).

1.2.24 The enquiry concluded that there 'needs to be a recognition' that care is 'being provided in an environment where the 'system' is working close to, and on occasion above, the capacity for which it was designed' (MBRRACE-UK, 2017).

1.2.25 In November 2017, the Department of Health published a report detailing progress against the Safer Maternity Care action plan and set out further steps to improve safety in maternity. These included measures to improve the standard of investigations and support for learning and quality improvement [4]. The timeframe for achieving the national ambition was brought forward to 2025. An additional ambition was set to reduce the national rate of pre-term births from 8% to 6% by 2025.

1.2.26 In 2018 NHS Resolution launched an incentive scheme to reward trusts that meet 10 safety actions designed to improve the delivery of best practice in maternity and neonatal services. The safety actions were agreed by national maternity safety stakeholders and included workforce planning (the labour ward co-ordinator having supernumerary status being one of the elements), multi-professional training, and implementation of the Saving Babies' Lives care bundle.

1.2.27 The Each Baby Counts 2018 progress report echoed many of the findings of the 2017 progress report, for example, the loss of situation awareness in adverse events and the need for the labour ward coordinator to be supernumerary and so maintain a helicopter view of activity. In addition, the importance of context when considering poor outcomes for babies was highlighted. The report stated that the 'reasons for these outcomes are complex and multifactorial' and that 'This complexity and interdependency highlights the need for...methods that recognise the context in which these events occur'. To identify improvements in a maternity unit, the authors said that the whole service needs to be considered with a 'focus on organisational structure, unit culture and training, and the way individuals communicate together and as wider teams, and also on the environment in which care is delivered' (Royal College of Obstetricians and Gynaecologists, 2018).

1.2.28 An ethnographic study of one high-performing maternity unit located in Southmead Hospital in Bristol (Liberati et al., 2019), published under the auspices of The Healthcare Improvement Studies (THIS) Institute, University of Cambridge, aimed to understand and describe mechanisms that contribute to safety. The study identified six mechanisms. These included elements relating to team functioning and psychological safety [5] mutual respect across roles and disciplines, an expectation of high standards in relation to clinical practice and behaviour, multiple sources of monitoring about the unit's state of safety, and a collective commitment towards safety. These mechanisms were found to be supported and sustained by the unit's multidisciplinary training programme and the contextual features: 'intervention and context shaped each other' (Liberati et al., 2019). These mechanisms were broadly confirmed and then refined (see Appendix A) in a wider followup study involving five other maternity units and stakeholder consultation (Liberati et al., 2020). Structural conditions such as staffing and physical environment were also identified as having an important influence on the mechanisms.

1.3 National initiatives to improve escalation of care

1.3.1 Timely and effective escalation is critical to reducing delays to intrapartum intervention once fetal compromise is suspected. The Each Baby Counts Learn and Support Programme, which feeds into the Maternity Transformation Programme, is a collaboration between the Royal College of Obstetricians and Gynaecologists and Royal College of Midwives directed at improving two areas of practice: clinical escalation and debrief.

1.3.2 The Each Baby Counts 2019 progress report (Royal College of Obstetricians and Gynaecologists, 2020) focused on the theme of clinical escalation as a recurrent, critical contributory factor in incidents referred to the programme. Escalation was found to be 'a complex process that requires a combination of clinical, behavioural and logistical steps in order to correctly identify and deliver urgent care'.

1.3.3 A 'failure to escalate/act upon risk/transfer appropriately' was identified in 36% of reports (358 out of 986). Some of these related to a lack of recognition of risk or fetal compromise but the majority involved unsuccessful attempts to escalate for a variety of reasons. Themes included loss of situation awareness, team dynamics and unit culture, workload and workforce challenges, and communication. Recommendations were made to address key themes.

1.3.4 In relation to human factors such as cognitive biases (mental shortcuts based on the recognition of common patterns and signs together with experience) and known human limitations, the report recommendation was for research 'to establish how to operationalise learning' into practice. With regard to workload and workforce challenges, the recommendation also included the need for research 'to identify safe obstetric staffing standards for the workload and acuity, to guide policy-level changes for the workforce'. To address communication issues, the recommendation included the need for staff to be familiar with emergency communication and escalation protocols and for these to be 'included in simulated escalation calls during local multidisciplinary team training' (Royal College of Obstetricians and Gynaecologists, 2020).

1.3.5 This investigation, therefore, adds to an already considerable body of work within the last five years and initiatives underway to improve safety, including escalation, in maternity care.

2 Examples of incidents

2.1 Below are two summarised examples of delays to intrapartum intervention described in HSIB maternity investigation reports. Each delay was individually investigated by the maternity investigation programme to identify its causes and contributing factors. These included staffing (for example, inadequate staff cover or poor skill mix), high workload, and infrastructure (such as lack of availability of a delivery room on the labour ward or lack of a theatre).

2.2 Example 1

A mother in her first pregnancy was assessed as being at low risk and a plan was made for midwifery-led care in a birth centre. On two occasions during her pregnancy she experienced reduced fetal movements. On both occasions she was assessed, the cardiotocography (CTG) [6] results were deemed normal and the Mother was discharged home.

At 39 weeks and 0 days the Mother had a membrane sweep [7] and irregular contractions followed. She telephoned the maternity unit helpline number and was told that it was unlikely that she was in established labour. However, the Mother was advised to attend the unit as she reported concerns about reduced fetal movements. After the telephone call, there was no communication by staff with the labour ward assessment area. When the Mother arrived at the assessment area, a shift handover was in progress and staff were not expecting her. The Mother waited in the corridor as the waiting area was full.

After two hours the Mother was assessed, reassured and discharged home; she was reporting significant pain with contractions. Five hours later the Mother rang the maternity unit helpline reporting two contractions every 10 minutes. It was thought unlikely labour had progressed so quickly, and the Mother was advised to wait at home for more frequent contractions.

Ten hours after her second telephone call, the Mother returned to the maternity unit reporting concerns about reduced fetal movements and continued painful contractions. After examining her, maternity staff identified she was having a prolonged latent first stage of labour and induction of labour (IOL) was agreed. The CTG readings at this time were deemed normal. The Mother waited for a bed in the IOL bay and continued to report painful contractions. CTG monitoring continued during the night.

Both the IOL bay and labour ward were full, and there were disruptions in care due to the high workload. Midwifery staff from other areas were relocated to the labour ward to lend support. The high labour ward acuity was not communicated to the on-call management team. Some staff were reported as not being as approachable as others. The Mother's distress about her ongoing painful contractions, and progress of her labour, was not escalated as there was a reluctance to further burden the already stretched obstetric team members, who were involved in emergencies.

On several occasions during the early hours of the day, staff found the CTG difficult to interpret and queried 'several drops' in the baby's heart rate. These concerns were not escalated to members of the labour ward team, who were busy in the operating theatres. After repositioning the Mother, and repeat CTGs with additional clinician review, the trace was described as normal. The Mother reported being very distressed by her pain and queried if "something else was going on".

The Mother's care was transferred to the day staff at morning handover. A further three CTGs were conducted through the morning, with a decision for a category 2 caesarean section [8] made at 13:30 hours. The Baby was born in poor condition and required resuscitation. Once stable, the Baby was transferred to a neonatal intensive care unit where active cooling [9] was initiated and the baby was treated for hypoxic ischaemic encephalopathy (brain injury caused by an inadequate supply of oxygen to the baby's brain during the antenatal, intrapartum or postnatal period). The Baby's condition did not improve, and a decision was made, with the Mother and Father, to implement palliative care. The Baby died one month after birth.

2.3 Example 2

A mother in her first pregnancy had an uneventful antenatal period. She had a family history of pre-eclampsia [10] and presented at maternity triage reporting that her baby was not moving.

After examination and a CTG categorised as normal, the Mother was sent home with advice to attend for an ultrasound scan the following day. The Mother reported feeling reassured; she was not informed of the importance of increased surveillance for fetal movement. The ultrasound scan showed the Baby's growth was within the expected range; both the blood flow to the Baby's brain and amniotic fluid volume were abnormal, possibly indicating that the Baby was anaemic. As increased amniotic fluid can indicate gestational diabetes, the Mother was sent home and a blood sugar test was arranged for the following day. The abnormal ultrasound results were documented in the Mother's notes but were not directly communicated to the obstetric team.

The blood sugar results were normal, and the obstetrician who next saw the Mother documented good baby movements upon examination.

At 37 weeks the Mother felt reduced fetal movements again and attended triage the following day reporting no fetal movements at all. A CTG was performed and the Mother was reviewed due to concerns about the abnormal fetal heart rate pattern.

The triage area was extremely busy, and concern about managing the workload had been escalated.

An obstetric review identified that the CTG was showing a rare type of pathological (abnormal) trace. A plan was made to admit the Mother to the labour ward for induction of labour. This was delayed due to lack of beds and once the Mother arrived a decision was made to monitor her clinical condition and CTG. Staff escalated the continued concern over the Baby's heart rate to members of the obstetric team, who were busy seeing other mothers.

Additional CTG reviews were undertaken remotely. There was a high level of activity on the labour ward. Three hours after the Mother's admission, her labour was discussed with a senior obstetrician and a decision was made to deliver the baby by caesarean section.

The multidisciplinary team at the delivery had not been fully prepared for the possibility of a baby being born in such poor condition; there was one neonatologist present, and not all the specialist equipment required.

A blood test taken from the Baby at birth showed severe anaemia. This was not recorded or communicated to the neonatal team. The team was unaware of this until after the Baby's admission to the neonatal unit, which delayed the commencement of a blood transfusion.

The Baby was intubated and ventilated at three hours old and transferred to the nearest neonatal intensive care unit. The Baby continued to deteriorate and died later the same day.

Diagnostic tests taken after the birth of the Baby indicated that they had been born three to five days following an extremely large fetomaternal haemorrhage [11].

3 Involvement of the Healthcare Safety Investigation Branch

3.1 Decision to investigate

3.1.1 A review of Healthcare Safety Investigation Branch (HSIB) maternity investigations identified delays to intrapartum intervention once fetal compromise is suspected as a theme in incidents resulting in stillbirth, neonatal death and potential severe brain injury. The Chief Investigator authorised a national investigation based on HSIB's patient safety risk criteria:

Outcome impact – what was, or is, the impact of the safety issue on people and services across the healthcare system?

3.1.2 Delays to intrapartum intervention can result in significant harm including stillbirth, neonatal death and brain injury (MBRRACE-UK, 2017; NHS Resolution, 2017; Royal College of Obstetricians and Gynaecologists, 2017).

3.1.3 In addition to the harm caused to a baby, such incidents have a devastating impact on the families affected, the healthcare professionals involved and the organisations where such events occur. If subsequent investigations find that the outcome might have been prevented if the care provided had been different, the impact on families is exacerbated still further (Royal College of Obstetricians and Gynaecologists, 2017).

3.1.4 As well as the human cost, such incidents undermine public confidence and trust in healthcare services. They damage a hospital's reputation.

3.1.5 Harm resulting from errors in maternity care incur a financial burden. Such errors contribute significantly to the cost of clinical negligence claims (NHS Resolution, 2017).

