

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### Guideline Responsibilities and Authorisation

<b>Department Responsible for Guideline</b>	NICU
<b>Document Facilitator Name</b>	Richard Pagdanganan
<b>Document Facilitator Title</b>	Associate Charge Nurse Manager
<b>Document Owner Name</b>	Chantelle Hill
<b>Document Owner Title</b>	Charge Nurse Manager
<b>Target Audience</b>	Nurses
<p><b>Disclaimer:</b> This document has been developed by Waikato District Health Board specifically for its own use. Use of this document and any reliance on the information contained therein by any third party is at their own risk and Waikato District Health Board assumes no responsibility whatsoever.</p>	

### Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
1	Leanne Baker	Nov 2011	New version
2	Joyce Mok	April 2014	3 yearly update
3	Natali Ollington	June 2018	3 year update
4	Richard Pagdanganan, Ancy Jose, Narika McDowall	October 2021	3 yearly update

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### Contents

1	Overview .....	3
1.1	Purpose .....	3
1.2	Scope .....	3
1.3	Patient .....	3
1.4	Definitions.....	3
2	Clinical Management .....	4
2.1	Competency required .....	4
2.2	Equipment .....	4
2.3	Guideline .....	5
2.3.1	Set up for whole body cooling:.....	5
2.3.2	Observations during treatment.....	7
2.3.3	Rewarming .....	8
2.4	Potential complications.....	10
2.5	Audit .....	10
3	Evidence base .....	10
3.1	Bibliography.....	10
3.2	Associated Waikato DHB Documents.....	11

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 1 Overview

#### 1.1 Purpose

To ensure the CritiCool™ device is used safely to provide whole body therapeutic hypothermia to improve long-term outcomes in infants having evidence of both asphyxia and moderate to severe encephalopathy.

#### 1.2 Scope

Waikato DHB staff working in NICU

#### 1.3 Patient

Neonates

#### 1.4 Definitions

<b>CFM monitor</b>	The Cerebral Function Monitor (CFM) provides real time monitoring of brain function to assist with earlier diagnosis and treatment, and may assist in predicting outcomes.
<b>CritiCool™</b>	CritiCool™ is a temperature regulating systems, induces, maintains, and reverses hypothermia in an effective and precise manner. The system is composed of two elements, the CritiCool™ device, and the CureWrap™.
<b>CritiCool™ device</b>	The device functions as a control unit constantly monitoring the baby's core temperature and as a cooling/rewarming device which brings the circulating water to the required temperature by using its on-board body temperature control algorithm.
<b>CureWrap™</b>	This is a flexible 3-dimensional single piece design, through which the water circulates. It is designed to be in close contact with a large area of the body, thus allowing optimization of energy transfer.
<b>Hypoxic Ischaemic Encephalopathy (HIE)</b>	HIE in term infant is a result of an acute shortage of oxygen and blood flow in the perinatal period resulting in depression at birth and ongoing encephalopathy.
<b>CPAP</b>	Continuous positive airway pressure
<b>aEEG</b>	Amplitude-integrated electroencephalography (aEEG) is a method for continuous monitoring of brain activity. In its simplest form, aEEG is a processed single-channel electroencephalogram that is filtered and time-compressed.

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 2 Clinical Management

#### 2.1 Competency required

Registered nurse who has completed Level 3 CPAP and/or ventilator orientation.

#### 2.2 Equipment

- CritiCool™ device (in store room) with grey and green cables and 2 x water hoses (hoses for filling and emptying water)



Figure 1 Criticool™ Device

- Cables and water hoses – NOT DISPOSABLE



Figure 2 Cable and Water Hose

- Bubble wrap: small piece for under head (in store room)
- Cooling wrap: CritiCool™ Infant CureWrap™ - 2 sizes available: < 4kg and 4-7kg (in store room)
- Access to 6L cold tap water (e.g. technician's workshop, gas room)
- Funnel + tubing + plastic measuring jug
- Rectal temperature probe – blue rectal probe is disposable (in store room)
- Skin (surface) probe cover
- Water-out connector, if none available, you can cut one (with a clamp) off used Cure Wrap

