national neonatal transport programme

Transport of Infants Referred for Cooling Treatment

NNTP Clinical Guideline Cooling on Transport

September 2011

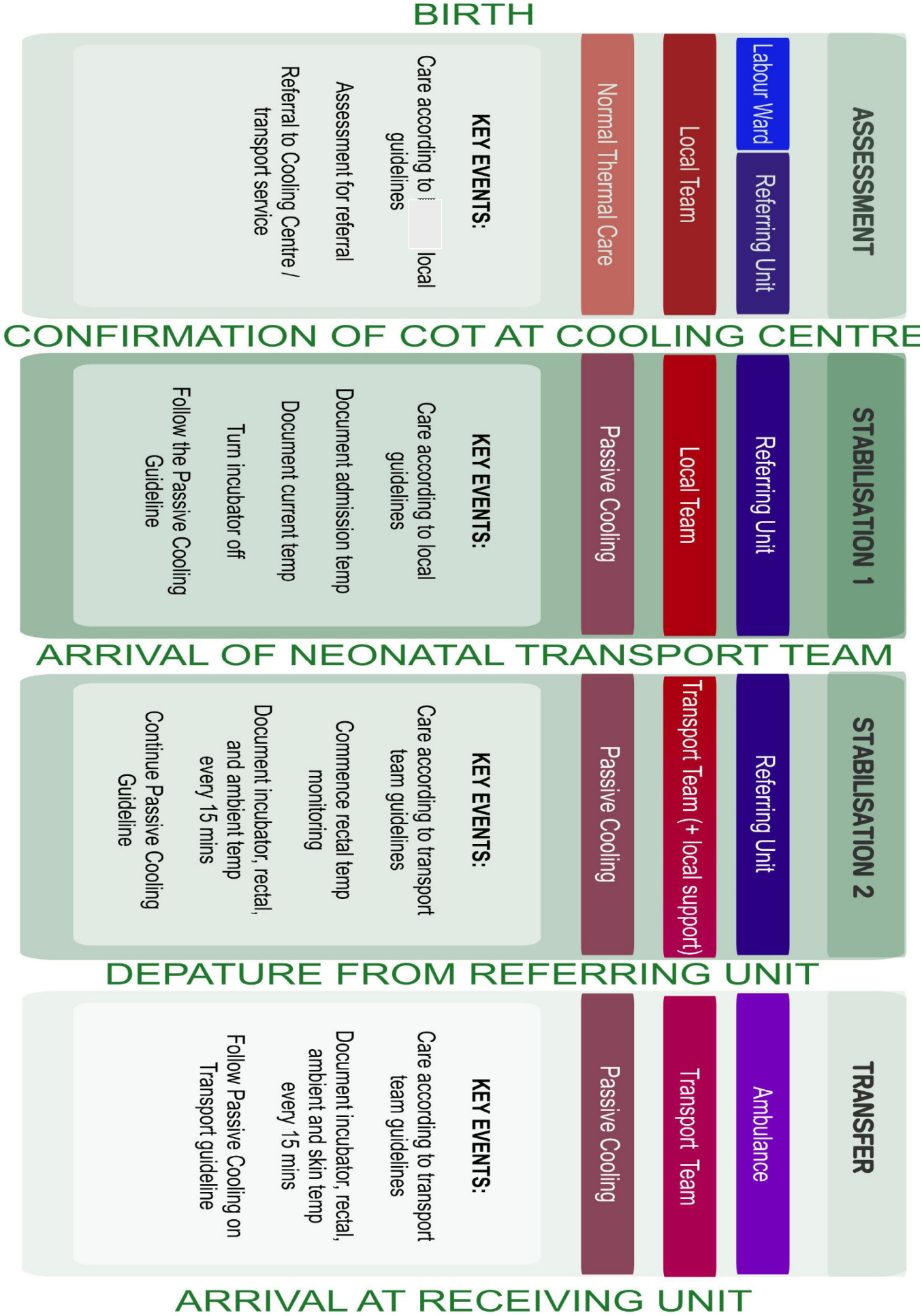
Reviewed June 2014

Contents

Introduction:

Current evidence indicates that moderate induced hypothermia (cooling) to a rectal temperature of 33-34^{o}C improves survival and neurological outcomes to 18 months of age in infants with moderate or severe Hypoxic Ischaemic Encephalopathy. Current protocols require **cooling to begin within a maximum of 6 hours after birth** and suggest that **cooling as early as possible is the ideal.** To facilitate early cooling in babies born in hospitals without the facilities for therapeutic hypothermia, passive cooling allows safe controlled cooling to begin prior to the arrival of the baby in the cooling centre. To facilitate, and standardise passive cooling in Ireland, the NNTP has adapted the following clinical guideline from the TOBY Protocol.

