UHL NNU Guideline: Sudden and Unexpected Postnatal Collapse in the hospital

University Hospitals of Leicester NHS Trust

Trust ref: C4/2024

Contents

1. Introduction and who this guideline applies to:

This guideline applies to healthcare professionals involved in the care of infants in the Neonatal service, including maternity staff, Paediatric and Neonatal staff.

Aims:

The aim is to provide guidance for managing infants who survive sudden and unexplained postnatal collapse (SUPC). This includes establishing the cause of collapse, identifying underlying diseases, providing information for future reproductive health of parents/future health of siblings of the case infants and clarifying prognosis and on-going management for survivors.

Key Points:

- On-going surveillance of mothers and infants after birth is crucial to prevent SUPC.
- Infants experiencing SUPC within the first week of life should undergo comprehensive investigation to determine underlying causes.
- All cases of PNW collapse get a rapid midwifery review to look at antenatal, perinatal and postnatal care.
- Therapeutic hypothermia may be considered after determining the cause and discussing potential benefits and risks with parents.
- All infants who die from an unexplained collapse should be notified to the appropriate authorities and undergo a post-mortem examination.
- National standards recommend a Multi-professional case review following unexpected infant

Related documents;

Resuscitation at Birth UHL Neonatal Guideline
Child Death and CDOP Process (0-18 years) UHL Childrens Hospital Guideline
Mild Hypothermia - Initiation UHL Neonatal Guideline
Hypoglycaemia - Neonatal UHL Neonatal Guideline
Consent to Hospital Post Mortem Examination UHL Policy

Background:

Sudden unexpected postnatal collapse (SUPC) occurs in the days and hours after birth, with an incidence of 2.6-19 per 100,000 live births in UK, and 1 in 20,000 live births within the first twelve hours[1 5.]

SUPC is defined as the sudden and unexpected collapse of a term or near term ((≥35 weeks' gestation) infant who is well at birth, but experienced cardiorespiratory compromise within the first seven days, leading to either death or the need for intensive care with or without encephalopathy. Some infants may not fit these exact criteria but still experience a milder form of collapse. Clinicians should investigate the reasons for collapse in all babies using the outlined approach in this guideline.

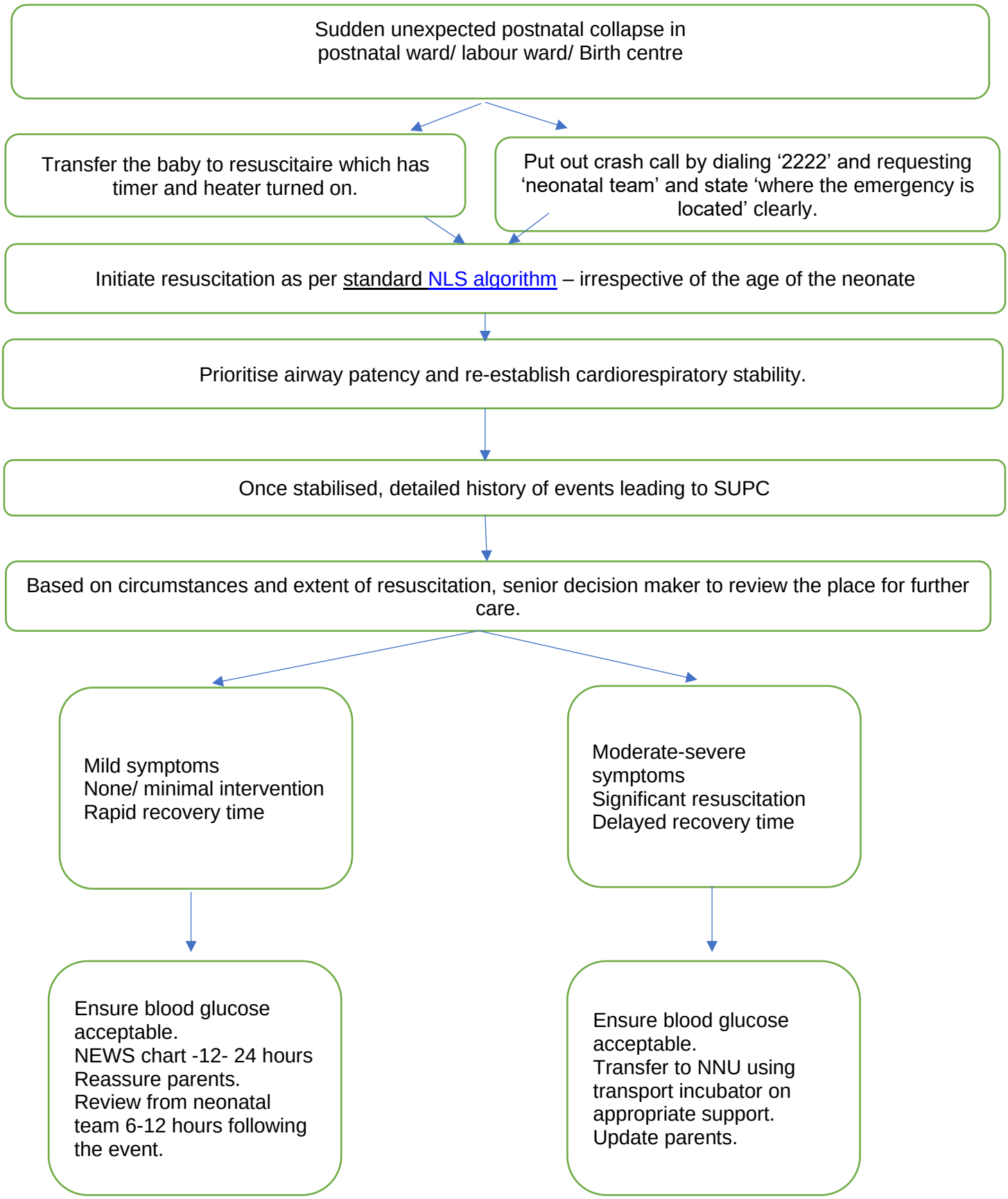
The guideline is based on the BAPM framework, which incorporates recommendations from the Healthcare Safety Investigation Branch (HSIB) (now known as the Maternity & Neonatal Safety Investigations (MNSI)) National Learning Report on Neonatal collapse, Skin to-skin contact[1], guidance for the investigation of Sudden Unexpected Death in Infancy (SUDI) [2], and the expert consensus of UK perinatal professionals.

Determining the cause of death in babies has important implications for parents, aiding in understanding the deterioration and supporting the grieving process.

For surviving infants, a comprehensive set of investigations improves the chances of identifying the cause, which affects management and prognosis. Management of infants who survive SUPC is primarily supportive, targeting the underlying cause when identified. However, around three-quarters of infants with no identified cause for collapse go on to develop post-asphyxial encephalopathy[7], often resulting from acute airway obstruction.