Systemic risk – how widespread and how common a safety issue is this across the healthcare system?

3.1.6 The safety risk of delays to intrapartum intervention once fetal compromise is suspected is a widespread issue. A review of 289 HSIB maternity investigations into intrapartum stillbirths, neonatal deaths and babies born with potential severe brain injury identified this type of delay as a contributing factor in 14.9% of cases. Appendix B describes the approach taken for this analysis.

3.1.7 A number of national reports have also identified this safety risk, for example, the Each Baby Counts reports by the Royal College of Obstetricians and Gynaecologists (2020; 2017). The 2017 report analysed the incident reports of 556 babies for whom different care might have led to a different outcome. The 'critical contributory factor' in 234 cases (42%) was identified as 'delay in management of delivery' (Royal College of Obstetricians and Gynaecologists, 2017). In addition, the 2017 MBRRACEUK perinatal confidential enquiry into term, singleton, intrapartum stillbirth and intrapartum-related neonatal death found there was a significant delay in both the decision to expedite the birth and in actually achieving birth in approximately a third of the deaths reviewed (MBRRACEUK, 2017). The enquiry found sub-optimal intrapartum care in 78.2% of cases. In 90% of the cases, the reviewing panel considered that appropriate management would have been likely to lead to a different outcome (MBRRACE-UK, 2017).

Learning potential – what is the potential for an HSIB investigation to lead to positive changes and improvements to patient safety across the healthcare system?

3.1.8 National reports over the last five years have identified delay in intrapartum intervention once fetal compromise is suspected as a patient safety issue and have made recommendations to mitigate it. Despite this, it continues to be a safety risk. This suggests there are complexities associated with addressing this issue that need to be understood and acknowledged.

3.1.9 An HSIB national investigation will usually provide insight into a safety issue and lead to safety recommendations. However, there has been, and continues to be, national work on effective clinical escalation to mitigate the risk of delays. That said, this investigation can complement existing work by looking at the issue of delay through the lens of resilience (see 3.5.7 to 3.5.10).

3.1.10 There may be opportunities to share learning from trusts that have made changes which appear to have had a beneficial impact on managing the risk of delays. This could positively influence processes and practices across organisations.

3.2 Scope and terms of reference

It was agreed that the national investigation would:

- use a Safety-II approach (see 3.5.7 to 3.5.9) to understand how staff work within the clinical environment, and how they adapt to the challenges posed by the system in which they operate
- seek to identify factors which appear to support resilient performance and so help modify the impact of issues such as inadequate staffing, poor infrastructure and high workload on delays to intrapartum intervention once fetal compromise is suspected review the national context surrounding delays in intrapartum intervention once fetal compromise is suspected

- develop safety recommendations as appropriate and identify considerations for trusts that may increase organisational resilience and so reduce the risk of delays in intrapartum intervention once fetal compromise is suspected.

3.3 Evidence gathering and verification of findings

3.3.1 To inform the gathering of evidence, the investigation was mindful of the four types of work described by Shorrock (2016). They are:

- Work as imagined – this refers to assumptions that may be made about how work is carried out by staff. People making these assumptions may be removed in time and space from those delivering care and therefore do not routinely observe work being carried out in the workplace (Hollnagel et al., 2015).
- Work as prescribed – the imagined way in which people work becomes ‘work as prescribed’ when it is set out in policy or processes that frontline staff are asked to follow and adhere to. This is often assumed to be the safest way to work (Shorrock, 2016).
- Work as disclosed – traditional incident investigations place emphasis on taking statements from staff in order to understand their actions. These statements may be based on partial or incomplete versions of one or more of the other varieties of human work. Staff may be uncomfortable about, or fearful of, disclosing variations and adaptations made to ‘work as prescribed’ if they are worried about the possible repercussions of their actions.
- Work as done – this refers to how people actually carry out their work. Understanding ‘work as done’ requires a practical focus and observing work in the environment in which it takes place. There is usually a difference between what is disclosed and how work is actually done in practice (Catchpole and Jeffcott, 2017).

3.3.2 The following methods were used to gather and verify evidence:

- review of 289 HSIB maternity investigations across England into intrapartum stillbirths, neonatal deaths and babies born with potential severe brain injury
- review of national reports and literature relevant to the safety risk
- observations of workflow in two maternity units, over two days, to understand ‘work as done’ (see section 4)
- informal interviews with clinical staff at the observation sites to understand their perception of the reasons for delays in intrapartum intervention
- interviews in person and by telephone with representatives of relevant national organisations [12] and subject matter advisors [13] regarding delays in intrapartum intervention once fetal compromise is suspected.

3.4 Observation sites

3.4.1 The investigation planned visits to five maternity units of different sizes and in different geographic locations to gain an understanding of workflow and challenges facing staff. The investigation was interested in adaptations to elements of practice relevant to organisational resilience. Visits to only two units (termed units A and B) were completed by the time the COVID-19 pandemic affected the UK causing observation visits to hospitals to cease. The adaptations that appeared to strengthen resilience are described in this report. However, they are not intended as exemplars but rather to share for consideration alongside any adaptations other maternity units have made. The investigation is mindful that innovations work differently in different contexts, so what appears to increase resilience in one context may not do so in another. The investigation acknowledges that other units will have made other adaptations that may enhance resilience to a greater extent than those presented here.

3.4.2 Unit A is a large maternity unit that covers a population of approximately 750,000 with an annual birth rate of over 10,000. It provides services over two sites. Both sites have a neonatal unit, offer obstetricled and midwifery-led care, and have bereavement facilities. Community midwifery services, including home birth, are provided to the local population. There are dedicated maternity operating theatres on both sites.

3.4.3 Antenatal services are provided in obstetric-led and midwifery-led clinics and there is a day assessment service for women with complex pregnancies who require additional surveillance. A dedicated maternity telephone triage service is available on both sites 24 hours a day, 7 days a week.

3.4.4 The investigation visited the larger of unit A's two sites. This site has an alongside midwifery-led unit as well as a regional neonatal intensive care unit.

3.4.5 There is obstetric consultant presence on the labour ward 24 hours a day on the larger site. On the smaller site there is obstetric consultant presence for 150 hours per week.

3.4.6 Unit B is a medium-sized maternity unit that covers a population with an overall birth rate of around 6,500 per year. It provides maternity services over two sites. One site offers both obstetric and midwifery-led care, with an obstetric consultant present on the labour ward from 08:00 hours to 17:00 hours, 7 days a week. Midwifery-led services are provided from the other site, including a birth unit, community midwifery and home birth services.

3.4.7 The labour ward for women who are booked under the care of an obstetric consultant includes four high-dependency beds, two theatres and a three-bed maternity post-anaesthetic care unit. This site also provides neonatal intensive care. There are two rooms specifically for parents who have experienced a pregnancy loss.

3.4.8 Antenatal care is provided by obstetric-led and midwiferyled clinics. There is also a fetal medicine service. Maternity telephone triage is available 24 hours a day, 7 days a week.

3.5 Investigative approach

3.5.1 The investigation drew on safety science to understand how staff work within the clinical environment and the factors that impact on them when acting upon suspicion of fetal compromise. It considered how staff use their knowledge, skills and experience to adapt their work to the challenges posed by the system in which they operate. Most of the time, these adaptations allow staff to operate safely and efficiently when responding to a suspicion of fetal compromise; however, they occasionally lead to incidents of delays in intrapartum intervention.

3.5.2 Safety-I and Safety-II are two different approaches used to analyse the safety of systems.

3.5.3 Safety-I focuses on incidents and adverse outcomes which are believed to happen because something goes wrong, 'hence they have causes that can be found and treated'. These causes are presumed to be 'failures or malfunctions of specific components: technology, procedures, the human workers and the organisations in which they are embedded'. Humans are 'viewed predominately as a liability or hazard, principally because they are the most variable of these components' (Hollnagel et al., 2015).

3.5.4 Investigation using a Safety-I approach seeks to retrospectively identify the causes of incidents and fixes for malfunctions. There is an emphasis on training, policies, procedures and compliance.

3.5.5 Safety-II is not focused on the minority of times things go wrong, but seeks to understand how normal or routine performance, which accounts for the majority of clinical interactions, usually results in a safe outcome. Safety-II considers how everyday performance is adapted to respond to varying conditions and constraints (such as lack of time, information or resources) and how these adaptations are not only opportunities for things to go wrong, but also ensure things usually go right. In other words, Safety-II views safe outcomes and adverse outcomes as emerging from a same basis - that is, both types of outcome stem from everyday performance adjustments. Incidents are considered to arise from 'unexpected combinations of everyday performance variability' rather than being a result of 'distinct failures and malfunctions' (Hollnagel et al., 2015).

3.5.6 The difference between a Safety-I and a Safety-II approach is illustrated by Figure 1 (Hollnagel et al., 2015). Safety-I focuses on the left tail of the normal distribution of performance which results in incidents and adverse outcomes. Safety-II sees this tail as a continuum of normal performance variability.

Fig 1 Normal distribution of performance

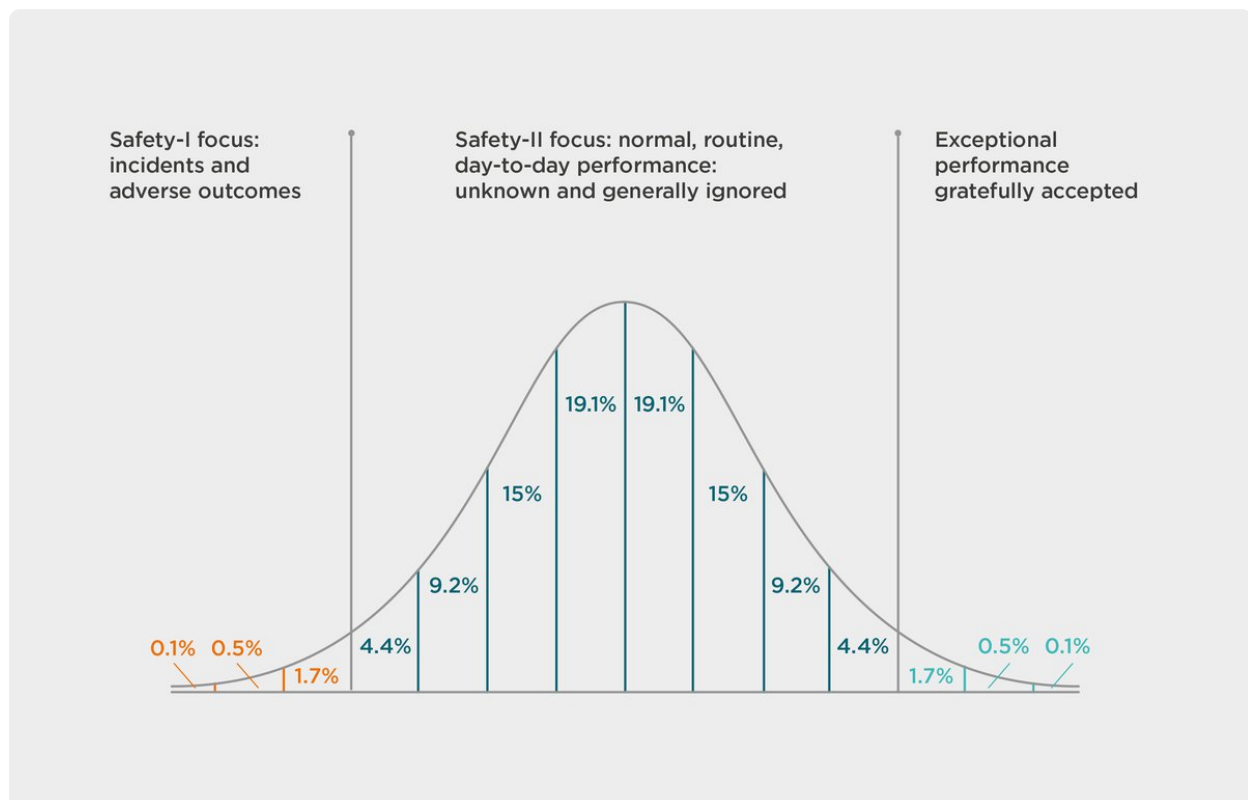


Fig 1 Normal distribution of performance

3.5.7 In Safety-II the focus of investigation is on day-to-day performance and understanding how things usually go right, this being seen as the basis of explaining how things occasionally go wrong. The emphasis is on improving a system's capability to make sure things always go right, referred to as an organisation's resilience. A key feature of a system's potential for resilient performance is its 'ability to adjust how it functions' (Hollnagel, 2015a).