OVERVIEW OF COOLING ON TRANSPORT



The Decision to Commence Cooling.

The decision to begin cooling an infant is to be made at **consultant level** – this may be the consultant in charge of the infant in the referring hospital, the consultant in charge of the transport or the consultant in the receiving centre. The decision to cool should be made as promptly as possible.

The Role of the NNTP

<u>The role of the Transport team is not to recommend cooling but to:</u>

a. Identify those infants that may benefit from cooling as soon as possible (ie at the time that the transport call is initially placed) and to discuss these cases with the relevant consultant(s) to determine the best course of action

b. Be cognisant of the importance of **commencing cooling within a maximum of 6 hours after birth. Once a decision has been made to cool an infant, this should occur as early as possible.**

c. Remember that cooling is an adjunct therapy. Despite an infant meeting the criteria outlined below, it may not be appropriate in some cases to commence cooling or to transfer the infant, as withdrawal of support may in fact be the most appropriate course of action

ASSESSMENT AND REFERRAL PHASE: NORMAL THERMAL CARE (Appendix 1)

This phase of care begins at the birth of an asphyxiated baby and ends once the baby has been accepted for therapeutic hypothermia by a cooling centre. Care during this phase will occur in the delivery room and referring neonatal unit, and will be provided by the local team.

- Babies should be resuscitated at birth according to accepted local protocols.
- As early as possible after resuscitation and stabilisation, the baby should be assessed according to the criteria below to see if therapeutic hypothermia is appropriate.

Treatment Criteria for Therapeutic Cooling

Infants meeting the clinical and neurological criteria on the Candidacy Checklist for Neonatal Therapeutic Hypothermia should be considered candidates for "Cooling": (See next page and also available in hard copy in your unit or to print @ http://www.nntp.ie/downloads/NNT_Cooling.pdf).

Please complete this checklist and if infants meet both the clinical and neurological criteria above, they should be considered candidates for cooling. Once the decision to cool is made, passive cooling should commence immediately.

- Babies with evidence of encephalopathy but not fulfilling criteria can be discussed with the NNTP and cooling centre to establish whether cooling may still be appropriate.
- As soon as the decision is made to refer for cooling, the referring unit should telephone the NNTP and cooling centre.
- If the referring clinician is unsure if a baby is suitable for cooling, this can be discussed with the NNTP and cooling centre.

Throughout this phase, the baby should continue to receive standard intensive care and be maintained at normal body temperature.

The following infants are Not Eligible for Cooling

a. Infants in whom cooling cannot be commenced < 6 hours after birth

b. Infants with major congenital abnormalities

c. Infants in whom death appears inevitable

d. While not an absolute contraindication to cooling, infants with an FiO2 requirement > 80% or with clinical evidence of severe PPHN warrant special consideration and discussion between consultants involved in the care of the infant.

CANDIDACY CHECKLIST FOR NEONATAL THERAPEUTIC HYPOTHERMIA (COOLING)

PATIENT'S NAME: _____ **HOSP. NO:** _____

TIME of BIRTH: _____:_____ hrs. **CURRENT AGE in hours /minutes:** _____ hrs._____ mins.

If current age is greater than 6 hours, call tertiary cooling centre before proceeding.

Directions for the use of this checklist: Start at the top and work through each numbered component. When directed to proceed to the exam, refer to the exam found on page 2. If there is missing data,(such as a known perinatal event and / or Apgar scores) and you are in doubt as to whether or not the patient qualifies for cooling, consult with the tertiary cooling centre promptly to discuss the patient.