This document was developed in response to the need for guidance based on the HSIB National Learning Report. The protocol and investigation schedule have been updated according to the latest evidence and practice from the BAPM framework

Sudden unexpected postnatal collapse of the newborn management pathway



2. Assessment, Investigation and Management

This guidance is an approach to assessing and managing babies safely following a sudden unexpected postnatal collapse specifically in the hospital setting.

2.1 Care pathway - Immediate action:
The UK Resuscitation Council NLS algorithm should be followed for newborn resuscitation, even if the baby is several hours or days old[19]. The priority is to ensure a patent airway and establish or re-establish cardiorespiratory stability. In older infants, alternative access such as intravenous (IV) or intraosseous (IO) should be considered if the umbilical cord is not suitable.
Parents should be allowed to be with their baby during the resuscitation if they wish and should receive support from healthcare staff.

2.2 Care pathway - Detailed assessment:

After resuscitation and stabilisation, a detailed assessment of the event, background history, and current circumstances should be conducted. This includes obtaining a detailed history from parents, family, and caregivers, examining the baby neurologically, considering the place of further care and observation, and conducting relevant investigations such as blood sugar and blood gas analysis. Initial treatment for likely causes such as hypoglycaemia or infection should be initiated. (See Appendix 1 for a recommended dataset).

2.3 Care pathway – Monitoring:

The location and extent of monitoring after a postnatal collapse should be determined by a senior decision-maker based on the circumstances and extent of resuscitation. The likelihood of secondary complications and recurrence of the event should also be considered. The duration and level of monitoring will depend on the baby's condition, location and DD for collapse.

On-going care beside mother (Labour ward, Birth Centre, and Postnatal ward)

- Regular intermittent observations (Newborn Early Warning Score **NEWS**) for at least 12 hours.
- Regular blood glucose monitoring until a stable glucose profile has been ascertained.
- Healthcare professional observation and assessment:
    - when the baby is in skin-to-skin contact with the parent/carer irrespective of feeding method
    - of mother and baby whilst breastfeeding
    - when the baby is being bottle fed by their parent/carer/when the baby is asleep.

SCBU/NNU:

- Regular blood glucose monitoring until a stable glucose profile has been ascertained.
- Continuous oxygen saturation and/or ECG monitoring.
- Non-invasive blood pressure or invasive blood pressure monitoring where signs of cardiovascular compromise.
- Assessment of acid-base and respiratory status with blood gas measurement.
- Assessment of neurological status at least 1-2 hourly for the first 6 hours after collapse.
- Cerebral function monitoring (CFM) if signs of encephalopathy develop or a high level of suspicion.
- Consider assessment of end-organ hypoxic injury: renal and liver function tests, echocardiogram, brain MRI.

2.4 Care pathway and Investigations

2.4.1. SUPC outside hospital:

Cases occurring outside the hospital setting should be investigated according to the guidance for the investigation of Sudden Unexpected Death in Infancy[2] and local procedures.

2.4.2. Investigations for living/surviving babies:

Clinicians should use judgement in individual cases as to which tests should be given priority to ensure optimal diagnostic yield with least intervention (Appendix 4).

Maternal specimens:

Placenta (if available)	Pathology and microbiology
Blood	Kleihauer test, viral titres, HbA1c
Urine	Toxicology
High and low vaginal swabs	For Group B streptococcus

Neonatal specimens: Tier 1 (Immediate)

Bloods:	Full blood count
	Blood culture
	Coagulation profile
	Blood gas, blood spot
	Renal and liver functions
	Glucose and Lactate
	Calcium and magnesium
	Ammonia
Cerebrospinal fluid:	Biochemistry
	Glucose (paired with plasma glucose)
	Culture
	Virology panel
	Lactate
	Amino acids including glycine (if applicable)
	CSF storage (if applicable)
Surface swabs	Bacteriology
Nasopharyngeal aspirate	Bacteriology and virology
Urine	Bacteriology
	Virology
	storage
Electrocardiogram	
Cranial ultrasound	

Neonatal specimens: Tier 2 (Following a detailed history and examination):

Bloods	Beta hydroxybutyrate
	Serum Amino acids, free fatty acids
	Insulin, cortisol
	Acyl carnitine profile
	Urate and Uric acid
	Viral titres if applicable

	Genetic samples including storage (discuss with genetics team)
Urine	Toxicology
	Organic acids including orotic acid
	Amino acids including sulphocysteine
12 lead ECG	
Electrocardiogram	
Skin Biopsy	Fibroblast culture
Muscle Biopsy	If unable to exclude neuromuscular/mitochondrial disorders

Neonatal specimens: Tier 3 (specific to suspected condition):

Imaging	Skeletal survey
	MRI brain – timing guided by BAPM Framework for Practice[20]
	Renal and adrenal ultrasound
	Echocardiogram
ECG	At presentation and after 3 weeks of age
Ophthalmology	Ophthalmoscopy
	Retcam
Electroencephalogram	
Genetics	Assessment and clinical photographs

2.5 Care pathway - Ongoing management

To ensure appropriate ongoing management for babies who survive for some hours after SUPC (Sudden Unexpected Postnatal Collapse), the following steps should be taken:

2.5.1 Initial management recommendations:

Engage with parents:	Provide support and explanations to parents during resuscitation. After achieving stability, focus on the parents and provide concise information about the situation, what has been done, and what will happen next. Tailor communication to each individual parent, address their questions, and be flexible and sensitive in approach.
History:	Obtain a history from parents regarding the events leading up to and immediately before the collapse, as well as the baby's general medical and family history. (Appendix 1).
Involvement in care planning:	Parents should be involved in the decisions about their baby's care after SUPC, including discussions about potential therapeutic hypothermia and anticipatory planning keeping in line with BAPM Enhanced Shared Decision-making Framework[26]
Support	Support parents in being with their baby, as this may be their last time together[27]. Create a conductive environment for privacy and consider the need for additional support from family members, chaplains, perinatal psychologists, family support teams, and family support charities. Consider involving the UHL bereavement services team.
● **Infection:**	Treat empirically for **bacterial sepsis** based on local antimicrobial guidelines. Consider treating for **disseminated viral illness,** especially if there is a family history of oral or genital herpes simplex virus (HSV), herpetic skins lesions, or suspected seizures/encephalopathy[19 28].
Normoglycemia	Maintain as per UHL neonatal guidelines/BAPM recommendations[29]
Normothermia	Maintain as per UHL neonatal guidelines/BAPM recommendations[29], unless therapeutic hypothermia is initiated

Nutrition	Assess the safety of feeding, encourage oral/enteral feeding if possible and provide support for breastfeeding mothers requiring intravenous fluids.