3.5.8 Organisational resilience is particularly important for systems such as healthcare which are buffeted by combinations of usual and unusual demands. These demands include, for example, variations in staffing and other resources, peaks in workload, information losses or corruptions, incessant change, and diffuse or conflicted goals (for example, trade-offs between thoroughness and efficiency). In addition, healthcare relies on people working together and coping with complexity and uncertainty. Fairbanks et al (2014) state that resilience 'makes a large but largely hidden contribution to patient safety'. They consider units such as emergency departments to be particularly good places to look for resilience because the circumstances frequently call on the need for it, particularly because of the unregulated flow of disturbances or unpredictable events.

3.5.9 Maternity units, and in particular labour wards, share some characteristics with emergency departments. For example, the clinical condition of mothers and babies can change rapidly, and situations evolve in unpredictable and uncertain ways. Interventions are time critical

and decisions are often required in the face of uncertainty and high stress. Similarly, there is an unregulated flow of workload and disturbances. Therefore, in common with emergency departments, the principles of resilience may be particularly beneficial in the consideration of delays to intrapartum intervention once fetal compromise suspected.

3.5.10 Resilience engineering 'looks for ways to enhance the ability of systems to succeed under varying conditions' (Hollnagel, 2015a). There is an acceptance that the causes of incidents and adverse outcomes may be impossible to eliminate, although it may be possible to control the conditions that brought them into existence if it is understood how work is normally done. Hollnagel identifies four abilities as the basis for resilient performance:

- 'The ability to monitor...that which is or could seriously affect the system's performance in the near term...'
- 'The ability to anticipate...such as potential disruptions, novel demands or constraints, new opportunities, or changing operating conditions'
- 'The ability to respond...by activating prepared actions or by adjusting current mode of functioning...'
- 'The ability to learn...in particular to learn the right lessons from the right experience...' (Hollnagel, 2015b).

3.5.11 Safety scientists such as Hollnagel point out that the Safety-I approach is based on a view of safety that was developed in the field of industrial safety between around 1965 and 1985. The approach and assumptions underlying it were then imported into patient safety years later 'even though healthcare showed little resemblance to industrial workplaces in the 1970s' (Hollnagel et al., 2015). These authors highlight the complexity of clinical work, which requires high levels of discretion and professional judgement, and the need for people to be flexible and adaptive for the system to work reliably. The authors state that few activities in healthcare are independent of each other: 'We must accept that systems today are increasingly intractable.' The consequence of this being that 'predictability is limited during design and operation, and that it is impossible precisely to prescribe or even describe how work should be done' (Hollnagel et al., 2015).

3.5.12 Safety-II does not replace the more traditional Safety-I approach. Both consider how safety can be improved within the healthcare system, so can be viewed as complementary. However, there are differences in focus and application between the two approaches.

3.5.13 NHS investigations have traditionally adopted a Safety-I approach to try to identify what may have gone wrong – in this case, the causes that have led to delays in intrapartum intervention. This HSIB investigation instead considered systemic elements that enabled successful escalation and timely intervention – in other words, elements that contribute to resilience.

3.6 Analysis

3.6.1 In order to identify aspects of organisational resilience, the evidence gathered from the observation visits was analysed using a systems approach. This means the analysis considered all the interacting work system elements such as the technology and tools used, the tasks, the people involved, the organisation and the physical environment. The model used is called Systems Engineering Initiative for Patient Safety (Holden et al., 2013).

4 Findings and analysis from the national investigation

This section describes the investigation's findings in relation to systemic and contextual elements that appear to support organisational resilience and therefore reduce the risk of delays to intrapartum intervention once fetal compromise is suspected. The four main aspects of resilience are an organisation's ability to monitor, anticipate, respond, and learn (see 3.5.10).

It is acknowledged that there are multiple factors that can impact on resilience, meaning that elements may have variable effects in different maternity units. The elements are presented here as considerations for units, accepting that some will have a number, or all, of these elements in place already.

The investigation acknowledges that delays in the recognition of fetal compromise also take place, but this issue is outside the scope of this report. However, the findings are likely to be relevant to these scenarios.

4.1 Roving bleep-holder

4.1.1 The ability to monitor and the ability to anticipate have been identified as two of the four abilities that are the basis for resilient performance (Hollnagel, 2015a; Fairbanks et al., 2014). The ability to monitor includes knowing what to look for and being able to monitor factors that are seriously affecting, or could seriously affect, the system's performance in the near term (the next few hours or the duration of a shift) either positively or negatively. The ability to anticipate includes: 'Knowing what to expect, or being able to anticipate developments further into the future, such as potential disruptions, novel demands or constraints, new opportunities, or changing operating conditions' (Hollnagel, 2015b). Without a shared situation awareness (see 1.2.4) it is not possible to effectively monitor or anticipate.

4.1.2 Clinical staff interviewed by the investigation spoke of the unpredictability of workload. There was a constant need for juggling and prioritisation in response to unfolding events on the labour ward and areas that impact on labour ward activity – that is, triage areas, assessment units, antenatal wards and midwifery-led birth units either within the hospital or in the local community. The labour ward coordinator (LWC) on each shift, who should be supernumerary, is expected to have a 'helicopter view' of activity on the labour ward and all the other relevant areas mentioned above (that is, they are expected to be situation aware), as a means of monitoring and anticipating workload and resource requirements.

4.1.3 Typically, this situation awareness is achieved by:

- the LWC contacting the leads for those areas at the start of the shift and on an ad hoc basis during the shift
- the leads for these areas contacting the LWC and making them aware of mothers needing admission to the labour ward or other situations requiring their attention
- the maternity matron updating the LWC following visits to, or communication with, those areas
- ad hoc conversations – for example, obstetricians returning to the labour ward from these areas and updating the LWC.

4.1.4 Multiple national reports (and HSIB's maternity investigations) have highlighted the challenges of the LWC role remaining supernumerary to facilitate a helicopter view, and hence situation awareness. Staffing shortages, for example, can seriously impact on this (see 4.9). Loss of situation awareness has been identified as a critical factor when reviewing intrapartum care resulting in adverse outcomes (Royal College of Obstetricians and Gynaecologists, 2020; 2018; 2017).

4.1.5 The MBRRACE-UK report (2017) on intrapartum stillbirth and intrapartum-related neonatal death found that such outcomes commonly appeared to arise from a 'complex failure of situational awareness and ability to maintain an objective overview of a changing situation'. The 2017 Each Baby Counts report (Royal College of Obstetricians and Gynaecologists, 2017) explained the 'essentially fallible' nature of situation awareness, given the limitations of working memory and that if 'working memory becomes overloaded, items will simply be forgotten'. Furthermore, the report stated that distractions are an important cause of loss of situation awareness and will be unavoidable on a labour ward. The report concluded: 'The construct of situational awareness, the limitations of human memory and the complexity of any given situation mean that, inevitably, situational awareness will be suboptimal at any one time.' Consistent and reliable monitoring and anticipation are, therefore, challenging and require systemic support rather than a sole reliance on individuals.

4.1.6 Unit A enhanced its organisational resilience in monitoring and anticipation with the creation of a supernumerary, bleep-holding role (in addition to the LWC) whose task, day and night, was to actively seek information that might impact on the labour ward's ability to perform. In essence, this role helped to sustain situation awareness across the unit.

4.1.7 In Unit A, a senior midwife (band 7) was assigned to the bleep-holder role each shift. Their time was spent roving between key areas within the maternity unit, seeking pre-determined information, as well as providing immediate clinical advice and support. The information was used to collate a maternity unit status report, completed three times per day: at approximately 07:00 hours in preparation for the early shift, at 13:30 hours in preparation for the late shift and at 21:00 hours in preparation for the night shift. Of particular note was the structured and standardised nature of the task. The information sought had evolved over time, developed by those in the role. The report template (and hence the information gathered) was reviewed at a monthly bleep-holders' meeting. Details gathered were those which aided prioritisation of workload and resource, helped with management of patient flow and highlighted particular issues such as safeguarding concerns or disability.

4.1.8 The maternity unit status report facilitated each area having a shared knowledge and understanding of the situation and pressures faced by the different areas, that is, a shared mental model. It acted as a tool to facilitate co-ordinated thinking and actions, and to share the cognitive load involved in oversight of the maternity unit. At the end of each shift the information was shared more widely by email with senior staff within the Trust (such as the chief nurse and duty manager) to support a shared understanding of the workload and resource pressures within the maternity unit.

4.1.9 In addition to the (electronic) maternity unit status report, the bleep-holder completed a more detailed (electronic) document which was updated at set times over a 24-hour period. This document included standardised information for each area regarding flow, formal handover with the neonatal intensive care co-ordinator and any delays such as mothers waiting in triage or in the assessment unit for more than four hours. Telephone calls taken, staff deployed to different areas, informal meetings, and decision-making in response to the evolving events of the shift were also recorded. The data was available for future analysis if needed. The investigation was told that the bleep-holder reports were very useful in informing debriefs of events or investigations into patient safety incidents. They therefore provided a useful tool for reflection and learning, supporting the learning aspect of resilience as well as aiding decision making and management of risks in real time.

4.1.10 The authority of the bleep-holder role was inherent in the role, rather than being dependent on the status of the person holding the bleep, thus reinforcing standardisation. The role included freedom to act – for example, the bleep-holder could move staff based on identified need (or anticipation of needs) in a particular area, as well as liaise with senior obstetric, anaesthetic or other multidisciplinary staff to escalate care as they felt appropriate.

4.1.11 The investigation was told that the roving bleep-holder role brought significant benefits compared to reliance on the LWC to have a helicopter view, or maintain situation awareness, of the whole maternity unit. One senior midwife described LWCs as inevitably having “a bubble view of labour” as they are based on the labour ward. In addition, they said the busyness and pressures on the labour ward meant their attention is always fully occupied there rather than across the whole unit.