**Note: If patient is < 6 hours old and meets the gestation, weight and blood gas criteria and has a witnessed seizure, patient is eligible for 'COOLING' regardless of additional exam findings. Consult the tertiary cooling centre to discuss any questions or concerns.*

Clinical Information	Criteria *(place a tick in the box that corresponds to the patient information)*	Instructions
Gestation	1 ≥ 36 weeks gestation ☐	Go to ⇛ 2 **Weight**
	= 35 weeks gestation ☐	May not be eligible *Contact cooling centre*
	< 35wks gestation ☐	Not Eligible
Weight	2 ≥ 1800 grams ☐	Go to ⇛ 3 **Blood Gas**
	< 1800 grams ☐	Not Eligible
Blood Gas pH = _____ Base Excess = _____ Source: Cord ☐ *Or* 1st infant blood gas at <1hour of life ☐ Arterial ☐ Capillary ☐ Venous Time Obtained: _____ : _____	3 pH < 7.0 *or* Base excess ≥ -16 ☐	Criteria met thus far. Go to **EXAM***
	No gas obtained ☐ *or* pH 7.0 to 7.15 ☐ *or* Base excess -10 to -15.9 ☐	Go to ⇛ 4 **History of acute perinatal event**
	pH >7.15 or Base Excess < 10 ☐	May not be eligible; Go to ⇛ 4 **History of acute perinatal event**
Acute Perinatal Event *(tick all that apply)*	4 Variable / late foetal HR decelerations ☐ Prolapsed / ruptured / tight nuchal cord ☐ Uterine Rupture ☐ Maternal haemorrhage / placental abruption ☐ Maternal trauma (eg. vehicle accident) ☐ Mother received CPR ☐	Any ticked, Go to ⇛ 5 **Apgar score**
	No perinatal event *or* Indeterminate what the event was because of home birth or missing information	May not be eligible; Go to ⇛ 5 **Apgar score**
Apgar Score at 1 minute _____ 5 minute _____ 10 minute _____	5 Apgar ≤ 5 at 10 minutes (yes) ☐	Criteria met thus far. Go to **EXAM***
	Apgar ≤ 5 at 10 minutes (no) ☐ *(no, was 6 or greater at 10 minutes)*	Go to ⇛ 6 **Resuscitation after delivery**
Resuscitation after Delivery *(tick all that apply)* _____ PPV/intubated at 10 minutes _____ CPR _____ Adrenaline administered	6 Continued need for PPV or Intubated at 10 minutes?(yes) ☐	Criteria met thus far. Go to **EXAM***
	PPV/Intubated at 10 minutes?(no) ☐	May not be eligible Go to **EXAM***

This checklist, adapted from the 'STABLE Program', 6th edition, 2013, has been produced by the National Neonatal Transport Programme (NNTP) and endorsed by the Faculty of Paediatrics, Royal College of Physicians, Ireland, in March 2014.

Circle findings for each domain

PATIENT IS ELIGIBLE FOR COOLING WHEN 3 OR MORE DOMAINS HAVE FINDINGS IN COLUMNS 2 OR 3

Domain	1	2	3
Seizures	**None**	**Seizures common:** (focal or multifocal seizures) (Multifocal: clinical activity involving > one site which is asynchronous and usually migratory) Note: If the patient is < 6 hours old and meets the gestation, weight and blood gas criteria and has a witnessed seizure, patient is eligible for cooling regardless of the rest of this exam	**Seizures uncommon:** (excluding decerebration) ***Or*** Frequent seizures
Level of Consciousness	**Normal** **or** **Hyperalert**	***Lethargic*** Decreased activity in an infant who is aroused and responsive **Definition of Lethargic:** • Sleeps excessively with occasional spontaneous eye opening • Responses are delayed but complete • Threshold for eliciting such responses increased • Can be irritable when disturbed	**Stuporous / Comatose** Demonstrates no spontaneous eye opening and is difficult to arouse with external stimuli **Definition of Stuporous:** • Aroused only with vigorous and continuous stimulation **Definition of Comatose:** • No eye opening or response to vigorous stimulation In both stupor and / or coma, the infant may respond to stimulation by grimacing / stereotyped withdrawal / decerebrate posture
Spontaneous activity when awake or aroused	**Active** **Vigorous, doesn't stay in one position**	**Less than active, not vigorous**	**No activity whatsoever**
Posture	**Moving around and does not maintain only one position**	**Distal flexion, complete extension or "frog-legged" position** Term infants with HIE often exhibit • Weakness in hip-shoulder distribution (eg proximal part of extremities) • Distal joints, fingers and toes often exhibit strong flexion • Thumbs strongly flexed and adducted. • Wrists often flexed • Above postures are enhanced by any stimulation	**Decerebrate with or without stimulation (all extremities extended)**
Tone	**Normal** • Resists passive motion **Hypertonic, jittery** • Lowered threshold to all types of minimal stimuli eg light touch, sudden noises • Infant may even respond to his/her own sudden movements	**Hypotonic or floppy,** • Axial hypotonia (ie. head lag) and/or limb hypotonia	**Completely flaccid like a rag doll**
Primitive reflexes	***Suck:*** Vigorously sucks finger or ETT ***Moro:*** Normal: Limb extension followed by flexion with stimulus	***Suck:*** Weak ***Moro:*** Incomplete	***Suck:*** Completely absent ***Moro:*** Completely absent
Autonomic system	***General Activation of Sympathetic nervous system*** ***Pupils:*** • Normal size (-1/3 of iris diameter) • Reactive to Light ***Heart Rate:*** • Normal, > 100bpm ***Respirations:*** • Regular spontaneous breathing	***General Activation of Parasympathetic nervous system*** ***Pupils:*** • Constricted (< 3mm estimated) • but reactive to light ***Heart Rate:*** • Bradycardia (< 100bpm, variable up to 120) ***Respirations:*** • Periodic, irregular breathing effort • Often have more copious secretions and require frequent suctioning	***Pupils:*** • Skew gaze, fixed, dilated, • not reactive to light ***Heart Rate:*** • Variable, inconsistent heart rate, irregular, may be bradycardic ***Respirations:*** • Completely apnoeic, requiring PPV & / or ET intubation and ventilation