2.5.2 Consideration of Therapeutic Hypothermia:

- Therapeutic hypothermia (TH) is a standard of care for infants of 36 weeks' gestation or more who have moderate to severe encephalopathy following birth asphyxia. Evidence supports its benefit when the therapy is instigated within 6 hours of birth[30].
- TH following postnatal collapse lacks robust evidence but has been used in cases without an identified cause[31 6 32 33]. The potential benefits and risks, considering the wide range of underlying causes of SUPC, should be carefully assessed.
- TH may be considered on case-by-case basis if initiated within 6 hours of collapse, involving a second consultant.
- Investigate possible causes and exclude intracranial bleed before initiating TH[31].
- Involve parents in a shared decision-making process, explaining the off-protocol use of TH and its potential risks and benefits.
- **Document** neurological examination, HIE grading assessment, CFM pattern, justification for TH, and parental information. Follow the BAPM framework for practice, including MRI at 5-15 days and neurodevelopmental assessments at 2 years[30].

2.5.3 Withholding intensive care and redirection to comfort care:

Around 25% of babies will die following SUPC either due to unsuccessful resuscitation or redirection to comfort care. Guidance on making decisions to limit treatment can be found in the RCPCH Framework of Practice[34].

2.6 Investigations after the baby's death:

A dedicated staff member should support the family during investigations and reporting following the baby's death. Local guidance for parental support and review process, such as the National Bereavement Care Pathway, should be followed[21]. Investigations after death should be performed according to the guidance for the investigation of Sudden Unexpected Death in Infancy (SUDI)[2] and local procedures.

Once death is confirmed, escalate to medical examiner on call via switchboard (17711)

If applicable, escalate to safeguarding team at extension 15770 or 01162551616 (out of hours) and maternity safeguarding team if applicable on extension 16432.

2.6.1 Death has occurred after discharge from hospital:

These cases should be investigated as per the guidance for the investigation of Sudden Unexpected Death in Infancy[2] and according to any local procedures.

2.6.2 Death has occurred on hospital premises:

a) Before post-mortem examination:

It is recommended that if it has not been possible to take samples during life then, where feasible, certain samples should be taken immediately following death whilst awaiting post-mortem examination to avoid losing significant diagnostic information.
Obtaining post-mortem samples must be performed on licensed premises (Human Tissue Act 2004) requiring the infant to be taken to the pathology department or where the local Pathology Licence permits, on the neonatal unit or in the emergency department.

Consent should be sought from parents (or the coroner) and documented using the appropriate sections of the standard neonatal post-mortem consent form following full explanation of what samples are required and why there is a need.
The baseline samples should, where possible, be discussed with and agreed by a pathologist and where indicated a biochemist.

Recommended samples to be collected before post-mortem:

Throat and nose swab	For bacterial and viral culture, including SARS COV 2 sample for PCR
Blood culture	
Blood and urine for metabolic studies	Glucose
	Acylcarnitine
	Organic acids and amino acids including orotic acid and sulphocysteine
	Freeze Urine for storage
Blood	DNA storage and chromosomal studies
Dried blood spots	On several cards
Cerebrospinal fluid by Lumbar puncture or ventricular tap	Biochemistry
	Glucose
	Culture
	Virology
	Lactate
	Aminoacids including glycine
	Freeze and storage
Skin biopsy	Culture and storage of fibroblasts 3 x 2mm full thickness collected under sterile conditions into culture or viral transport medium or saline soaked gauze. (send promptly to cytogenetics lab)
Muscle Biopsy	For electron microscopy, histopathology and enzymology- wrap in aluminium foil, snap freeze and store at -70C. Contact metabolic physician or pathologist before collection of samples.

b) Post-mortem procedure:

Every death resulting from SUPC where the cause of collapse is not known must be notified by law to the medical examiner/Coroner, including babies who die of the hypoxic-ischemic sequelae of a collapse for which the cause us undetermined before birth.
Further details from BAPM framework could be accessed online on the following hyperlinks:
Sudden and Unexpected Postnatal Collapse | British Association of Perinatal Medicine (bapm.org)

Investigation of Newborn Infants who suffer a Sudden & Unexpected Postnatal Collapse | British Association of Perinatal Medicine (bapm.org)

***Medical certificate of the Cause of Death*(MCCD):**

The doctor caring for the infant in such situations must not issue a MCCD. A MCCD enables the deceased's family to register the death, which is not the same as a death certificate which gets issued after the death has been officially registered and is never issued by a doctor.
It is important to recognise the additional distress that referral to a Coroner may cause parents. The routine nature of this process should be emphasised, with an explanation as to why the

referral is being made. It is also important that parents do not feel they are under suspicion for their child's death, and that instead, answers are being sought which may influence future decision-making[22].
Where the Coroner does not order a post-mortem examination, it remains important to discuss with parents the value that a full or even limited PM examination has in confirming the clinical cause of death and identifying other associated anomalies or conditions. Ideally such consent can be obtained by a consultant and/or a dedicated nurse specialist in PM consent.
If despite all efforts both the coroner and parents decline either a full or limited PM, consideration should be given to requesting a post-mortem MRI.
The PM examination should be carried out by a perinatal or paediatric pathologist[2 23] as soon as possible. It is essential that all relevant information is available to the pathologist at the time of PM, including details of the mother, her pregnancy and labour as well as those of the infant, the birth, the events surrounding collapse and care until death.
Histological investigation of macroscopically normal organs provides reasonable diagnostic yield in this clinical context and remains an essential component of the examination[24]. PM procedure is provided in Appendix 5.

Handling samples:

Whole organs are not routinely retained beyond release of the body for funeral, any retention beyond this will require parental consent.
Tissues taken at a Coroner's PM must be destroyed within 12 weeks of the end of the inquest (if held) or the coroner's involvement unless permission has been given for retention.
The fibroblast culture from skin biopsy is not included in the requirements of the Human Tissue Act, and such samples may legally be retained without the need for specific parental consent. Specific consent will also be required for genetic testing.
Reports should be made available as quickly as possible without compromising quality. A provisional report recording all investigations initiated should be made within one week of PM to the Coroner who should thereafter report findings to the clinician. From the date of PM, issuing a final report should normally take no longer than two months; if a specialist examination on a retained organ has been requested, the examination may take longer.
The lead neonatologist must meet with the parents at the earliest opportunity to explain the findings of all investigations. Where the Coroner is involved, this meeting should be with their consent.

2.7 Care Pathway- Reporting and Review

2.7.1 Reporting

The Medical Certificate of the Cause of Death should follow national reporting classification systems. Proposed approaches include providing a definite diagnosis if available, using a 'holding' diagnosis like 'unexplained pending further examination' in other cases, and submitting a final cause of death after completing all investigations.
There is a legal requirement to notify the local child death review team and the National Child Mortality Database (NCMD) within 48 hours of the death. Additional reporting requirements may exist, such as reporting to the Maternity & Neonatal Safety Investigations (MNSI).

2.7.2 Review:

- Every child death must undergo a review by the local child death review team, involving all potentially involved agencies (Primary care, hospital team, social care, and police).
- The review process should start within 48 hours of the death and involve timely multidisciplinary and multi-speciality assessments, following standardized risk management procedures.