4.1.12 By physically going to the different areas regularly throughout the day (and night) and having face-to-face communication, the roving bleep-holder could obtain a rich knowledge of each area to inform decision-making and prioritisation. In terms of support, the role was described as having had a “massive impact”, particularly at night and weekends when there were fewer senior staff on duty. A matron told the investigation that they thought it would be reasonable for all sizes of maternity unit to have a person in this role. They added that the role may have particular benefits for smaller units without 24-hour obstetric consultant cover.

4.1.13 One of the roving bleep-holders told the investigation that because senior midwives from different areas (antenatal, labour ward, postnatal) took the role of the bleep-holder, the particular needs of those areas were understood. They said this meant there was an appreciation of the specific skills and critical number of midwives required, which informed decisions about redeployment of staff. In addition, they highlighted the importance of areas such as the antenatal ward and triage area in terms of risk and possible delays, hence the value of close involvement and monitoring of those areas.

4.1.14 The bleep-holders provide clinical advice and support, such as a ‘fresh eyes’ second opinion on cardiotocography (CTG). It appeared that the bleep-holders acted as the ‘go-to’ person for concerns and issues when support was needed. Multiple examples were given of how their activities might reduce intrapartum intervention delays such as:

- transfer of a mother to the labour ward from the antenatal ward
- facilitating transfer to the Trust's other maternity unit when there is a backlog of cases where mothers require induction of labour
- being alerted to abnormal CTGs or concerns of deterioration so they can assist with escalation. Summary

4.1.15 Without situation awareness it is not possible to effectively monitor or anticipate (see 4.1.1). The LWC is expected to be supernumerary to facilitate situation awareness.

4.1.16 National reports have highlighted the challenges for the LWC to remain supernumerary. These reports have identified loss of situation awareness as a critical factor when reviewing intrapartum care resulting in adverse outcomes.

4.1.17 A roving bleep-holder may provide a means to foster situation awareness.

4.2 Regular multidisciplinary ward rounds

4.2.1 The ability to respond is another of the four abilities that form the basis of resilient performance. Fairbanks et al (2014) describe responding as 'acting or reacting, intervening, correcting, tuning, adjusting...trading-off, sacrificing to achieve specific goals'.

4.2.2 Regular multidisciplinary ward rounds enable monitoring, anticipating and timely response to emerging problems. The value of regular multidisciplinary ward rounds was highlighted in the two-part ethnographic study by Liberati et al (2019, 2020) to identify mechanisms that appear important in the creation of a 'very safe' maternity unit. One of the mechanisms identified was 'monitoring, coordination, and distributed cognition [14]'. Handovers, board rounds and ward rounds were described as key in monitoring the current state of the unit and co-ordination of response. In relation to ward rounds a registrar (a senior doctor completing specialist training to be an obstetrician) is quoted by the study: "We also have a really strong culture of doing regular ward rounds...so we're not fire-fighting, we're trying to anticipate what's going to happen and where risk is."

4.2.3 Units A and B conducted regular multidisciplinary ward rounds throughout the day. This activity helps staff to monitor current activity and anticipate future events. It also promotes another aspect of resilience – the ability to respond. In Unit A multidisciplinary ward rounds were carried out every 4 to 6 hours (4 in a 24-hour period) and included midwifery, obstetric and anaesthetic input. In Unit B, 4 were carried out in a 24-hour period spanning weekdays (the difference being that rounds were not carried out during the night and were less frequent at weekends). If, for whatever reason, it was deemed too intrusive to hold the team discussion in the room where the mother was in labour, it would take place outside the room.

4.2.4 Staff in both Unit A and Unit B spoke of the value of regular ward rounds on the labour ward. One consultant interviewed said that this practice created a "culture" of "keep[ing] things moving...no-one is lax about the possibility of a negative outcome". They added that the expectation set was one of "not letting things pass...not letting things fester".

4.2.5 The consultant compared the unit to the five other units they had worked in, where multidisciplinary ward rounds only happened once or twice a day, and there was a reliance on board rounds [15]. In their view the frequency of ward rounds was a cornerstone of creating a “feeling of everyone being invested in the same outcome together”.

4.2.6 The teamworking benefits of regular multidisciplinary ward rounds were said to be matched by the gains achieved by role-modelling values and standards of practice. The same consultant said that being seen proactively going round and reviewing care “sets the expectation level for registrars... even though you could easily just do board rounds as there are electronic records and central monitoring of CTGs”. The consultant said that sometimes registrars new to the unit could initially be resistant to this way of working, but believed they soon appreciated the benefits. The consultant added that it provided an excellent opportunity for registrars to lead the ward rounds with the consultant there for back-up. In addition, the ward round ensured that the midwife caring for the mother, and the mother, were involved in the discussions. This is often not possible at a board round.

4.2.7 Summing up the effect of the regular multidisciplinary ward rounds, the consultant said they had helped create “high expectations” and “an atmosphere that is proactive... that’s the most important thing”. However, they said that this atmosphere and rigour was nurtured and reinforced and by other elements such as multidisciplinary skills drills and simulation (see 4.4), teamworking and psychological safety (see 4.10).

Summary

4.2.8 Regular multidisciplinary ward rounds enable the monitoring, anticipation of, and timely response to, emerging problems.

4.2.9 The teamworking benefits of regular multidisciplinary ward rounds were said to be matched by the gains achieved by role-modelling values and standards of practice. However, these gains may only be realised when other elements of a supportive context exist.

4.3 Ways to enhance multidisciplinary situation awareness

4.3.1 Shared situation awareness, across the multidisciplinary team, can be enhanced through a number of activities and use of information technology (IT).

4.3.2 The investigation observed ways in which units A and B enhanced their ability to maintain an accurate picture, and a shared mental model (see 4.1.8) of the maternity unit’s operational state and helped sense problems arising. These included:

- Safety huddles – at regular times throughout the day to facilitate a shared understanding of the progress of mothers in labour, emerging concerns, and resource demands.

- Multidisciplinary handovers on the labour ward – including anaesthetists, obstetricians, neonatologists, midwives and matron to promote a shared awareness and input to both the care of mothers and the activity and pressures facing the unit.
- Use of a contemporaneously updated whiteboard in the shared staff area on the labour ward to provide information at a glance and a shared oversight of the progress of mothers in labour. In Unit A there was also an electronic equivalent of the whiteboard where the progress and details of each mother's labour could be seen and accessed by clinicians wherever they were. In both units the information was structured (according to the mnemonic SBAR: situation, background, assessment and recommendation) and in Unit A the whiteboard was also colour-coded to immediately highlight particular interventions, for example, mothers with an epidural sited. Furthermore, in Unit A, the whiteboards were split between elective and emergency work to reflect the separation of work, with a dedicated LWC for each (see 4.7).
- Centralised monitoring of CTGs – meaning at multidisciplinary team handovers and board rounds it was possible to look at the CTG of individual mothers in labour. However, the consultant at Unit B was clear about the importance of holistic assessment achieved through ward rounds, rather than a reliance on this, echoing the conclusions of national reports (Royal College of Obstetricians and Gynaecologists, 2020; 2017).
- Electronic data in a structured format (SBAR) regarding mothers and activity, visible to relevant staff responsible for care, and/or oversight of the whole unit and workflow.

4.3.3 The investigation spoke with the consultant obstetrician who was the Quality Improvement Lead for the Each Baby Counts programme. They pointed out that with regard to escalation, IT remains largely unutilised. They said the current systems and processes were outdated in that they continued to rely on “human interpretation... [and] moving up the chain of command”. They said the ideal would be for clinical information systems to be able to identify the need for intervention, resulting in automated messaging to those who need to act on that information. That is, the ideal would be an information system that presents information in a timely way, to the relevant clinicians and thus supports them to do the right thing at the right time. The investigation was not made aware of any such information systems currently in use in maternity services and agrees this is an area that warrants more research but that may currently be beyond the capacity and integration of most hospital IT systems. Summary

4.3.4 A shared situation awareness can be promoted by activities such as safety huddles and structured information sharing tools.

4.4 Multidisciplinary skills drills and simulation

4.4.1 The value of those working together training together has been highlighted in national reports (Royal College of Obstetricians and Gynaecologists, 2020; NHS England, 2016a). In terms of resilience, multidisciplinary training supports the ability to respond, to anticipate and to learn.

4.4.2 A study of how to be a 'very safe' maternity unit (Liberati et al., 2019) looked at the influence of skills training (technical and non-technical) and in situ simulation (the simulation of scenarios in the actual setting in which people work). The unit studied (Southmead in the south west of the UK) had developed a mandatory in situ simulation programme called PROMPT (Practical Obstetric MultiProfessional Training) which staff involved in maternity care were expected to attend annually. The study found that the training 'fostered and constantly reinforced' mechanisms that contributed to safety. Specifically, simulations enabled staff to:

- learn and make sense of events together
- develop more understanding of each other's roles and responsibilities, as well as each other's social cues
- achieve technical competence and confidence in each other's technical skills
- gain insight into, and appreciation of, the value of all staff members
- grow a sense of pride in the unit and foster shared goals.

4.4.3 The authors concluded that the PROMPT training programme on its own was 'far from a magic bullet' for safety but found that it 'both nurtured and sustained' the conditions needed to achieve it (Liberati et al., 2019).

4.4.4 Macrae and Draycott (2019) have also studied Southmead's in situ simulation programme as a source of organisational safety. The authors drew on the research fields of resilience engineering and high-reliability organising for their analysis, stating: 'At core, simulation as a safety strategy embodies many of the key commitments of high reliability organising and resilience engineering: it is deeply concerned with the particulars of practical work, it is focused on developing the positive attributes and active capacities that underpin safe performance, and it is oriented to improving safety through recognising and responding to disruptions.'

4.4.5 Their analysis identified three 'core organising processes' through which resilience – and therefore safety – was enhanced by the unit's in situ simulation:

- Relational rehearsal – this refers to the social processes involved in in situ simulation, that is, the coming together of diverse professionals to collectively work together to respond to an emergency scenario. This provides an opportunity to strengthen social and professional bonds, build shared expectations, and create collective trust. In combination, this was believed to reduce fear and so empower staff to speak up.

- System structuring – this refers to the processes involved in testing and improving the organisational systems that support the management of obstetric emergencies. In situ simulation was found to provide ‘a space in which deficiencies in current work systems and organisational arrangements can be identified and addressed’ (Macrae and Draycott, 2019).
- Practice elaboration – this refers to the processes involved in examining and improving clinical practices to promote timely and effective responses to emergency scenarios. In situ simulation was seen as creating a space to observe and reflect on practical work, and the systems surrounding it, in order to identify refinements and improvements.

4.4.6 The authors state that: ‘The process of simulating, debriefing and reflecting on practice creates a safe space to identify and strengthen the activities that produce success. Equally, systemic in situ simulation is also directly targeted at identifying and addressing weaknesses in systems and practices.’ (Macrae and Draycott, 2019)

4.4.7 In its briefing paper on key areas for improvement in maternity services, the Care Quality Commission (CQC) (2020) stated that ‘maternity training still varies widely – both in terms of topic areas covered and resources available’. It proposed three areas that training should include: core competencies of individual staff, effective multidisciplinary teamworking, and scenario training that role plays planning or serious complications that require an effective multidisciplinary team response.