Neurological Exam to evaluate candidacy for cooling: If in doubt as to whether patient qualifies for cooling, consult with the cooling centre promptly to discuss the patient.

STABILISATION PHASE 1: PASSIVE COOLING (Appendix 2)

This phase of care only begins once the baby has been accepted for therapeutic hypothermia by a cooling centre, and the NNTP (or local team if NNTP unavailable) has accepted the transfer of the baby. Care during this phase will continue in the referring neonatal unit and will be provided by **the local unit,** with support and advice from the NNTP transport consultant as required. The phase of care ends on the arrival of the neonatal transport team.

- All units in the ROI should now have the means to measure continuous core temperature using a rectal probe attached to a patient transport monitor.
- The local unit should be advised to document both the admission and current rectal temperature of the baby.
- At this stage, continuous rectal temperature monitoring should be commenced. The rectal temperature probe should be inserted 2-3cm and fixed to the skin using 'steristrips'.
- The incubator should then be turned off (and the portholes opened if in a closed incubator). The baby should be naked apart from a nappy. Staff should document the baby's temperature every 15 minutes to ensure the baby does not fall below 33ºC.
- The passive cooling protocol should then be followed under the telephone guidance of the transport consultant (see appendix 2).
- If despite following the guideline, the baby does not cool to target temperature within approximately 60 mins, advice should be sought from the transport consultant /cooling centre.
- Additional techniques that facilitate cooling are a fan, an inactivated chemical gel mattress or removing any head covering that may be in use to secure an ET tube or a CPAP device. However active cooling techniques such as fans may result in overcooling unless careful core temperature monitoring is in place. Therefore these should not be implemented without rectal temperature monitoring.
- The remainder of the clinical care should be according to local guidelines with advice, where necessary, from the transport consultant.

IN THE MEANTIME

The NNTP (or local transport team) should be dispatched as soon as it is available. Prior to leaving, check that all the equipment required is available in the transport bag (see appendix 4). The NNTP (or local) team should turn the **transport incubator temperature down to 25ºC,** and open the portholes to allow the incubator to cool down. Portholes can be closed once the incubator has reached the desired temperature of 25ºC.

STABILISATION PHASE 2: PASSIVE COOLING (Appendix 2)

This phase of care begins on the arrival of the neonatal transport team and ends when the team depart with the baby en route to the cooling centre. Care during this phase will continue in the referring neonatal unit and will be provided by the NNTP with support from the local unit and advice from the transport consultant or by the local transfer team if NNTP unavailable.

On arrival, and after the clinical handover, an initial set of temperature readings should be taken and documented. This must include rectal, incubator and room ambient temperatures. The baby should already be on continuous rectal temperature monitoring and this is continued. The cooling on transport log (see appendix 5) is a useful way of documenting temperature and thermal care.