- The perinatal care of infants requiring neonatal unit admissions for SUPC should be reviewed, focusing on avoidable factors. This review should be conducted in an open and honest manner, meeting the standards of duty of Candour set by the General Medical Council (GMC) and Nursing Midwifery Council (NMC).
- Peer review should be conducted for all assessed cases, including clinical details, aEEG, and neuroimaging when available.
- The review process should include mechanisms for sharing lessons learned and an action plan to address any improvement in future care provision. (Appendix 3)

2.7.3 Staff Support:

- Gather key facts from staff present after the event using the history taking tool (Appendix 1).
- Provide support to staff who have experienced a traumatic event, including team debriefing and mental health support.
- Offer mental health "first aid" and long-term counselling through trust wellbeing services.
- Engage with investigations for shared learning from adverse events/claims through organizations like MNSI and NHS resolution. Resources for staff involved in SUPC are available in Appendix 2.

2.8 Care pathway- Discharge and follow up:

• **Follow up**:

- The follow up plan will depend on the underlying pathology and the impact of the collapse.
- Infants who underwent TH should receive a standardised neurodevelopmental assessment at 2 years of age.
- Babies at high and medium risk for brain injury should have early and sequential assessments during neonatal follow-ups to detect developmental problems and provide early intervention.

● **Communication with Parents**:

- Parents should receive a copy of the discharge letter which has been explained to them by a member of the healthcare team.
- Parents should be provided with information and support groups, both local and national (Appendix 6).
- If they baby has died or an adverse event investigation has been initiated, parents should be informed about the local adverse event process (and if relevant, Perinatal Mortality Review Tool (PMRT) and HSIB and NHS Resolution), key contacts, and reassured that their questions or concerns will be addressed.
- Complete Duty of candour

Parents of surviving babies:

- Apply the principles of parent care and support mentioned in section 2.5.1 for all families.
- Provide contact details for specialist or outreach teams involved in the care of their child as appropriate.
- Give parents verbal and written information on safety regarding skin-to-skin contact, infant feeding infant sleeping, and co-sleeping, documenting it in the patient record.
- Offer parents the opportunity to learn basic newborn life support skills.

Healthcare professionals:

- Provide written handover of care to community teams, including the GP, health visitor, and community midwife. Include information about prognosis, parental understanding, and expectations.
- Contact the local Care of Next Infant (CONI) coordinator to determine if they can offer support to the family, following an Apparent Life-Threatening Event (ALTE)/Brief Resolved Unexplained Event (BRUE).
- Complete DATIX

3. Education and Training

None

4. Monitoring Compliance

- Unit must consider implementing, auditing, and evaluating the recommendations through the following measures: Orientation and updating of staff to relevant guidelines/policies.

5. Supporting References

1.Neonatal collapse alongside skin-to-skin contact. National Learning Report: Healthcare Safety Investigation Branch, 2020.

2.Sudden unexpected death in infancy and childhood. Multi-agency guidelines for care and investigation: The Royal College of Pathologists and the Royal College of Paediatrics and Child Health, 2016.

3.The Apgar score. Pediatrics 2006;117(4):1444-7. doi: 10.1542/peds.2006-0325 [published Online First: 2006/04/06]

4. Herlenius E, Kuhn P. Sudden unexpected postnatal collapse of newborn infants: a review of cases, definitions, risks, and preventive measures. Transl Stroke Res 2013;4(2):236-47. doi: 10.1007/s12975-013-0255-4 [published Online First: 2013/03/23]

5. Becher JC, Bhushan SS, Lyon AJ. Unexpected collapse in apparently healthy newborns--a prospective national study of a missing cohort of neonatal deaths and near-death events. Arch Dis Child Fetal Neonatal Ed 2012;97(1):F30-4. doi:10.1136/adc.2010.208736 [published Online First: 2011/07/01]

6. Pejovic NJ, Herlenius E. Unexpected collapse of healthy newborn infants: risk factors, supervision and hypothermia treatment. Acta Paediatr 2013;102(7):680-8. doi: 10.1111/apa.12244 [published Online First: 2013/04/05]

7. Monnelly V, Becher JC. Sudden unexpected postnatal collapse. Early Hum Dev 2018;126:28-31. doi: 10.1016/j.earlhumdev.2018.09.001 [published Online First: 2018/09/30]

8. Rodriguez NA, Hageman JR, Pellerite M. Maternal distraction from smartphone use: a potential risk factor for sudden unexpected postnatal collapse of the newborn. The Journal of Pediatrics 2018;200:298-99. doi: 10.1016/j.jpeds.2018.04.031

9. Skin to skin contact. Implementing Baby Friendly Standards resources: UNICEF UK.

10. Fawke J, Wyllie J, Madar J, et al. Newborn resuscitation and support of transition of infants at birth Guidelines. 2021

11. Piumelli R, Davanzo R, Nassi N, et al. Apparent Life-Threatening Events (ALTE): Italian guidelines. Ital J Pediatr 2017;43(1):111. doi: 10.1186/s13052-017-0429-x [published Online First: 2017/12/14]

12. Optimizing support for breastfeeding as part of obstetric practice. ACOG committee opinion number 756.: American College of Obstetricians and Gynecologists Breastfeeding Expert Work Group & Committee on Obstetric Practice, 2018.

13. Sudden Unexpected Postnatal Collapse in Healthy Term Newborns: AWHONN Practice Brief Number 8. Journal of Obstetric, Gynecologic & Neonatal Nursing 2020;49(4):388-90. doi: 10.1016/j.jogn.2020.05.002

14. Reyes JA, Somers GR, Chiasson DA. Sudden Unexpected Death in Neonates: A Clinicopathological Study. Pediatric and Developmental Pathology 2018;21(6):528-36. doi: 10.1177/1093526618764054

15. Weber MA, Ashworth MT, Risdon RA, et al. Sudden unexpected neonatal death in the first week of life: autopsy findings from a specialist centre. J Matern Fetal Neonatal Med 2009;22(5):398- 404. doi: 10.1080/14767050802406677 [published Online First: 2009/06/17]

16. Guidelines for the Investigation of Newborn Infants Who Suffer a Sudden and Unexpected Postnatal Collapse in the First Week of Life: Recommendations from a Professional Group on Sudden Unexpected Postnatal Collapse. London: WellChild, 2011.

17. BAPM. The Prevention, Assessment and Management of in-Hospital Newborn Falls and Drops. 2020

18. RCOG. Each Baby Counts: Situational Awareness. , 2015.

19. Draft 2020 European Resuscitation Council Guidelines for Newborn Resuscitation and Support of Transition of Infants at Birth. https://api.resuscitation2020.eu/asset-document/35-Draft%20NLS%20Guidelines%20for%20Public%20Comment%2019Oct20.pdf.