4.4.8 The impact of simulation has been found to vary and to be influenced by a range of factors, including how closely simulations correspond to actual events encountered in daily practice, the authenticity of simulated scenarios and settings, and how fully participants engage in simulated exercises (Crofts et al., 2006; Dutta et al., 2006). This suggests that in situ simulation may be more beneficial than off-site training and highlights the importance of incorporating scenarios encountered within the maternity unit, and of resources and attendance being prioritised as a core activity contributing to safe practice.

4.4.9 The investigation is aware of work progressing under the Maternity Transformation Programme, and involving relevant stakeholders, to agree a training curriculum and core competency framework for the multidisciplinary staff involved in maternity care. One of the consultant obstetricians on the programme’s working group explained that the work is currently in its infancy, but it is anticipated that there will be different modules covering different aspects of care that contribute to safety. These modules would be mandatory and include measurement of competency in that area of practice. It is anticipated that escalation – including, importantly, empowerment to escalate both because of high workload or clinical need – would form part of the curriculum and competency assessment. The consultant said that once developed, the curriculum and competency framework would need to be trialled and evaluated.

4.4.10 Units A and B had a programme of mandatory multidisciplinary skills training and simulation. The training (and simulations) included technical and non-technical skills (such as teamwork, leadership and communication) required to manage different types of obstetric emergency. All professionals involved in maternity care (such as midwives, maternity care assistants, obstetricians, neonatologists, anaesthetists and maternity theatre staff) were required to attend. In Unit A the simulation was provided in situ within the maternity unit, and also within other clinical areas where obstetric emergencies may present, such as the emergency department. The equipment and kit for simulations was stored in a room on the labour ward meaning it could be taken to other areas for simulations. Unit B provided off-site obstetric emergency training based on PROMPT, as well as in situ skills drills in the clinical areas. The head of midwifery explained that these were run without the staff having advanced warning; staff only knew when they answered the emergency bell and were presented with a scenario. A debrief took place immediately afterwards.

4.4.11 Comments from clinical staff interviewed at the units suggested that the training also supported the 'learning from experience' aspect of resilience (see 4.5). Fairbanks et al (2014) describe this learning element as involving 'studying experiences and integrating the resulting knowledge into structures available for future practice'.

4.4.12 The investigation heard specific examples of how the training promoted learning. A matron at Unit A said that breakdowns in communication had been a theme from incident investigations a few years previously. They gave the example of a registrar making the decision to take a mother to the obstetric theatre, but then a delay occurring because the plan (or the timing of the plan) had not been clearly articulated or understood by the anaesthetic team and LWC. The matron described how this, and other incidents, had been incorporated in simulations; poor communication had deliberately been included to see if it was picked up by participants. If not, it formed part of the discussion at the end of session debrief, to highlight the importance of closed-loop communication [16] in ensuring there was a shared understanding of the plan by everyone in the relevant multidisciplinary team.

4.4.13 The consultant interviewed at Unit B told the investigation that non-technical skills and factors such as situation awareness were incorporated within their training. They said the post-simulation debriefs focused on these aspects in particular. The consultant was emphatic about the value of multidisciplinary staff coming together to train and learn and the power of simulation. In addition to the gaining of technical competence, they reflected on the impact on team-dynamics and said that the debriefs of simulated scenarios enabled staff to "talk about the importance of the healthcare assistant or midwife speaking up if they have a concern" and the fact that "in an emergency everyone is equal". The other comments regarding the benefits of simulation echoed those described in the Liberati et al study (2019) (see 4.4.2).

Summary

4.4.14 The benefits of multidisciplinary training including in situ simulation have been highlighted in national reports and other studies.

4.4.15 Such training supports three of the necessary abilities for resilient performance – response, anticipation and learning.

4.4.16 Comments by staff at units A and B about the value of such training mirrored the findings of the reports and studies.

4.5 Learning from experience

4.5.1 In his paper on resilience analysis, Hollnagel (2015b) states that the means of monitoring and responding must ‘be revised or adjusted based on experiences, i.e., based on learning. Learning must serve to strengthen or reinforce that which worked well, and change or adjust that which did not work well’.

4.5.2 Multidisciplinary training and simulation is one way to promote learning (see 4.4). The investigation heard other examples in units A and B of planning and resource being directed at learning from experience. The consultant at Unit B described the weekly risk meeting where patient safety incidents reported by staff (using the hospital's electronic incident reporting system) were reviewed. They told the investigation that the meeting, led by a consultant obstetrician and with midwives and neonatologists in attendance, meant things were “highlighted quickly”.

4.5.3 The consultant at Unit B also shared details of the quarterly clinical case reviews and new monthly departmental training being set up. At the monthly training, trainees will share and discuss two cases where things did not go well. The consultant saw these processes as helping to create a culture where staff know “things are being looked at”. The consultant described the focus as being “outcome led...decisions must always be led by the goal of a safe outcome for mother and baby”. Related to this, they pointed out that incident reports were often about communication issues or differing perceptions and

said “that needs to be resolved too...[because it is] important for teamwork”. From a SafetyII perspective, it would also be appropriate to share learning from cases that had gone well, particularly when unexpected, problematic events had occurred.

4.5.4 The investigation was told about learning shared across other hospitals' maternity units as well as within a single unit. For example, the governance midwife at Unit A described a dashboard which had been created across the surrounding geographical region. This was shared through the local maternity system and included a range of clinical outcomes such as babies admitted to the neonatal intensive care unit and caesarean section rates. The midwife explained that the dashboard was not used in a competitive or performance management way

but to allow clinicians to see the differences and then link with neighbouring colleagues “to understand the reasons why”. They said this also meant it was possible to benchmark their own unit and understand why they were where they were. Summary

4.5.5 Learning from experience is an important aspect of organisational resilience that requires time and resource.

4.5.6 The observation sites had multiple forums in place to support learning in addition to training and simulation.

4.6 Senior clinical review at triage

4.6.1 Although daily and weekly workload can be predicted to a degree (for example, elective caesarean sections and mothers booked for induction of labour), maternity units are subject to unexpected rises in demand throughout the day. This results both from rapid changes in the condition of mothers and babies and uncontrolled numbers and complexities of attendances.

4.6.2 Managing flow through the different maternity areas is critical in order to maintain sufficient capacity for demand. Successful flow management, therefore, is essential to resilient performance, in particular, the aspects of responding and anticipating.

4.6.3 Mothers contact their local maternity unit regarding the need for admission either because they have concerns about the wellbeing of their baby or themselves, or because they think they are in labour. This contact may be in person or by telephone. An assessment takes place, usually undertaken by clinical staff (often a midwife in the first instance), to determine the appropriate course of action. Assessment of mothers commonly takes place in a dedicated assessment unit or defined triage area. These areas are the ‘front door’ to the maternity unit and, as in the emergency department, review by a senior clinician to promote accurate assessment at this point is critical to both flow and safe care (Healthcare Safety Investigation Branch, 2020; Emergency Care Intensive Support Team, 2012).

4.6.4 Units A and B told the investigation of changes they had made to increase the seniority of staff in these areas, enabling a response informed by greater knowledge and skills. In Unit A, junior staff were not assigned to the triage area. Telephone calls and assessment of women were, therefore, handled by staff with a level of experience (band 7 or band 6). The roving bleep-holder, who was more senior still, had regular physical presence in this area, providing an additional senior resource and route of escalation.

4.6.5 In Unit A, a consultant was assigned to the triage, assessment, and ward areas every afternoon. Outside these times, the labour ward consultant could be contacted as needed. The triage area was situated on the labour ward so clinical support was physically near. In addition, a junior doctor was assigned solely to triage, and a senior doctor was assigned to both triage

and the day unit. The registrar had time dedicated solely to the triage area from Monday to Thursday, 17:00 hours to 19:30 hours (to help ensure women were seen prior to the night shift). The consultant interviewed at Unit A said that ideally consultant presence in the triage area would be increased, but this would require additional resource.

4.6.6 Unit B also allocated senior midwives to its assessment unit although this was alongside some more junior midwives. A consultant obstetrician was also rostered to be physically present in the unit for either the morning or afternoon, Monday to Friday. This meant that, at those times, senior expertise was immediately at hand, enhancing the unit's ability to respond to and anticipate changing working conditions. The consultant obstetrician interviewed was very aware of the importance of the assessment unit in terms of risk and flow. They highlighted the value of consultant involvement in decisions about which mothers need admission and the plan of care for those admitted. They saw this as key to reducing unnecessary admissions as well as supporting timely admission and intervention for those that needed it. The consultant said that the assessment unit was included in the regular ward rounds to facilitate oversight.

Summary

4.6.7 Management of the flow of patients between different maternity areas is critical to resilient performance.

4.6.8 Providing senior staff at the point of triage assists with flow management by promoting an early and effective response and anticipating future needs.

4.7 Separate labour ward coordinators to oversee elective and emergency workload

4.7.1 It is not uncommon for maternity units to have separate theatre teams for elective and emergency work but only one LWC overseeing both types of activity on the labour ward. When there is a high workload, focus inevitably gravitates towards the emergency work. This can delay the response to elective cases and hence reduce the resilience of the unit as a whole.

4.7.2 In Unit A the investigation was told that one of the most significant improvements had been the separation of workload for LWCs into elective (planned caesarean sections and mothers having inductions of labour) and emergency work, with one LWC dedicated to maintaining oversight of the workflow of each. Thus, there were two LWCs on each shift 24 hours a day, 7 days a week. A matron interviewed said that prior to this "the focus was on emergency work not elective... there were significant delays occurring in inductions of labour... we had massive issues with flow to the labour ward... now things are escalated quickly and managed". The matron said the change in practice had "made a huge difference...it's one of our major successes".

4.7.3 Another midwife said that as well as reducing delays, this change had meant much greater support was available to junior midwives on the labour ward. Furthermore, the two LWCs provided “back-up” for each other when there were peaks in workload. The matron’s view was that the separation of workload in this way, and allocation of a second LWC, was appropriate and would be beneficial for large and medium-sized units. Summary

4.7.4 Having separate LWCs to oversee elective and emergency workload may, in larger units, reduce delays in response to elective cases and so increase resilience of the unit.

4.8 Physical infrastructure and equipment

4.8.1 National reports have highlighted the impact of physical infrastructure on safe care (Royal College of Obstetricians and Gynaecologists, 2020; Liberati et al., 2019, 2020; NHS Resolution, 2017). In particular, it can affect a unit’s ability to monitor and respond. The investigation is mindful that many aspects of physical infrastructure – such as the size and layout of a building – are not amenable to change without significant resource and time. However, some adjustments, such as repurposing rooms, are possible.