Incubator / ambient / rectal temperature readings should be documented every 15 minutes (e.g. in the cooling log - see appendix 5). Whilst the baby is in the hospital incubator, the passive cooling in referral hospital protocol should be followed (see appendix 2). Once the baby has been placed in the transport incubator (set at 25ºC) the passive cooling on transport protocol should be followed (see appendix 3). The remainder of the clinical care should be according to local transport guidelines with advice where necessary from the transport consultant / cooling centre.

TRANSFER PHASE 3: PASSIVE COOLING (Appendix 3)

This phase of care begins when the transport team depart with the baby from the referral unit and ends on handover of clinical care at the cooling centre. Care during this phase will be provided by the NNTP (or local transport team) with advice from the transport consultant / cooling centre.

Whilst the baby is being transferred, incubator / ambient / rectal temperature readings should continue to be documented every 15 minutes. The passive cooling on transport protocol (appendix 3) should be followed during the transfer. **The ambulance temperature** should be set at that which is comfortable for the transport team, but should be **between 18 and 24ºC**. The remainder of the clinical care should be according to transport guidelines with advice where necessary from the transport consultant / cooling centre.

Other important things to remember…

3 S's… Sugar, Sodium, Seizures.

a. Attention to airway, breathing and circulation takes priority over cooling
b. Fluid restrict **ALL** infants to 40 ml/kg/day
c. Use D12.5% or higher if necessary to maintain normal glucose levels
d. Actively treat seizures - Drug of choice is phenobarbitone
e. Ventilate the patient as necessary
f . Think about UVC /UAC access – cooling causes vasoconstriction and it can be hard to get peripheral access once cooling has commenced. Also UVC access allows the administration of higher concentrations of Dextrose. However, the placement of lines should not delay the transfer of an infant to a cooling centre for active cooling.
g. Sedation is usually not required but one can consider morphine if clinically indicated.
h . While it is nice to have a baseline coagulation profile and platelet count prior to leaving the referring centre, transport should not be delayed waiting for these results. An infant with a severe clinical coagulopathy is generally very unwell, and for other reasons related to a poor prognostic outcome, may not be a candidate for cooling and transfer.

References:

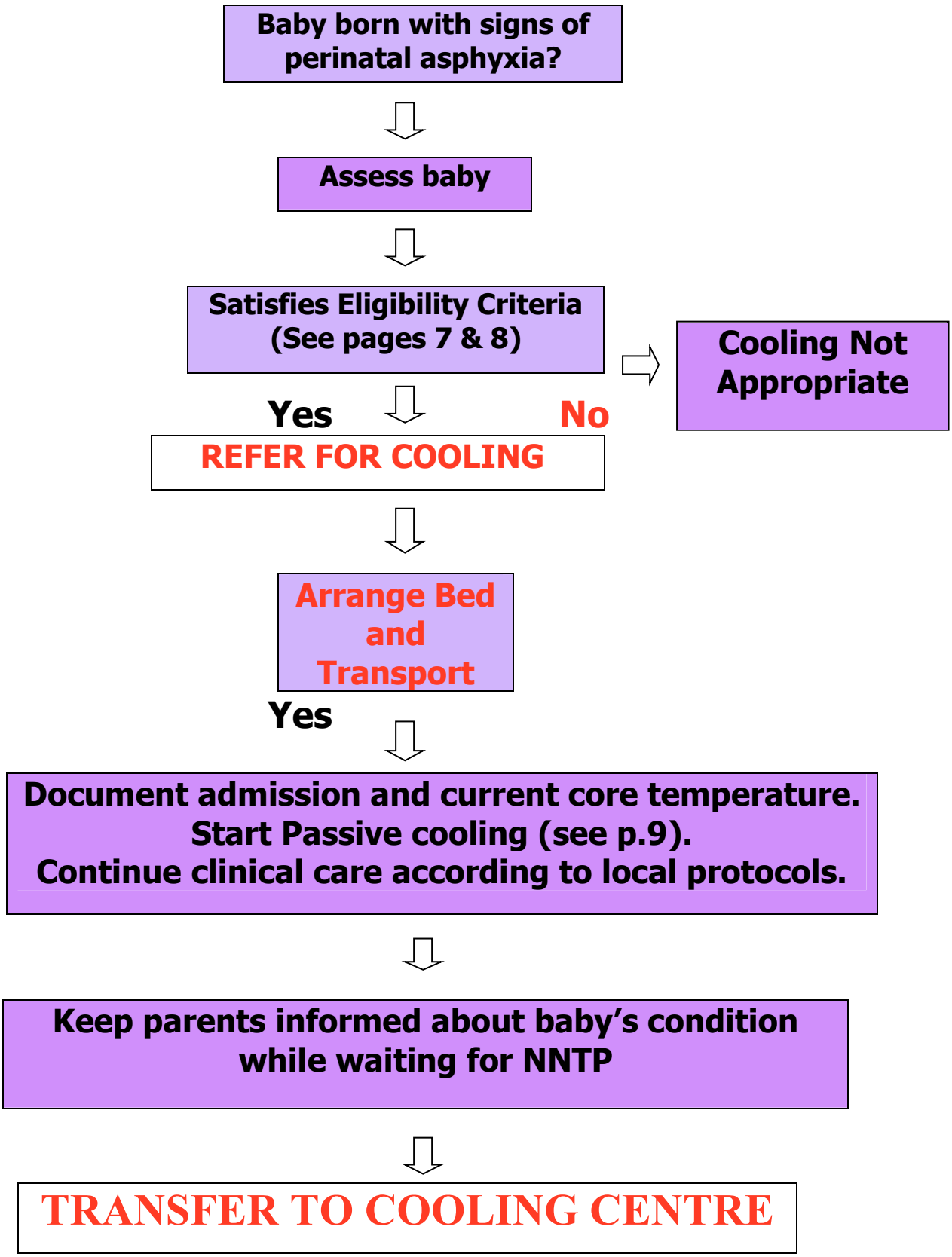
Edwards AD, Brocklehurst P, Gunn AJ, Halliday H, Juszczak E, Levene M, Strohm B, Thoresen M, Whitelaw A, Azzopardi D. Neurological outcomes at 18 months of age after moderate hypothermia for perinatal hypoxic ischaemic encephalopathy: synthesis and meta-analysis of trial data. *BMJ.* 2010;340: c363. Available at: hhtp//www.ncbi.nlm.nih.gov/pubmed/20144981

Karlsen, Kristine (2013) The STABLE Program, 6th Edition, p.86-87.

Kendall, G., Robertson, N, Azzopardi D. Cooling on retrieval clinical guideline. 2009 *TOBY (UK) cooling register. National Perinatal Epidemiology Unit.* Available at: https://www.npeu.ox.ac.uk/files/downloads/tobyregister/TOBY-Register-Transport-Protocol.pdf