20. Fetal & Neonatal Brain Magnetic Resonance Imaging: Clinical Indications, Acquisitions and Reporting. A BAPM Framework for Practice: BAPM, 2016.

21. Sands. National Bereavement Care Pathway: Department of Health and Social Care, 2017.

22. Garstang J, Griffiths F, Sidebotham P. Parental understanding and self-blame following sudden infant death: a mixed-methods study of bereaved parents' and professionals' experiences. BMJ Open 2016;6(5):e011323. doi: 10.1136/bmjopen-2016-011323 [published Online First: 2016/05/21]

23. Ernst LM. A pathologist's perspective on the perinatal autopsy. Semin Perinatol 2015;39(1):55-63. doi: 10.1053/j.semperi.2014.10.008 [published Online First: 2014/12/17]

24. Lewis C, Hutchinson JC, Riddington M, et al. Minimally invasive autopsy for fetuses and children based on a combination of post-mortem MRI and endoscopic examination: a feasibility study. Health Technol Assess 2019;23(46):1-104. doi: 10.3310/hta23460 [published Online First: 2019/08/29]

25. Pryce JW, Paine SM, Weber MA, et al. Role of routine neuropathological examination for determining cause of death in sudden unexpected deaths in infancy (SUDI). J Clin Pathol 2012;65(3):257-61. doi: 10.1136/jclinpath-2011-200264 [published Online First: 2011/12/03]

26. Enhancing Shared Decision Making in Neonatal Care: A BAPM Framework for Practice: British Association of Perinatal Medicine, 2019.

27. Redshaw M, Henderson J, Bevan C. ‘This is time we’ll never get back’: a qualitative study of mothers’ experiences of care associated with neonatal death. BMJ Open 2021;11(9):e050832. doi: 10.1136/bmjopen-2021-050832

28. Kimberlin DW, Baley J. Guidance on management of asymptomatic neonates born to women with active genital herpes lesions. Pediatrics 2013;131(2):e635-46. doi: 10.1542/peds.2012-3216 [published Online First: 2013/01/30]

29. Identification and Management of Neonatal Hypoglycaemia in the Full Term Infant: A BAPM Framework for Practice: British Association of Perinatal Medicine, 2017.

30. Therapeutic Hypothermia for Neonatal Encephalopathy: A BAPM Framework for Practice: British Association of Perinatal Medicine, 2020.

31. Brito S, Sampaio I, Dinis A, et al. Use of Therapeutic Hypothermia in Sudden Unexpected Postnatal Collapse: A Retrospective Study. Acta Med Port 2020 doi: 10.20344/amp.13767 [published Online First: 2021/04/24]

32. Filippi L, Laudani E, Tubili F, et al. Incidence of Sudden Unexpected Postnatal Collapse in the Therapeutic Hypothermia Era. Am J Perinatol 2017;34(13):1362-67. doi: 10.1055/s-0037-1603678 [published Online First: 2017/06/02]

33. Smit E, Liu X, Jary S, et al. Cooling neonates who do not fulfil the standard cooling criteria - shortand long-term outcomes. Acta Paediatr 2015;104(2):138-45. doi: 10.1111/apa.12784 [published Online First: 2014/08/29]

34. Larcher V, Craig F, Bhogal K, et al. Making decisions to limit treatment in life-limiting and lifethreatening conditions in children: a framework for practice. Arch Dis Child 2015;100 Suppl 2:s3- 23. doi: 10.1136/archdischild-2014-306666 [published Online First: 2015/03/25]

35. Coughlan B, Powell D, Higgins MF. The Second Victim: a Review. Eur J Obstet Gynecol Reprod Biol 2017;213:11-16. doi: 10.1016/j.ejogrb.2017.04.002 [published Online First: 2017/05/21]

36. Scott SD, Hirschinger LE, Cox KR, et al. The natural history of recovery for the healthcare provider "second victim" after adverse patient events. Qual Saf Health Care 2009;18(5):325-30. doi: 10.1136/qshc.2009.032870 [published Online First: 2009/10/09]

37. Busch IM, Moretti F, Purgato M, et al. Psychological and Psychosomatic Symptoms of Second Victims of Adverse Events: a Systematic Review and Meta-Analysis. J Patient Saf 2020;16(2):e61-e74. doi: 10.1097/pts.0000000000000589 [published Online First: 2019/03/29]

38. Postnatal Care National Institute for Health and Care Excellence; 2021 [Available from: https://www.nice.org.uk/guidance/ng194.

39. Baby Check App: The Lullaby Trust; [Available from: https://www.lullabytrust.org.uk/safer-sleepadvice/baby-check-app/.

40. The radiological investigation of suspected physical abuse in children: The Royal College of Radiologists and The Society and College of Radiographers, 2018.

41. Martin A, Paddock M, Johns CS, et al. Avoiding skull radiographs in infants with suspected inflicted injury who also undergo head CT: “a no-brainer?”. European Radiology 2020;30(3):1480-87. doi: 10.1007/s00330-019-06579-w

42. https://www.bapm.org/resources/sudden-and-unexpected-postnatal-collapse-supc

6. Key Words

Death, Resuscitation, NLS, Post-mortem

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS			
Guideline Lead (Name and Title) S Mittal – Consultant Neonatologist			**Executive Lead** Chief Medical Officer
Details of Changes made during review:			
Date	**Issue Number**	**Reviewed By**	**Description Of Changes (If Any)**
November 2023	**1**		**New document**

Appendix 1: Recommended data sheet for detailed history taking:

Parental background:			
Full name of Mother		Full name of Father	
Occupation of mother		Occupation of father	
Mother's country of birth		Father's country of birth	
Mother's ethnic origin		Father's ethnic origin	
Mother's Language		Father's Language	
Social service involvement	(Details including dates)		
Social worker name & no.			
Fertility issues		No of previous miscarriages	
No of previous pregnancies		No of previous terminations	
No of still births		No of previous infant deaths	
Details of previous congenital anomalies/infections/GBS			
Family health conditions			
3 generations family tree	(Please use blank sheet & include consanguinity and assisted reproductive techniques)		
Pregnancy			
Maternal smoking (amt/day)		Maternal alcohol(units/wk)	
Medications (prescribed & non-prescription)		Tobacco, alcohol or drugs in the 4hours before collapse	
Illness/ conditions of mother during pregnancy		Accidents/falls	
Any other issues experienced		Stresses	
Estimated delivery date		Gestation at booking	
Maternal age at booking		BMI at booking	
Was this ever a multiple pregnancy?		Fetal anomaly concerns	
Any concerns including growth, Dopplers, liquor, movements			
Results of other microbiology		Swabs taken and results	
Labour			
Was labour induced? How?		Maternal pyrexia	
Rupture of membranes spontaneous?		Maternal tachycardia	
Duration of ruptured membranes		Maternal antibiotics	
Mode of delivery		Vaginal bleeding	
Concerns about fetal movements		Meconium-stained liquor	
Concerns about CTG/FH			
Analgesia during labour including total dose opiates		Did the mother receive lignocaine for episiotomy?	
Birth			
Mode of birth		Estimated blood loss	
Presentation		Placental appearance	
Order (if multiple birth)		Placenta sent for histology?	
APGAR scores at	1 min	5 min	10 min
Cord gases	Arterial: Venous:		
Resuscitation required			
Postnatal			
Sex		Any congenital anomaly	

		identified?	
Birth weight & centile		Did the baby receive any medications /immunisations prior to the collapse?	
Head circumference & centile			
NEWS: was risk assessment made appropriately and pathway followed?		Stool & urine output adequate?	
Hypoglycaemia: was risk assessment made appropriately and pathway followed?		Feeding mode (breast/ bottle/NG/cup)	
Infection: was risk assessment made appropriately and pathway followed?		Were any doses of antibiotics missed or given more than 1 hour after decision to treat	
Any concerns raised regarding general state of baby between birth and collapse?			