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 4 of 11

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 2.3 Guideline

#### 2.3.1 Set up for whole body cooling:

##### 1. Preparing CritiCool™ Device

- Confirm with medical staff and ward policy that the neonate meets the criteria for therapeutic cooling and check treatment as prescribed.
- Inform parents if present.
- Fill reservoir in gas room/technician's workshop with 6 litres of cold tap water to level between two red lines.
- Assemble equipment at infant bedside.
- Ensure unit is plugged into blue UPS power, leave hoses and sensors disconnected from infant.
- Turn power on (power switch at back of machine).

##### 2. Setting up temperature on CritiCool™

- Wait until CritiCool™ self-test completed.
- Once self-test done unit will automatically default to cooling operational mode, panel will display a snowflake icon with temp set to 33°C.
- Manually adjust temp to 33.5°C.

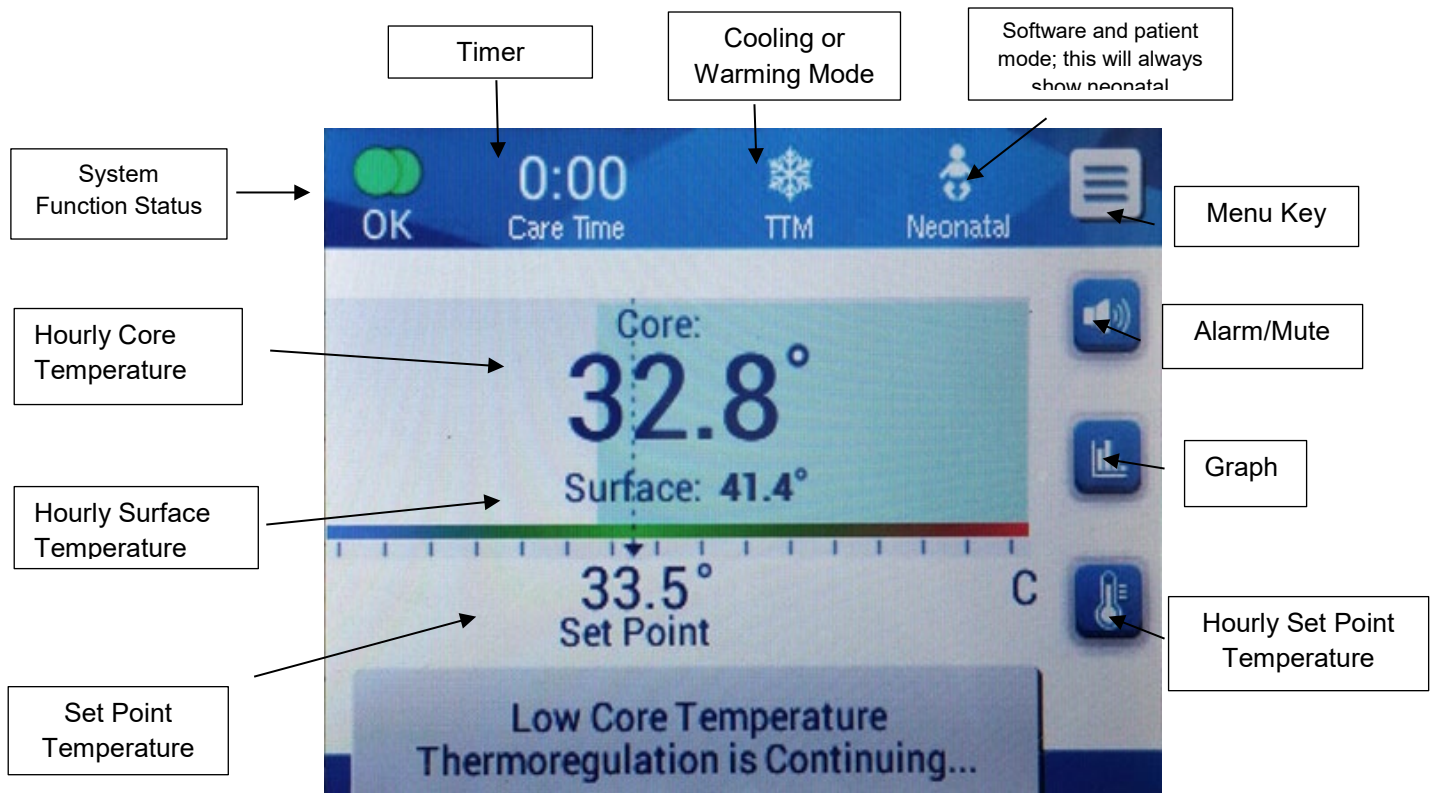


Figure 3 Regulation of Core Temperature

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 3. Preparing infant for cooling

- Turn off radiant warmer.
- Lay baby on unfilled cooling wrap.
- Do not secure cooling wrap around baby while empty because it will expand after filling, increase the risk of circulatory compromise if already fitted and becomes tight following filling.