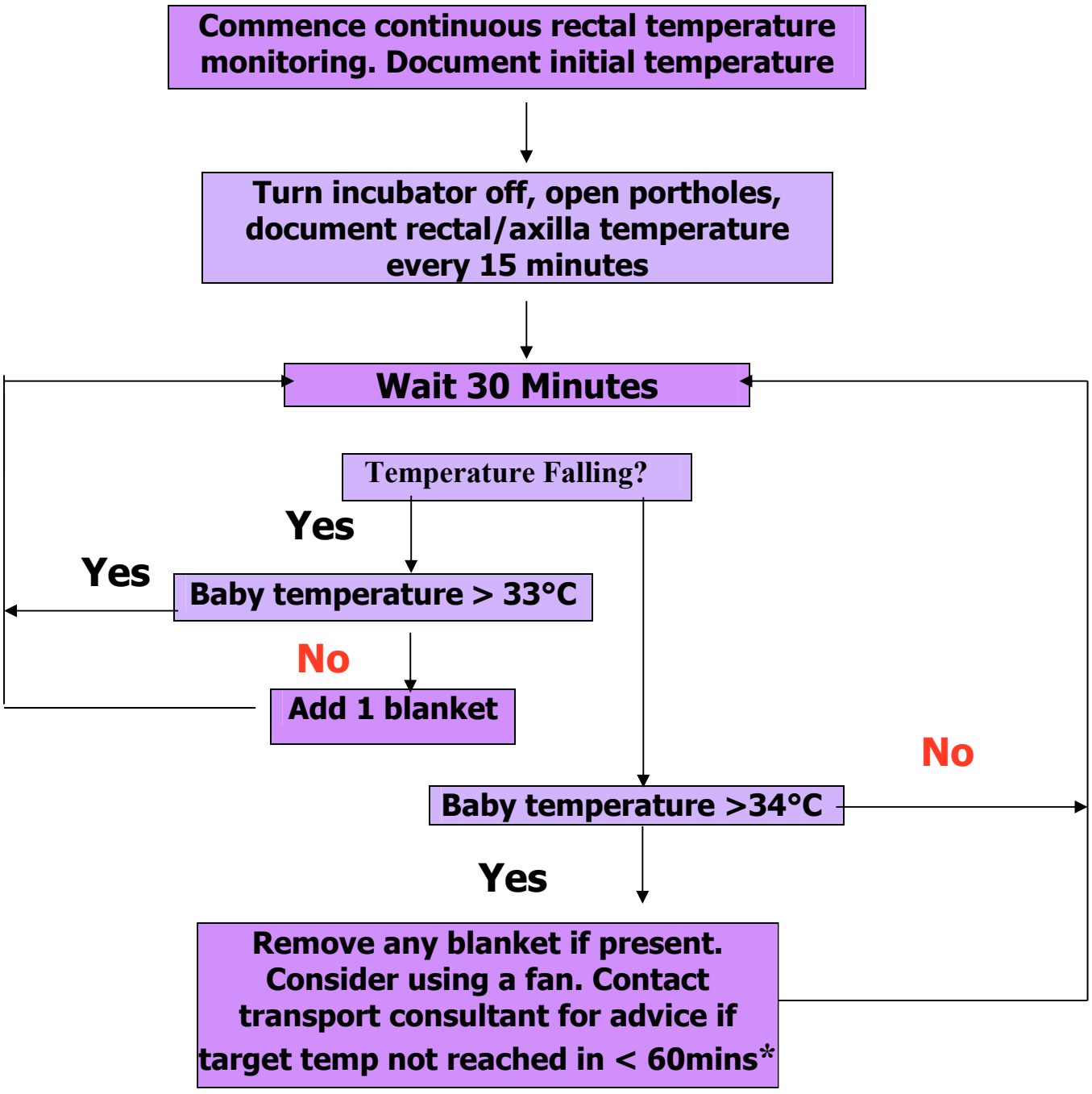
Appendix 1

REFERRAL OF A BABY FOR COOLING TREATMENT PROTOCOL



Appendix 2

PASSIVE COOLING IN REFERRAL CENTRE PROTOCOL

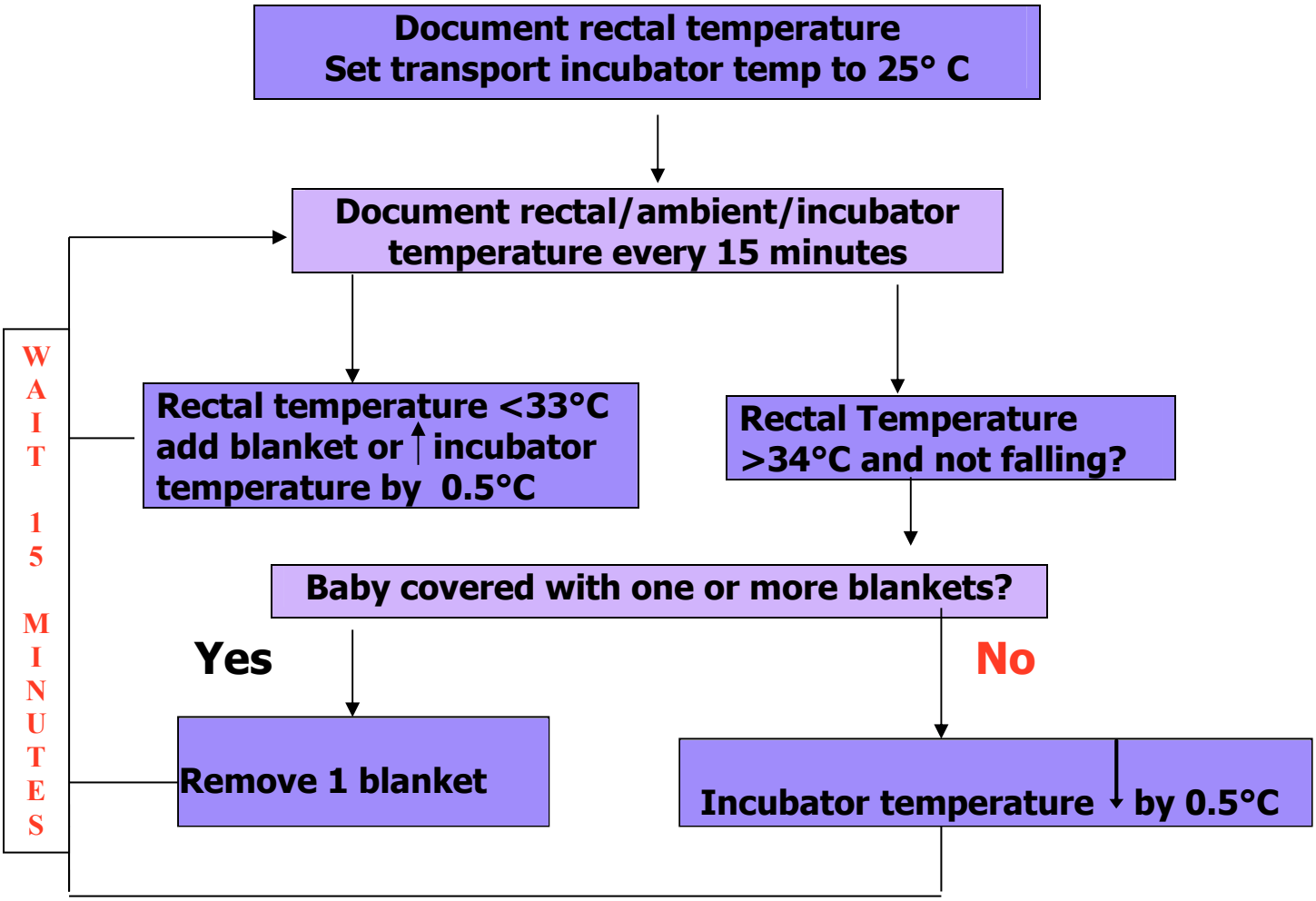


TARGET TEMPERATURE 33.0-34.0°C

***Ice packs should not be used for cooling as these can result in severe hypothermia. Active cooling (e.g. fan) should not be used unless rectal temperature is monitored.**

Appendix 3

PASSIVE COOLING DURING TRANSPORT PROTOCOL



Other factors that may improve cooling: use a fan if safe and available, remove any head covering used to secure ETT. If not achieving adequate hypothermia contact transport consultant /cooling centre

TARGET TEMPERATURE 33.0- 34.0 °C

Appendix 4

NNTP equipment Checklist

- **Rectal temperature probes and leads to connect to 'Transport' monitor.**
- **Thermometer for ambient temperature readings**
- **Candidacy for Cooling Checklist**
- **NNTP Transport flow-sheet ,**
- **Cooling log (Appendix 5)**
- **NNTP Cooling Protocol.**