Circumstances of collapse			
Age at collapse (hours)		In what position was the baby found (prone/supine/side)?	
Location within hospital		Location of baby at time of collapse (cot/arms/breast/abdomen/bed/other)	
Who found the baby?			
In whose care was the baby at the time of collapse?		Wass the baby presumed to be feeding/sleeping or other at the time?	
List everyone who was in the room at the time of collapse		Was anyone else helping with care of the baby? Give details	
Consciousness level of mother at time of collapse (alert, tired, very lethargic, asleep)		Was the mother undergoing a procedure at the time of collapse?	
How long prior to the collapse did the baby last feed? Give details			
How long prior to the collapse had the baby last been known to be well? By whom and give details			
When baby was found, was there potential for obstruction f the airway observed? Eg. face against maternal body part or pillow			
Had the mother received any medication, prescribed or non-prescribed between birth and time of collapse?		Any other details/ information?	

Full name of person completing form	Signature
Role/ Title of person completing form	Date

Appendix 2: Resources

Skin-to-Skin Care

• UNICEF UK Baby Friendly Initiative https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/implementing-standards-resources/skin-to-skin-contact/

• https://www.unicef.org.uk/babyfriendly/new-hsib-report-confirms-importance-of-close-monitoring-of-babies-in-immediate-postnatal-period/

• https://www.hsib.org.uk/investigations-and-reports/neonatal-collapse-alongside-skin-to-skin-contact/national-learning-report-neonatal-collapse-alongside-skin-to-skin-contact/

• Research on skin-to-skin contact https://www.unicef.org.uk/babyfriendly/news-and-research/baby-friendly-research/research-supporting-breastfeeding/skin-to-skin-contact/

• Video on safe SSC and positioning https://www.youtube.com/watch?v=cXjJVHeNBzg

Infant feeding policies and guidance

- https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/implementing-standards-resources/sample-infant-feeding-policies/
- https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/breastfeeding-resources/
- https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/bottle-feeding-resources/
- NICE (2014) Public Health Guidance 11: Maternal and Child Nutrition (http://guidance.nice.org.uk/PH11), Issued March 2008 (updated November, 2014)
- NICE (2021) Postnatal care NICE guideline [NG194] Published: 20 April 2021

Infant sleep

• UNICEF UK Baby Friendly Initiative resources

https://www.unicef.org.uk/babyfriendly/babyfriendly-resources/sleep-and-night-time-resources/

• Baby Sleep Information Source https://www.basisonline.org.uk/

• Lullaby Trust https://www.lullabytrust.org.uk/professionals/publications/

Parent information on observing your baby:

• Safer Sleep for Babies: A guide for parents and Carers https://www.lullabytrust.org.uk/wpcontent/uploads/Safer-sleep-for-babies-a-guide-for-parents-web.pdf

• The T.I.C.K.S. Rule for Safe Babywearing http://babyslingsafety.co.uk/ticks.pdf

APGAR Scoring

• Apgar V. A proposal for a new method of evaluation of the newborn infant. Curr Res Anesth Analg 1953;32:260-7. doi:10.1213/00000539-195301000-00041 pmid:13083014

• NICE (2014) Intrapartum care for healthy women and babies. Clinical guideline [CG190]Published: 03 December 2014 Last updated: 21 February 2017

Improving human factors and situation awareness

• https://www.rcog.org.uk/en/guidelines-research-services/audit-quality-improvement/eachbaby-counts/implementation/improving-human-factors/

• https://www.rcog.org.uk/en/guidelines-research-services/audit-quality-improvement/eachbaby-counts/implementation/improving-human-factors/further-resources-human-factors/

• https://www.rcog.org.uk/en/guidelines-research-services/audit-quality-improvement/eachbaby-counts/implementation/improving-human-factors/video-briefing/

BAPM Frameworks for Practice

• Identification and Management of Neonatal Hypoglycaemia in the Full Term Infant (2017) https://www.bapm.org/resources/40-identification-and-management-of-neonatal-hypoglycaemia-in-the-full-term-infant-2017

• The Prevention, Assessment and Management of in-Hospital Newborn Falls and Drops (2021) https://www.bapm.org/resources/161-the-prevention-assessment-and-management-of-in-hospital-newborn-falls-and-drops

Staff support following SUPC

• Medical Defence Union Second Victim Support https://mdujournal.themdu.com/issue-archive/spring-2019/second-victim-support

• Second Victim Support https://secondvictim.co.uk/

• NHS Resolution Being Fair Report 2019 https://resolution.nhs.uk/resources/being-fair-report/

- UHL Professional Nursing Advocates (PNA's), Professional Midwifery Advocates (PMA's) & Trauma Risk Management (TRiM)

Ideas to support staff education:

• P.S.O (see pathway for details)

