Clinical Standard Operating Procedure (SOP)

HYPOXIC ISCHAEMIC ENCEPHALOPATHY & THERAPEUTIC HYPOTHERMIA

University Hospitals Bristol NHS
NHS Foundation Trust
NEST Newborn Emergency Stabilisation & Transport Team
Southwest Neonatal Network

Setting	UHBristol: Neonatal Emergency Stabilisation and Transport Team
Staff	NEST Team, staff making referrals to the NEST team
Patients	Any infant who may meet the criteria for Therapeutic Hypothermia

Current evidence indicates that moderate induced hypothermia (cooling) to a rectal temperature of 33-34°C within 6 hours of birth improves survival and neurological outcomes in infants with moderate or severe perinatal asphyxial encephalopathy.

Referral

Infants who meet the criteria for therapeutic hypothermia require centralisation to a tertiary NICU. The referral should include a conference call that includes the NEST Consultant and the Receiving Unit Consultant. The CFM should be reviewed as part of this referral process (the CFM can sent securely by NHS Mail)

Babies should be assessed sequentially by criteria A, B and C as listed below:

A Babies ≥ 36.0 weeks gestation with at least ONE of the following:

- Apgar score of less than or equal to ≤5 at 10 (ten) minutes after birth
- Continued need for resuscitation, including endotracheal or mask ventilation, at 10min after birth
- Acidosis defined as either umbilical cord pH or any arterial, venous or capillary pH within 60 min of birth less than (<) pH 7.00
- Base deficit greater than or equal to (≥) minus16 mmol/L in umbilical cord blood sample or any blood sample within 60 minutes of birth (arterial or venous blood)

If the baby meets criterion A then assess for neurological abnormality using criterion B

B Moderate to severe encephalopathy consisting of

- Altered state of consciousness (lethargy, stupor or coma) And at least ONE or more of the following:
- Hypotonia persistent after successful resuscitation
- Abnormal reflexes including oculomotor or pupillary abnormalities
- Absent or weak suck
- Clinical seizures, as recorded by trained personnel

“Passive” cooling, with rectal temperature monitoring, should be initiated at this stage (while recording and assessing aEEG

C At least 30 minutes duration of aEEG recording that shows abnormal background voltage aEEG or seizures (clinical or electrical) thus meeting ONE of the following at anytime during the first six hours after birth:

- Normal background voltage with electrical seizure activity
- Moderately abnormal voltage (upper margin of trace >10μV and lower margin of trace <5μV) 6
- Suppressed activity (upper margin of trace <10μV and lower margin of trace <5μV)
- Continuous seizure activity

Advice to local units about commencing Therapeutic Hypothermia

- All infants undergoing any form of cooling **must** have continuous temperature monitoring. Insert the rectal temperature probe to 6cm.
- Units with Tecotherm / Criticool machines. Set target rectal temperature to 33.5°C. (beware some units are mistakenly setting constant mattress temp to 33.5°C)
- Units without cooling machines - nurse in an open cot, nappy only and provide passive cooling with fans / water filled gloves (Placed on side of torso, not on head, not in direct contact with the skin). Do not use ice packs.

Critical Care during the retrieval process

Ventilation:

- All infants with HIE should intubated and ventilated for transport (see RSI SOP)
- Use temperature corrected values for all blood gases
- Target $PaCO_2$ – 5-6.2 kPa
- Target PaO_2 – 8-12 kPa
- Hypothermia may exacerbate pulmonary hypertension, ensure infants undergoing TH maintain Sats >95%.

Cardiovascular:

- Mean Arterial Blood Pressure should be maintained ≥45mmHg
- Infants with NIBP <45mmHg should have an invasive arterial BP monitoring device (UAC / Peripheral arterial line)
- Treat hypotension as per Hypotension SOP
- A sinus bradycardia of >75bpm in cooled infants is normal. A heart rate of higher than 100 bpm may suggest inadequate sedation.

Fluids:

- Start maintenance 10% dextrose at 40ml/kg/day- increase to keep BSL 3.5-8 mmol/L

Access:

- Infants with borderline NIBP, those requiring inotropes or those having seizures should have UVC/UAC sited for transfer
- Infants with HIE, adequate BP and no seizures can be moved with 2 peripheral cannula.

Cooling

- 2 temperature probes should be used, 1 for the Tecotherm and 1 for the monitor. Equipment for cooling is kept in the blue bag. Target temp 33.5°c.

CFM

- The portable CFM (blue bag) should be taken- (see appendix 1)
- The infant should be attached to the NEST CFM after the first look to allow data to be collected prior to transfer.
- Download the data on job completion to the portable hard drive as per the guideline.

CNS:

- Undertake a cranial US in the local unit where possible (primarily looking for intracerebral haemorrhage at this point)
- Ensure adequate sedation to prevent distress and shivering. Bolus morphine followed by continuous infusion starting at 20mcg/kg/hr. Increase if infant distressed or heart rate remains unexpectedly high.
- Treat seizures as per Neonatal Seizure SOP

Sepsis:

- All infants should be treated with first line IV antibiotics.