***Please refer to Appendix 6: NNTP's Candidacy for Cooling Checklist available in hard copy in your unit or @ http://www.nntp.ie/downloads/NNT_Cooling.pdf**

NNTP Transport Cooling Log ***(The Following information should be recorded on this log. Photocopy for transport records)***

PATIENT NAME ---------- WEIGHT---------- GEST---------- D.O.B. ----------TIME BORN----------

REFERRING UNIT ----------

RECEIVING UNIT ----------

ADMISSION TEMP ---------- (rectal / axilla / tympanic/ skin)

TEMP ON STARTING PASSIVE COOLING---------- (rectal / axilla / tympanic/ skin).: TIME TARGET TEMPERATURE REACHED:----------

	Cooling Started	+15mins	+30 mins	+45mins	+1hr	+1hr15m	+1hr 30m	+1 hr 45m	+2hrs
TIME									
Patient Location (open table/unit/ Incubator/ ambulance)									
Ambient Temperature (ie room/amb)									
Rectal Temperature									
Axilla Temperature (if no rectal)									
Incubator Temp. (Record even if turned off)									
No. of Blankets									

	+2hr 15 M	+2hr 30m	+2hr 45m	+3hrs	+3hr15 m	+3hr 30m	+3 hr 45m	+4hrs	+ 4hr 15m
TIME									
Patient Location									
Ambient Temperature									
Rectal Temperature									
Axillal Temp. (if no rectal)									
Incubator Temp. (Record even if turned off)									
No. of Blankets									