4.8.2 Staff in units A and B reported on aspects of the physical infrastructure that influenced their capacity for resilience. Examples included:

- use of digital enhanced cordless technology (DECT) telephones by the LWC so that staff from other areas can contact them easily for an immediate response rather than going through the ward telephone or using the bleep system
- areas such as triage, the antenatal ward and neonatal intensive care all having close proximity to the labour ward for ease of transfer and contact with staff
- obstetric consultant offices being on, or near to, the labour ward for ease of communication and response
- adequate operating theatre space (and staffing) to accommodate peaks in demand
- the midwifery unit being housed in the same building as the labour ward with easy access to the operating theatres (in Unit B it was possible to go directly via a lift from the midwifery unit to theatres)
- availability of blood analysing machines on the labour ward to provide rapid results of critical tests
- adequate supply of equipment needed to care for mothers in labour (for example, cardiotocograph (CTG) machines, CTG machine belts, sonicaid, blood pressure monitors and drip stands) [17].

Summary

4.8.3 Although it is difficult to change some aspects of physical infrastructure, there are some adjustments that can be made that may increase resilience.

4.9 Staffing and workload

4.9.1 The National Institute for Health and Care Excellence (NICE) issued guidance on safe midwifery staffing for maternity settings in 2015. This included the need for mothers in established labour to receive one-to-one care, and for staffing to allow for the 'ability to deal with fluctuations in demand (such as planned and unplanned admissions and transfers, and daily variations in midwifery requirements for intrapartum care)' (National Institute for Health and Care Excellence, 2015). The guidance describes a process to calculate midwifery staffing establishment and includes suggested indicators to monitor the adequacy of midwifery staffing establishment.

4.9.2 National reports have repeatedly highlighted the negative impact of high workload and inadequate staffing, or poor skill mix, on safety (Care Quality Commission, 2020; Royal College of Obstetricians and Gynaecologists, 2020 and 2018; MBRRACE-UK, 2017; NHS Resolution, 2017). The 2019 Each Baby Counts progress report states: 'The impact of high activity on an already stretched service must be acknowledged, as well as the limitations of the current infrastructure to cope with an increased acuity of workload' (Royal College of Obstetricians and Gynaecologists, 2020). Similarly, the 2017 MBRRACE-UK report said 'an overstretched and under-resourced maternity and neonatal workforce' were the 'the underlying issues' in intrapartum stillbirths and neonatal deaths. Service capacity issues during intrapartum care affected over a fifth of the 78 deaths reviewed by the MBRRACE-UK enquiry, with more than half of these situations being considered to have contributed to the poor outcome (MBRRACE-UK, 2017).

4.9.3 A safety culture survey carried out by the Maternity and Neonatal Safety Improvement Programme (NHS Improvement, 2019) did not include questions about workload and staffing specifically. However, it did ask questions to elicit responses about burnout (emotional exhaustion) and work-life balance, which are likely to be influenced by such factors. The survey identified that 'midwives of all types on antenatal and postnatal wards, but particularly managers and those at band 6 or below, report they feel burnt out'.

4.9.4 The thematic review of HSIB maternity investigations concerning delays to intrapartum intervention once fetal compromise was suspected identified high workload as a contributory factor in 67% of reports.

4.9.5 The ethnographic study by Liberati et al (2019) to identify mechanisms underpinning safety highlighted the deterioration in those mechanisms caused by worsening structural conditions, such as staff shortages and high workload beyond the limits of resources. The authors concluded that their findings 'indicate that any intervention to improve safety may founder in inadequate structural conditions'.

4.9.6 Worsening structural conditions such as staff shortages and high workload will also erode a unit's capacity for resilient performance. The four abilities necessary for resilience (see 3.5.10) will all be severely affected if there are insufficient staff, or insufficient time, to dedicate to the activities needed to support them. For example, the monitoring and anticipating functions of the roving bleep-holder at Unit A are dependent on the bleep-holder role being supernumerary and able to regularly visit all relevant areas to gather information about activity and resource demands on the horizon. Safety huddles cannot take place if staff are engaged in the delivery of urgent care. The learning function fulfilled by the meetings and forums described by the consultant interviewed at Unit B (see 4.5.2 to 4.5.3) depend on staff being able to participate. As Hollnagel (2015b) states: 'Efficient and systematic learning from experience requires careful planning and ample resources.'

4.9.7 The 2019 Each Baby Counts progress report (Royal College of Obstetricians and Gynaecologists, 2020) made two recommendations to address staffing and workload. The first was to 'Develop and fund an appropriate tool to record current workload and anticipate the obstetric care required for the population'. The second was the need for research 'to identify safe obstetric staffing standards for the workload and acuity, to guide policy-level changes for the workforce'.

4.9.8 This tool for recording obstetric workload was seen as complementing the midwifery acuity tool currently implemented nationally (Birthrate Plus). The requirement for a systematic, evidence-based process to calculate midwifery staffing establishment (and mitigations in place to address shortfalls) is included in NHS Resolution's Maternity Incentive Scheme. (see 1.2.26).

4.9.9 Staffing and workload are also being addressed through the Maternity Workforce Strategy (Health Education England, 2019). The Head of Maternity and Neonatal Safety at NHS England and NHS Improvement told the investigation about the elements of the strategy that aim to increase capacity. These include increasing midwifery training placements, reducing attrition within the obstetrics and gynaecology consultant training pathway, producing a competency, education and career framework for maternity support workers, and developing tools to support workforce planning locally.

4.9.10 Despite national reports and other studies highlighting the negative impact of inadequate staffing and high workload on safe care, NICE found the evidence to suggest a relationship between midwifery staffing and maternal or neonatal safety outcomes was 'weak, potentially

subject to bias and unclear about the direction of the effect' (National Institute for Health and Care Excellence, 2015). This suggests the importance of understanding the interplay between context and staffing. The significance of context on nursing workload has been highlighted by other authors (Carayon and Gurses, 2008). NICE states the need for research to identify factors that may lessen or exacerbate the relationship between staffing and outcomes such as 'organisational culture, organisational policies and procedures including training' (National Institute for Health and Care Excellence, 2015). The outcomes of the planned research by The Healthcare Improvement Studies (THIS) Institute may help identify these factors (see 4.10.2 to 4.10.3).

4.9.11 Staffing and workload were described by staff interviewed at units A and B as critical factors in their ability to provide safe care. A senior midwife from the antenatal ward at Unit B said that "staffing is the biggest issue...if you've got the staff you need to attend to women you can spot the problems ahead". This midwife also highlighted the importance of medical presence – "ideally we need a doctor based on the [antenatal] ward".

4.9.12 Echoing the importance of medical staff, an LWC at the same unit said that on the labour ward "there's not a lack of availability of doctors...[so]... not really delays in intervention". A matron at Unit A made a similar point. They said that the availability of medical staff on the labour ward and the 24/7 obstetric consultant cover meant it was, in their experience, "extremely rare" to have delays in obstetric review. The investigation was mindful of the other elements to support resilience reported by staff in these units, such as good teamworking and psychological safety, which are likely to interplay with the availability of doctors in reducing delays.

4.9.13 A matron interviewed at Unit B emphasised the importance of skill mix (as opposed to numbers of staff per se). They gave examples of mothers with increasingly complex health problems requiring midwives with particular knowledge and skills. Unit B used a nationally implemented midwifery acuity tool; Unit A used local templates based on experience. Units A and B used redeployment of staff between areas to manage peaks in demand.

Summary

4.9.14 National reports and HSIB maternity investigations have highlighted the negative impact of inadequate staffing and high workload on safe care. It is possible the effect may be ameliorated to a degree through resilience created by other factors. However, a serious, prolonged understaffing is likely to erode a unit's capacity for resilience.

4.9.15 National recommendations have been made to determine appropriate maternity staffing levels and address shortfall. In addition, the Maternity Workforce Strategy is progressing actions to increase capacity. Evidence from this investigation endorses the need for the attention being given to staffing. The outcome of these recommendations and actions is awaited.

4.10 Teamwork and psychological safety

4.10.1 The study by Liberati et al (2019), as part of THIS Institute, highlighted the importance of considering context and improvement interventions in tandem (the example they looked at being PROMPT – see 4.4.2). The authors argue that safety emerges through an interplay between context and improvement intervention, noting there are ‘multiple, complex, and dynamic ways in which interventions and contexts interact’. The study highlighted the importance of contextual aspects such as teamwork, strong social relations between staff and psychological safety - as did the follow-up study (Liberati et al., 2020). The significance of these elements to the provision of safe care and effective escalation has long been recognised in national reports and enquiries (Care Quality Commission, 2020; Royal College of Obstetricians and Gynaecologists, 2020 and 2018; MBRRACE-UK, 2017; Kirkup, 2015).

4.10.2 Based on the Liberati et al follow-up study, a framework was published (2020) describing features of safety in maternity units. The framework is intended as a basis for reflection and action by those providing care (see Appendix A).

4.10.3 The investigation spoke with the Director of THIS Institute. They said that alongside the framework, interventions are being developed to help units to strengthen identified areas of need. One possible intervention is simulation of clinical scenarios which draw out particular aspects (such as teamwork or hierarchy) relevant to one or more of the mechanisms that contribute to safety. The Director of THIS Institute thought it likely that escalation would be included in these simulations given its significance in the delivery of safe care.

4.10.4 In 2019 NHS Improvement published a report on measuring safety culture in maternal and neonatal services (NHS Improvement, 2019a). The report defined culture as ‘a social construct comprising the behaviours, attitudes, beliefs, and values of a group of people’. The survey on which the report was based was conducted by the Maternity and Neonatal Safety Improvement Programme in collaboration with 87 trusts. The survey was completed by 16,265 clinical and non-clinical staff. Midwives accounted for just over 50% of respondents. The survey included perceptions of teamwork, communication, leadership, commitment to safety, psychological safety and burnout.

4.10.5 The survey was conducted in recognition that 'culture can be either an enabler or barrier to improvement. Elements of culture, such as teamwork and communication, can have a profound impact on clinical outcomes: things that go wrong can often be tracked back to problems inherent in the system, human relationships or behaviours, and attitudes to safety' (NHS Improvement, 2019a).

4.10.6 Elements of teamwork measured by the survey included communication, learning from each other and dealing with difficult colleagues. The latter element was 'one of the lowest scoring and most concerning items on the survey'. The report states: 'More than 70% of all managers are reporting that difficult colleagues are a commonplace and consistent challenge in their workplace.' (NHS Improvement, 2019a)

4.10.7 The investigation met with the senior Improvement Manager for the Maternity and Neonatal Safety Improvement Programme to discuss the programme's work and its potential link with delays to intrapartum intervention. They told the investigation that themes from their conversations with midwives included the importance of obstetric consultant presence on site, and empowerment to escalate directly to senior obstetricians. Without the latter, they said escalation "can get stuck at a certain level" (such as waiting for a registrar to be free), causing avoidable delays.

4.10.8 The Each Baby Counts Learn and Support Programme, with its focus on clinical escalation, also highlighted the influence of teamwork and psychological safety. The programme is working with nominated development leads from 16 maternity units who are running workshops and interviews with maternity staff to identify the barriers and facilitators of effective clinical escalation. From this, potential solutions or interventions are being co-developed with staff. In addition, the programme conducted a baseline survey of escalation practice in participating units to add to the information gathered from workshops and national reports.