"Off label" Therapeutic Hypothermia

Infants recruited into clinical studies were ≥36 weeks and <6 hours of age. However, some infants may present or be referred at >6 hours or at 34 / 35 week gestation or with unknown criteria A information. It is important that these infants are discussed with the receiving hospital consultant to get a decision on appropriateness of offering therapeutic HT (which may still be recommended)

Clinical Research studies

Research studies in this field of work are common. At present there is an ongoing randomised study of the addition of the anaesthetic gas Xenon into the ventilation circuit of babies with HIE. The xenon research team may accompany the NEST team in order to discuss with families the study and gain informed consent and enrol the patient in this study. The NEST team has clinical primacy in these situations.

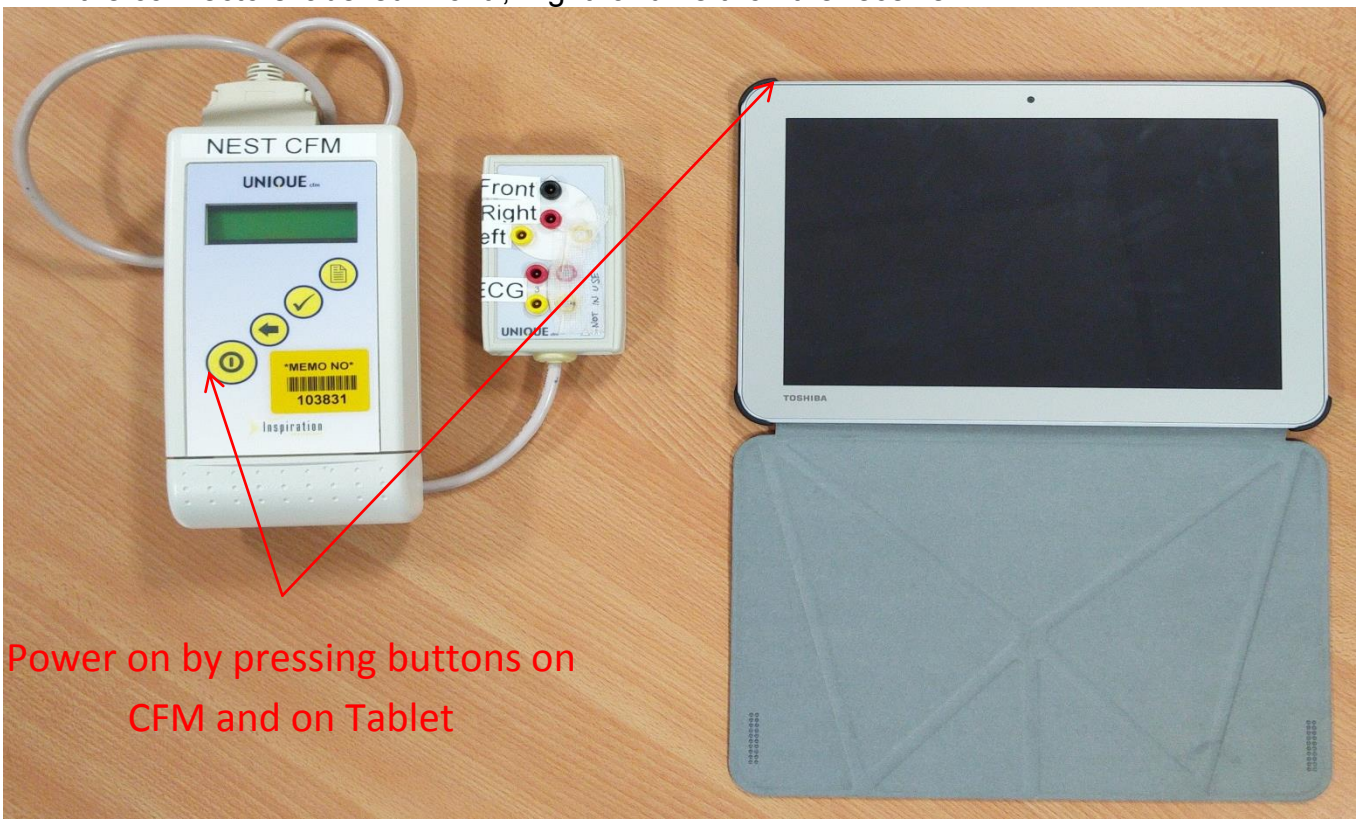
Other Relevant Guidelines

- NEST SOP: Respiratory Support
- NEST SOP: Management of Hypotension
- NEST SOP: Management of Neonatal seizures
- NEST SOP: RSI SOP
- NEST SOP: Criteria for top cover attendance