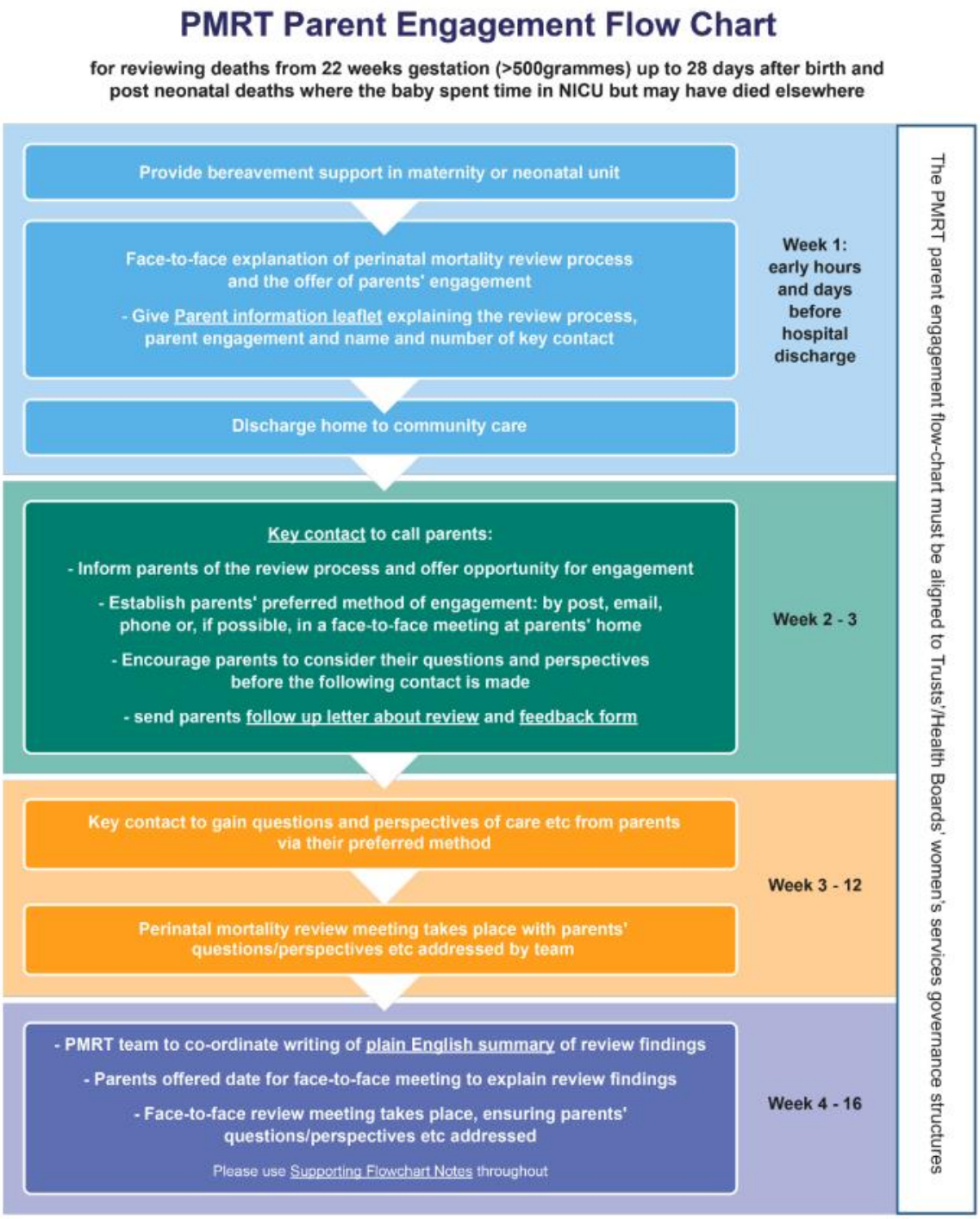
- PREPARE the parents.
- SUPPORT the mother (parent/carer), baby and environment.
- OBSERVE the mother (parent/carer) baby and environment.

• M. B. E

- MOTHER– information, position, observation, listen and respond.
- BABY – position, observation, respond.
- ENVIROMENT – safe and responsive.

Appendix 3: Perinatal Mortality Review Tool:

Parent Engagement Flowchart The following flowchart produced by the Perinatal Mortality Review Tool collaboration is designed to assist clinicians in communicating with parents in the PMRT process.



Appendix 4: Aetiologies of SUPC

Appendix 4. Aetiologies of SUPC

List of conditions described in the aetiology of Sudden Unexpected Postnatal Collapse or collapse in infancy and relevant investigations.

Condition	Investigations to detect conditions in each category
Infection Systemic: Bacterial infection- various Viral infection- Echovirus, Coxsackie, Respiratory Syncytial Virus, Parvovirus, Herpes Meningitis: bacterial, viral	Placenta-histopathology, bacteriology Maternal blood-viral PCR and serology Maternal high and low vaginal swabs- bacteriology Blood- culture, viral PCR and serology, storage, CRP CSF- bacteriology, virology, biochemistry, glucose, dried blood spot targeted metabolomic assay Urine- bacteriology, virology Surface swabs- bacteriology Nasopharyngeal/endotracheal aspirate- bacteriology, virology MRI
Cardiac anomalies Cyanotic heart disease: Transposition of the great arteries, Truncus arteriosus, Univentricular heart, Pulmonary stenosis/atresia, Tricuspid atresia Left sided obstructive lesions: Coarctation/interruption of aorta, Hypoplastic Left heart, Aortic stenosis Cardiac conduction problems: Long QT syndrome, Atrial fibrillation Total anomalous pulmonary venous drainage Myocardial infarction Cardiomyopathies Barth syndrome Congenital coronary artery aneurysm Anomalous coronary artery	ECG Chest X-ray Echocardiogram Blood- Troponin, chromosomes and /or aCGH, DNA, storage Genetics for cardiac conduction disorders/cardiomyopathy Blood spot for cardiolipin analysis
Respiratory Conditions Airway obstruction: choanal atresia, Pierre Robin, cleft palate, accidental smothering Pneumonia +/- aspiration Pulmonary hypertension Pulmonary haemorrhage Congenital diaphragmatic hernia	ENT assessment See investigations for infection Chest X-ray, airway screening imaging ECHO
Maternal drugs and medications -Those associated with neonatal hypoglycaemia: beta blockers, carbimazole -Those associated with neonatal sedation, respiratory depression or poor neonatal adaptation: opiates, SSRIs -Those associated with neonatal seizures: Perineal lignocaine for episiotomy injected into fetal scalp, withdrawal from maternal substances such as opioids, cocaine and benzodiazepines	Seek in history and consider all maternal medications that may contribute to neonatal effects listed. Maternal and baby urine for toxicology
Haematological Anaemia	Baby full blood count, Group, DAT and film Maternal Kleihauer Baby and maternal viral PCR and serology Placental pathology