4.10.9 Based on the evidence gathered, the investigation was told by the Programme Lead that a "key focus" of the programme was on "behaviours that promote safe and effective escalation". They pointed out that "communication between teams underpins all of the contributory factors cited in EBC [Each Baby Counts] reports, as well as team culture and psychological safety".

4.10.10 The Lead explained that the programme's approach was informed by quality and safety improvement methodology and behavioural science. The proposed solutions will be tested and evaluated in the participating units.

4.10.11 The comments by the Programme Lead echoed those of the Executive Director for Professional Leadership at the Royal College of Midwives, who said that in relation to effective clinical escalation, "behaviour and safety culture are the key things".

4.10.12 The investigation met with the current president and president elect of the Obstetric Anaesthetists' Association. They spoke about the impact of good teamworking and communication on clinical escalation. The president said: "In a functioning unit, there shouldn't be surprises...things don't happen without warning." They pointed out the value of regularly being kept in the loop with "the direction of travel" of women in labour and the importance of good working relationships to this. In addition to structured handovers and inclusion in ward rounds, the president said: "The informal 'I thought you better know...' is very helpful." They said it allowed planning of work in the near future to take account of possible intervention needed by them.

4.10.13 The importance of midwives having easy access to obstetric consultants and feeling empowered to go directly to them with concerns was highlighted in the 2019 Each Baby Counts progress report (Royal College of Obstetricians and Gynaecologists, 2020). In its review of cases, the report identified instances of documentation where, after identifying suspected fetal compromise and a need for urgent intervention, the registrar had been called but was not available due to being involved with the care of another mother. The report found that 'Repeatedly, the escalation attempt ended there', leading to a delay in medical review and a missed opportunity to intervene earlier. Similarly, the report identified a consistent theme of not informing the consultant on call when multiple obstetric reviews were required simultaneously. Using a case to demonstrate the theme, the report concluded that 'it is unclear why there was acceptance of waiting for the registrar'. An action for maternity units was to encourage a culture where staff knew they were expected and encouraged to escalate directly to obstetric consultants in such circumstances (Royal College of Obstetricians and Gynaecologists, 2020).

4.10.14 In addition, the individual HSIB maternity investigations on which this investigation was based, as well as the HSIB report (2020) of themes arising from the whole of the maternity programme, identified the need for midwives to be empowered to seek medical expertise directly. The report cited delays in care caused by rigid processes for escalation, where requests were expected to move stepwise through a hierarchy of seniority, instead of being sought directly.

4.10.15 The importance of aspects such as teamwork and psychological safety is recognised by the Care Quality Commission (CQC) – the organisation which regulates and inspects health and social care services in England. The CQC's Deputy Chief Inspector of Hospitals spoke with the investigation. They said that as part of their strategy-setting for the next five years, consideration was being given to how the inspection framework, and approach, might be amended to allow capture of relational aspects such as multidisciplinary teamworking and team dynamics, which were "so important" to the delivery of safe, high-quality care.

4.10.16 The Deputy Chief Inspector was aware of the culture surveys of maternity units undertaken by the Maternity and Neonatal Safety Improvement Programme which included these relational aspects, along with the study by Liberati et al (2019). The CQC's briefing paper (2020) on improving safety in maternity services highlighted evidence of poor working relationships and the need for improvement in the culture and leadership of some units.

4.10.17 The Deputy Chief Inspector told the investigation about nine pilot inspections of maternity units that had taken place to inform their new approach. The pilot inspections included observations of handovers, team interactions, escalation activity and other elements of work. They pointed out the difficulty of quantifying these aspects in order that they could be formally assessed as part of inspections. The Deputy Chief Inspector said the CQC worked closely with NHS Resolution and was also keen to align the requirements of NHS Resolution's maternity incentive scheme with the CQC's emerging approach for inspection of maternity units.

4.10.18 Teamwork and psychological safety appeared to be equally important in supporting and sustaining all four aspects of resilience (monitoring, responding, anticipating and learning). In units A and B there was evidence of good teamwork and psychological safety from events observed and comments by staff. For example, during the weekend observation visit at Unit B, the LWC brought croissants for the multidisciplinary team that morning – anaesthetists, obstetricians, midwives, maternity care assistants and cleaner – all appeared equally included.

4.10.19 The investigation heard this was a regular event and, when there was a pause in work, staff gathered in the shared staff room to talk together and share food. Conversations were both clinical and social and demonstrated an ease between staff groups. A mosaic on the wall of the labour ward celebrated the life of a colleague who had died and included details of the person's hobbies and pleasures, reflecting the social ties between the midwifery team. The bereavement rooms included ideas from staff, such as designed mugs with words of hope, and there were inputs from staff regarding layout and furniture in the rooms. Staff showed a clear sense of pride in these rooms as they showed them to the investigation.

4.10.20 Staff comments reflected the reported good relationships within the group. One LWC said: "We are very much part of a team." Speaking about escalation, they told the investigation that "it's easy here as the doctors are around...you can go directly to seniors". In relation to hierarchy, the LWC said that "medical staff never belittle midwifery opinion". The reported ease and trust among staff members was reflected in comments about their ability to challenge decisions or behaviours: "We can have frank conversations as we've been involved in mentoring them [midwives, medical staff]."

4.10.21 Similar comments were made at Unit A: "I can escalate to obstetric or anaesthetic staff as I need to...you don't need to work your way up here." In common with Unit B, the 24/7 presence of consultant obstetrician cover and their constant presence on the labour ward

appeared to be a significant factor in facilitating relationships and the bond between staff: “A consultant obstetrician is present all the time so it’s easy to talk to them...you get used to doing it.”

4.10.22 Echoing the importance of midwives feeling empowered to directly contact an obstetric consultant, a registrar interviewed at Unit B said that “midwives here know to contact the consultant straight away if they’re concerned and can’t get hold of us...following a review three or four years ago we really encouraged this”.

4.10.23 Supportive relationships between staff meant other ways of rapidly escalating care and gaining assistance were also used without concern. For example, in Unit A a midwife could use the emergency buzzer in a mother’s room if they wanted rapid assistance, even if the situation was not clearly an emergency. As one midwife said: “Pulling the emergency buzzer is fine... there’s no problem doing that if you need help quickly.”

Summary

4.10.24 Teamwork and psychological safety form the bedrock of resilient performance.

4.10.25 The significance of these factors has long been recognised in national reports and has been highlighted in other studies. There are ongoing national initiatives directed at assessing and improving teamwork and psychological safety.

4.10.26 The CQC is considering how to incorporate assessment of factors such as teamwork and psychological safety in its inspections of maternity units.

HSIB makes the following safety recommendation

Safety recommendation R/2020/103:

It is recommended that the Care Quality Commission, in collaboration with relevant stakeholders, includes assessment of relational aspects such as multidisciplinary teamwork and psychological safety in its regulation of maternity units.

5 Conclusions, implications of findings and safety recommendation

5.1.1 This investigation has used a Safety-II approach (see 3.5.7) to identify systemic and contextual elements that appear to support resilient performance and factors that will erode it, such as high workload, poor physical infrastructure and inadequate staffing. Recommendations have been made and work is progressing to address inadequate staffing, the outcome of which is awaited.

5.1.2 Since the national ambition, announced in 2015, of halving the rate of stillbirths, neonatal deaths and maternal deaths in England by 50% by 2030 (later brought forward to 2025), there has been a focus on improving safety in maternity care. Multiple reports have made recommendations and multiple workstreams are progressing under the umbrella of the Maternity Transformation Programme. The investigation is mindful that, as well as bringing positive changes, this improvement work and the monitoring of compliance with recommendations places an additional burden on maternity units. This burden has been recognised nationally and, as a result, in 2019, NHS England and NHS Improvement convened the Insights Group. This group's remit was to review the 400 current recommendations against agreed criteria to produce a manageable set of realistic, effective actions that will improve safety. This work is ongoing at the time of writing.

5.1.3 The elements identified in this investigation as supportive of resilience are not new, particularly factors such as the importance of teamworking, situation awareness and activities such as multidisciplinary training and simulation. However, in relation to situation awareness, systemic support – such as a role dedicated to monitoring and anticipating across the maternity unit – is required, rather than sole reliance on individual capability.

5.1.4 This report complements existing intelligence and work being pursued to address areas identified for improvement. Specifically, in relation to effective clinical escalation, the barriers and potential solutions identified from focus groups and interviews with staff at 16 trusts as part of the Each Baby Counts Learn and Support Programme, reflect contextual factors identified from the investigation's observation visits. These contextual factors are reflected in the Each Baby Counts themed report on escalation (Royal College of Obstetricians and Gynaecologists, 2020).

5.1.5 The two-part ethnographic study by Liberati et al (2019, 2020) identified features of safe maternity units, as well as observable indicators of these features (see Appendix A). This investigation used the principles of resilience to identify elements that may be important in reducing the risk of delays to intrapartum intervention. However, there is significant cross-over between the features and elements identified in this report.

5.1.6 This cross-over and evaluation of the interventions being developed for maternity units by The Healthcare Improvement Studies (THIS) Institute (see 4.10.3), mean it would be more helpful to await the evaluation of this work rather than this investigation making recommendations for changes in maternity care.

5.1.7 Using a Safety-II approach provided insight into the detail of work undertaken in maternity units, the nuances of the work system, and staff perceptions. Such insight is not possible from reading policies, procedures and guidance. Conversations with staff, and observations of interactions, provided a rich sense of aspects such as teamwork, social relations and feelings towards the unit and each other. This points to the value of using a Safety-II approach to inform assessment of maternity units.

5.1.8 Given the Care Quality Commission is reviewing its assessment approach for maternity units to reflect relational aspects such as teamwork and psychological safety, this investigation makes the following recommendation.

HSIB makes the following safety recommendation

Safety recommendation R/2020/103:

It is recommended that the Care Quality Commission, in collaboration with relevant stakeholders, includes assessment of relational aspects such as multidisciplinary teamwork and psychological safety in its regulation of maternity units.

6 Considerations for maternity units

Based on the investigation findings, HSIB asks maternity units to consider the following questions:

- Does your unit have a role, or a means, separate from the labour ward coordinator, dedicated to monitoring and anticipation of activity across the maternity service, and troubleshooting, such as a roving bleep holder?
- Do you have regular multidisciplinary ward rounds throughout the day?
- Do you have regular safety huddles and multidisciplinary handovers using a structured information tool?
- Do you hold multidisciplinary in situ simulation and facilitated debriefing that includes both technical and non-technical skills? Are scenarios and incidents encountered in your unit included in the training?

- Do you know what your staff's perceptions of teamwork, psychological safety and communication are within your unit? Are actions taken in response? How are midwifery staff empowered to contact consultants directly if they have concerns?
- Is time and resource dedicated to regular multidisciplinary forums that provide a safe space to openly discuss scenarios where things did not go well? Do these forums also include discussion and reflection on scenarios where things went well despite unexpected events?
- Are senior midwifery staff assigned to triage and assessment areas? Is there adequate medical presence in these areas?
- In larger units, is the workload on labour ward separated into elective and emergency work? If so, is there a supernumerary labour ward coordinator for each?
- How does the physical infrastructure support work? For example, use of digital enhanced cordless telecommunications (DECT) telephones, availability of equipment, consultant offices on/ near labour ward, proximity of antenatal ward and neonatal unit to the labour ward.
- How are issues with staffing and workload escalated and responded to? Are senior trust personnel aware and involved?