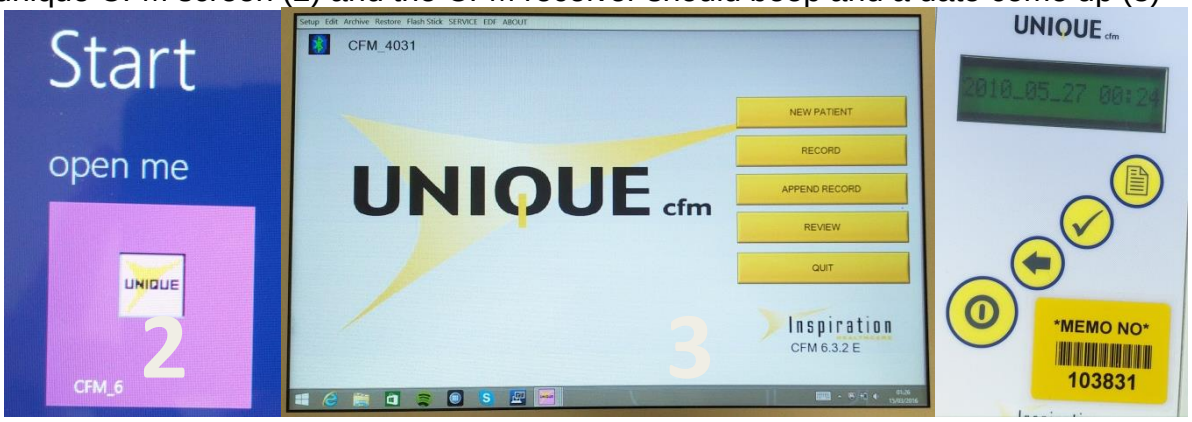
APPENDIX 1: Inspiration CFM guide

The CFM and tablet receiver are kept in the blue bag in the NEST office

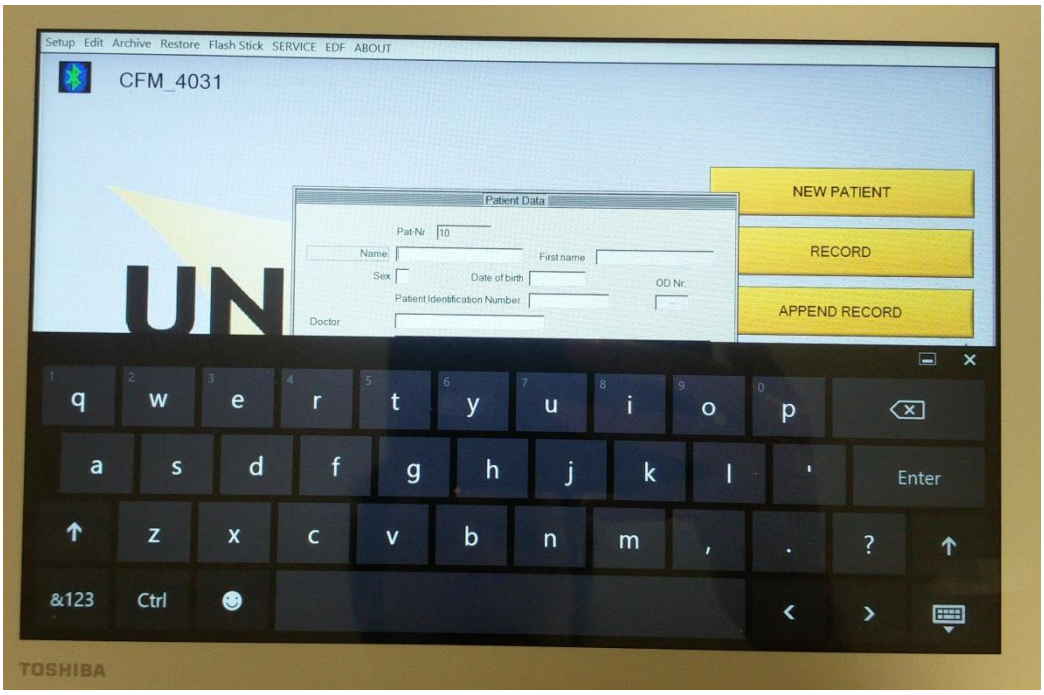
1. Turn on the tablet and the Unique CFM. Note there are chargers for both in the lid compartments of the blue bags. The connectors used on most CFM machines should fit in the connectors labelled “front”, “right” and “left” on the receiver.



2. On the Toshiba tablet click the Unique CFM logo on the start screen(1). If there is a picture when the tablet turns on swipe up to get to the home screen. This should give you the unique CFM screen (2) and the CFM receiver should beep and a date come up (3)



3. Click New patient from the Unique CFM page. Fill in the patient details (NB it is easier to close the first keyboard that appears using the red cross in the corner, then activate the windows keyboard by pressing the keyboard icon on the bottom right of the screen)



4. The CFM will then beep again. Press the box on the screen at the bottom to begin recording.
5. Once you have completed the recording press the exit button to finish. The CFM recording will then save.
6. You can review the CFM at a later date by clicking “review” then selecting the patient from the list.

Backing up the aEEG

1. Data from the aEEG can be archived to the hard drive in the blue bag. Attach the hard drive to the tablet using the supplied cable and adapter.
2. Click on “Flash stick” on the top menu on the CFM homescreen, and then click on archive to stick.
3. The file should then be backed up onto the hard drive.

Related documents	Network Guideline HIE / cooling NEST Top Cover Attendance
Safety	
Queries	Dr Tooley: NEST team 01173 421745