Metabolic Hypoglycaemia Hypocalcaemia Hypomagnesaemia Fatty acid oxidation defects- including MCAD deficiency, VLCAD deficiency, LCHAD deficiency, carnitine acylcarnitine translocase deficiency, CPT2 deficiency, trifunctional protein deficiency Urea cycle defects Organic acidaemias Lysosomal storage disorders- I-cell disease Peroxisomal disorders- Zellweger syndrome Glycogen storage disorder types 2 or 4 Heart-specific phosphorylase kinase deficiency Mitochondrial disorders- respiratory chain, Leigh's disease Congenital defects of glycosylation Congenital lactic acidoses Glycine encephalopathy Biotinidase deficiency Glucose transporter defect- GLUT1 Molybdenum cofactor deficiency Sulphite oxidase deficiency	Blood- glucose, gas, lactate, ammonia, beta-hydroxybutyrate, amino acids, insulin, free fatty acids, acyl carnitine profile, uric acid, cortisol (3 samples at different time points), VLCFAs, calcium, magnesium, renal and liver biochemistry, DNA and chromosomes, blood spot, dried blood spot targeted metabolomic assay Cerebrospinal fluid- lactate, amino acids including glycine, storage Urine- organic acids including orotic acid, amino acids including urinary sulphocysteine and urine to be retained for storage Skeletal survey Muscle biopsy Skin biopsy- fibroblast culture Ophthalmoscopy/ Retcam MRI brain Electroencephalogram ECG Echocardiogram
Neurological Any metabolic cause of seizures/apnoea Drug withdrawal Perinatal infarction Intracranial bleed Antenatal injury Hypoplasia of brainstem nuclei Hyperekplexia: apnoea/tonic Congenital hypoventilation syndrome Rett syndrome variants Joubert syndrome	As above (metabolic) EEG/aEEG Maternal and infant urine and blood toxicology Coagulation screen Cranial ultrasound scan MRI brain Blood, skin biopsy for: PHOX2B sequencing (congenital hypoventilation syndrome); MECP2 sequencing and copy estimation (Rett syndrome variants); SMN1/2 sequencing (Spinal Muscular Atrophy)
Neuromuscular/skeletal Non accidental injury Congenital myasthenia syndromes Nemaline myopathy X-linked myotubular (centronuclear) myopathy Central core disease	Cranial ultrasound scan MRI brain Skeletal survey Genetics for congenital myasthenic syndromes DNA and chromosomes and/or aCGH Muscle biopsy - single genes screens for MTM1 (XLMM), RYR1 (central core disease), NEM1 -5 (nemaline myopathy), CHRNE & CHRNB1 (subunits of the acetylcholine receptor) Ophthalmoscopy/ Retcam (EMG, nerve biopsy)
Endocrine Hypoglycaemia Hyperinsulinism Congenital adrenal hypoplasia	Blood- glucose, lactate, ammonia, beta-hydroxybutyrate, amino acids, insulin, free fatty acids, acyl carnitine profile, uric acid, dried blood spot targeted metabolomic assay MRI to assess pituitary Cortisol (3 samples at different time points), electrolytes Renal and adrenal ultrasound scan

Appendix 5: Post-mortem procedure:

The list below is based on previously published protocols; the final decision regarding the extent of sampling should be decided by the pathologist on a case-by-case basis. (please also refer to the Consent to Hospital Post Mortem Examination UHL Policy)

Postmortem procedure	
Medical photography	Including overview of the entire body (front and back), face, profile, any dysmorphic features, and any marks or injuries.
Radiology: -Skeletal survey -body -Spine -Limbs -CT -MRI	Skull Xray (In the postmortem setting, CT head should be performed and as such, SXR is not indicated. [41]) AP/frontal chest (including clavicles), oblique views of the ribs (left and right), AP abdomen with pelvis. Lateral spine- cervical and thoracolumbar AP whole arms (shoulder to wrists) coned lateral elbows and wrists, PA hands and wrists. AP whole lower limb (Hip to ankle) coned lateral knees and ankles, coned AP ankles, DP feet. CT head is indicated in all cases. Whole body CT should be performed to investigate skeletal injury or where there is doubt from the skeletal survey. Whole body MRI should be considered for suspected soft tissue injury.
Anthropometric measurements	Body weight, crown-rump, crown-heel, heel-toe and occipitofrontal circumference
Microbiology -Bacteriology -Virology	Blood culture, Lung tissue /fluid, Bronchial swab, cerebrospinal fluid, spleen, any apparent site of infection. Postnatal swabs, cerebrospinal fluid, lung tissues, heart muscle, small intestine.
Organ systems: Minimum samples to be taken	Heart (free wall of left and right ventricle, interventricular septum), each lobe of both lungs, Kidneys, Liver, Thymus, Pancreas, Spleen, Lymph nodes, adrenal glands, costochondral junction of a rib, to include bone marrow sample, muscle, sample of any lesions including fractured ribs, others specifically indicated.
Frozen sections: Staining with Oil Red O for fat	Liver, Heart, Kidney, Lung, Skeletal muscle
Biochemistry	Blood: dried blood spot for acylcarnitine profile Urine: toxicology, amino and organic acids if available Bile: bile spot for acylcarnitine Skin sample for fibroblast culture
Molecular/ cytogenetics	Skin culture medium Frozen solid tissue (e.g., Spleen, liver, kidney, muscle)
Retained material for further examination	
Brain	The fixed brain should be sliced in the coronal plane at 1cm intervals. All brain slices should be photographed to provide a permanent record of macroscopic appearances.

Appendix 6: Signposting and Support organisations for Parents.

Organisation	Contact Details	Description
Baby Lifeline	www.babylifeline.org.uk	Charity supporting the safe care of pregnant women and newborn babies all over the UK.
BeBop	www.bebop.nhs.uk/families	A resource for parents about HIE, hypothermia and neuroprotection.
Birth Trauma Association	www.birthtraumaassociation.org.uk	Helping people who are finding it hard to cope with their childbirth experience.
Bliss	hello@bliss.org.uk www.bliss.org.uk	For babies born too soon, too small, too sick Provides vital support and advice to families of premature and sick babies across the UK.
Child Bereavement Trust	Helpline 0800 02 888 40 www.childbereavementuk.org	Providing specialised support, information and training to those affected when a baby or child dies, or when a child is bereaved.
The Lullaby Trust	Helpline 0808 802 6869 www.lullabytrust.org.uk	Charity raising awareness of sudden infant death syndrome (SIDS), providing expert advice on safer sleep for babies and offers emotional support for bereaved families
Newlife	Helpline 01543 462 777 www.newlifecharity.co.uk	Offers practical support for disabled children throughout the UK, cares for the carers, funds medical research, creates awareness and campaigns for change.
Peeps	Helpline 0800 987 5422 www.peeps-hie.org	The only UK charity dedicated to supporting those affected by HIE
Sands	Helpline 0808 164 3332 www.sands.org.uk	Charity supporting anyone affected by the death of a baby, provides training for health care professionals, and promotes research to reduce the loss of babies' lives.
Scope	Helpline 0808 800 3333 www.scope.org.uk	Charity supporting disabled people and their families through practical information and support, particularly at the time of diagnosis.
SUDC UK	sudc.org.uk	SUDC UK aims to prevent SUDC by raising awareness and funding crucial research. SUDC connects, families with expert professional and peer support.
Together for Short Lives	Helpline 0808 8088 100 www.togetherforshortlives.org.uk	Charity working to ensure that all children and young people, unlikely to live or reach adulthood, and their families, receive care and support whenever and wherever they need it.
Tommys	Phone 020 7398 3400 www.tommys.org	Charity carrying out research into the causes of miscarriage, stillbirth and premature birth. Provides information and support to anyone who has experienced baby loss.
UNICEF UK Baby Friendly Initiative	https://unicef.uk/bf-parents	The UNICEF UK Baby Friendly Initiative provides guidance for health professionals and parents on infant feeding, relationship building and infant sleep.