7 Appendices

Appendix A

Framework developed by Liberati et al (2020) identifying features of safety in maternity units.

Features	Description and examples
Commitment to safety and improvement at all levels, with everyone involved	• The unit shows an authentic commitment to learning from risky situations and adverse events, and it uses this learning to drive improvements. • Staff are skilled in noticing hazards and seek to address them in real-time. When appropriate, hazards are reported so that the whole unit can learn. • Staff invest in making the unit better. They are always looking for ways to improve working processes and the care environment—often through small-scale, easily actionable ideas—and are praised for their efforts. • Individuals in management roles are visible and accessible. They listen carefully to frontline staff and families, seeking to respond promptly to concerns or suggestions reported to them. • The unit has a range of formal risk management systems, processes and roles (including audits and/or a risk management team) that are

Features	Description and examples
	known, trusted and used by staff in the unit.
Technical competence, supported by formal training and informal learning	• Individuals are expected to perform their clinical tasks to a high standard of proficiency. • The unit invests in keeping staff trained and up to date. Regular high-quality training sessions are mandatory for all members of staff, and the unit management ensures that everyone has allocated time to attend. • Training is usually multidisciplinary and includes structured teaching, skill drills and simulations. • People also learn in less formal ways, for example, through mentorship, observing colleagues at work and discussing and reflecting on clinical cases. • Senior members of staff make sure that more junior staff have opportunities to debrief and ask questions after experiencing complex clinical situations and that they learn from theirs and others' experience. • A social space is accessible to all staff (a communal coffee room, for example) to support informal knowledge sharing, real-time information updates and reflection. • The many different forms of learning allow staff to demonstrate competence, confidence and coordination in high-stress, risky situations and help to create trust among team members.
Teamwork, cooperation and positive working relationships	• Teamwork is central to all of the activities carried out in the unit. Care, training and research are conducted with the input of all professions and disciplines. • People in different roles respect each other and value everyone's contributions to achieving the goals of the unit and upholding its values. • Through working and training together, people are aware of each other's roles, skills and competencies (who does what, how, why and when) and can work effectively together, thus demonstrating 'collective competence'. • When deciding who should perform a certain task, the team regard skills and experience as more important than seniority or professional roles: the person with the right skills for the specific task will intervene. • When disagreements happen between professions or roles (eg, on treatment decisions), they are settled calmly through open, thoughtful discussion and through reference to shared goals. People do not resort to hierarchies, displays of power, or aggressive behaviour. • People look after each other. Relationships are good, and any disruptive or bullying behaviours are recognised and managed effectively.

Features	Description and examples
	• Staff well-being and morale are recognised as important contributors to safety.
Constant reinforcing of safe, ethical and respectful behaviours	• The goals and values of the unit are clear: achieving good birth outcomes and promoting the dignity and well-being of parents and families. There is a shared expectation that members of staff will behave consistently with these goals and values. • Expected standards of practice are reinforced through the behaviours of everyone in the unit, including all professions and individuals at all levels—from the most junior to the most senior. • Newcomers are supported to understand and adhere to the unit's high standards but are also encouraged to make suggestions for improvement based on previous experience. • People intervene if the goals and values of the unit are not upheld. They do so mostly in informal ways (eg, by using humour or having a 'private word') but are ready to intervene more formally when needed (eg, through reporting systems and escalating). • Unsafe or inappropriate behaviours are noticed and corrected in real time, so they do not become normalised. • Although the highest standards of practice are expected, it is recognised that errors will sometimes happen. • Errors are recognised both as problems and as opportunities for learning. People are encouraged to discuss them openly, and actions are taken to reduce risk of their recurrence.
Multiple problem-sensing systems, used as basis of action	• The unit uses multiple methods to 'sense' and anticipate problems and identify opportunities for improvement, including staff and families' voice, hard data and clinical simulation. • These multiple forms of intelligence are also used to identify good practices and celebrate them where appropriate. • Families are encouraged to share their experience, in real time and retrospectively, through formal and informal feedback systems. This feedback is seen as key for improving care. • Members of staff feel that they can speak up for safety. They are confident that their concerns will be heard and that action will be taken as a result, whenever possible. • This sense of psychological safety cultivated on the unit makes it possible to learn from everyday events. • Clinically relevant data are collected and constantly monitored using visual methods (a clinical dashboard, for example) to identify concerning trends and guide improvement efforts. • Members of staff are reminded about the importance of looking at and interrogating data.

Features	Description and examples
Systems and processes designed for safety and regularly reviewed and optimised	• Working processes and information technology are well designed, and kept functional and up to date. • The unit's equipment and the physical environment are designed consistent with human factors and ergonomics principles to be safe, appropriate and easy to use. • People constantly review and seek to optimise working processes (eg, operating theatre scheduling) and tools (eg, postpartum haemorrhage kits) to meet the requirements of excellent care provision. • Simulation is used to observe how systems and processes operate in realistic conditions and to test the usability and appropriateness of equipment and other resources needed for care. • Once good practice is identified, it is standardised and spread across the unit to avoid unwarranted variation.
Effective coordination and ability to mobilise quickly	• Well-functioning systems (eg, IT systems and whiteboards) are in place to capture and share up-to-date information regarding each woman. • These systems help to identify risks early and to initiate an effective response. • Structured handovers and regular safety huddles, ward rounds and board rounds enable a shared, helicopter-level understanding of the state of the unit as a whole in real time. • Identified individuals in the team have specific responsibility and expertise for patient flow and management between the different care settings. • Mandatory training emphasises the importance of situational awareness, which includes enabling staff to recognise the important elements of their environment that may affect patient care. • Simulation-based training and structured emergency protocols allow staff to be competent and confident in responding to crises.

Appendix B

Analysis of HSIB maternity programme investigations

A review was undertaken of 289 HSIB maternity investigations into intrapartum stillbirths, neonatal deaths and babies born with potential severe brain injury. The investigations included in the review were those that had completed all stages of HSIB's internal quality assurance process by 10 January 2020. The reports were reviewed by a multi-professional team to identify contributory factors and potential learning for maternity care.

The analysis of investigation reports was performed using a qualitative analysis tool (NVivo) to identify cross-cutting themes across multiple investigations. Reviewers did not access case notes or individual statements from staff or parents during the review; only the investigation reports were analysed.

Delays to intrapartum intervention once fetal compromise was suspected was identified as a factor in 43 investigation reports by consensus agreement of two reviewers.

8 Endnotes

[1] National Institute for Health and Care Excellence guidance describes labour as progressing in three stages. The first stage begins with a latent phase which is when a mother experiences painful contractions and some changes in her cervix, including thinning out and opening of the cervix up to 4cm.

[2] Safety huddles are short multidisciplinary briefings, held at a predictable time and place. They focus on the patients most at risk and on sharing information about potential or existing safety problems facing patients or workers. They aim to increase safety awareness among staff, allow for teams to develop action plans to address identified safety issues, and foster a culture of safety (NHS Improvement, 2019b).

[3] For the Perinatal Confidential Enquiry (MBRRACE-UK, 2017), 78 cases underwent detailed review by multidisciplinary topic expert panels. Of the 78 cases, 40 were term intrapartum stillbirths and 38 term intrapartum-related neonatal deaths.

[4] Of note, the Safer Maternity Care progress report included the fact that HSIB would be funded to conduct independent investigations into all serious incidents that meet the criteria for notification from the Royal College of Obstetricians and Gynaecologists' Each Baby Counts programme and all maternal deaths from direct or indirect causes related to pregnancy.

[5] Psychological safety is a construct that 'describes a team climate characterized by interpersonal trust and mutual respect in which people are comfortable being themselves' (Edmondson, 1999). In such a climate individuals feel included, safe to express their views, to question the status quo and raise safety concerns without fear of being embarrassed, marginalised or punished in some way.

[6] Cardiotocography (CTG) is a way of recording the fetal heartbeat and the uterine contractions during pregnancy. The machine used to perform the monitoring is called a cardiotocograph.

[7] A membrane sweep or cervical sweep involves having a vaginal (internal) examination that separates the membranes of the amniotic sac surrounding the baby from the cervix (neck of the womb). This separation releases hormones (prostaglandins) that may trigger natural labour.

[8] National Institute for Health and Care Excellence clinical guideline 132 defines a caesarean section as category 2 where there is maternal or fetal compromise which is not immediately life-threatening. The baby should be delivered as soon as possible which in most cases will be within 75 minutes (National Institute for Health and Care Excellence, 2011).

[9] Active cooling is a procedure where the infant is cooled to between 33C and 34C, with the aim of preventing further brain injury following a hypoxic (lack of oxygen) injury. Hypothermia is usually induced by cooling the whole body with a blanket or mattress (or sometimes by cooling the head only with a purpose-made cap). The UK total body cooling trial (TOBY) confirmed that 72 hours of cooling to a core temperature of 33C to 34C within 6 hours of birth reduces death and disability at 18 months of age and improves neurodevelopmental outcome in survivors (National Institute for Health and Care Excellence, 2010).

[10] Pre-eclampsia is a condition that causes high blood pressure during pregnancy and after labour. It can be serious if not treated.

[11] Fetal-maternal haemorrhage is the loss of fetal blood cells into the mother's circulation. It takes place in normal pregnancies as well as when there are obstetric or trauma-related complications to pregnancy. [12] For example, interviews were held with representatives of the Royal College of Obstetricians and Gynaecologists, Royal College of Midwives, Obstetric Anaesthetists' Association, and NHS England and NHS Improvement.

[13] The subject matter advisors included the Deputy Chief Midwifery Officer, the Head of Maternity and Neonatal Transformation Programmes and lead for the safety workstream, the Senior Improvement Manager for the Maternity and Neonatal Safety Improvement Programme and the lead for the Each Baby Counts Learn and Support Programme.

[14] Distributed cognition may be defined as how knowledge is shared across multiple people and technology. This relies on how well a system represents information and how that information is used to achieve system goals.

[15] Board rounds involve multidisciplinary staff on the labour ward meeting to review the status of women in labour (as detailed on the board) and plan their care accordingly. They also provide an opportunity to highlight anticipated problems (often relating to capacity or demand) or issues (such as broken equipment). The board round is an opportunity to ensure there is a shared understanding of events and care plans.

[16] Closed-loop communication is a technique used to avoid misunderstandings. When the sender gives a message, the receiver repeats it back. The sender then confirms the message; for example, by saying 'yes' or 'correct'. When the receiver incorrectly repeats the message back, the sender will say 'negative' (or something similar) and then repeat the correct message. If the sender does not get a reply back, they must repeat it until the receiver starts closing the loop.

[17] Of note, the issue of adequate supplies of equipment to safely monitor and care for women was reflected in a survey (designed by the Royal College of Midwives and NHS England and NHS Improvement) sent to labour ward co-ordinators. The draft report of the survey results was shared with the investigation. Of the 288 survey responders, 51.4% said they did not always have the necessary equipment they required. This meant time was spent looking for various pieces of equipment to fulfil their role and responsibilities.

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