- Ensure no folds or bends present that may occlude water flow or cause pressure areas.
- Hoses should exit wrap at infant head end.
- Do not use cooling wrap to lift or move the baby.
- Place nappy on baby, urinary catheter may be insitu for some babies.

### 4. Applying temperature probes

- Measure and insert rectal temperature probe to **approximately 5cm** (this may vary on the age and size of the neonate), secure to inner thigh of infant and plug into cooling unit *via grey sensor* to provide continuous core temperature monitoring during therapy – unit will adjust function to maintain infant temperature at set level.

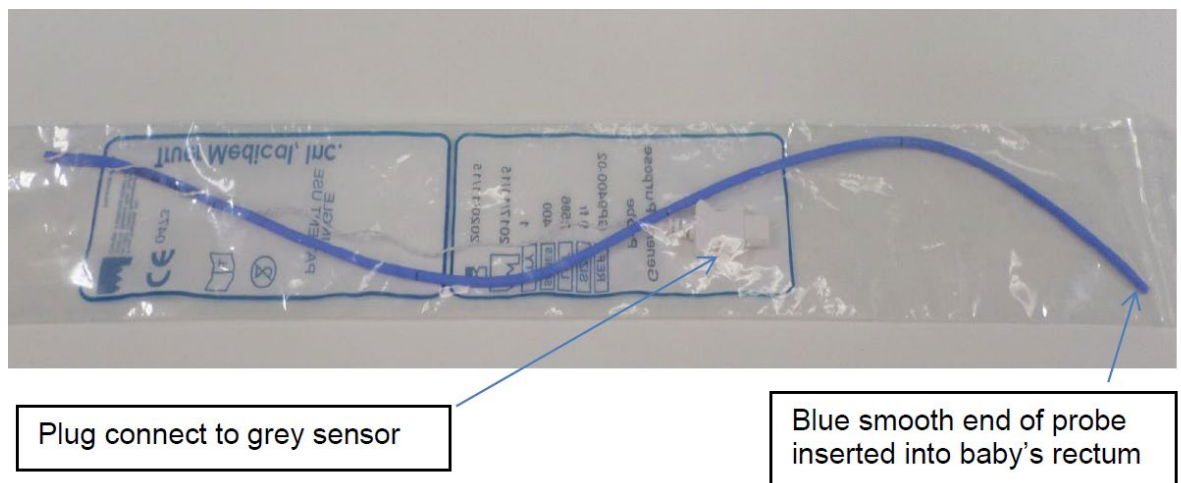


Figure 4 Rectal Temperature Probe

- Secure skin temperature probe to baby's skin **outside of the CureWrap™**, e.g. **upper chest / arm / leg** and connect to device *via green sensor*.

### 5. Filling cooling wrap

- Attach blue hoses to cooling unit and to cooling wrap and turn on the device.
- Open clamps – cooling wrap will automatically fill and a clicking sound should be heard.
- Check cooling wrap for signs of leakage during filling, and replace if leaking.

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 6. Securing cooling wrap

- Wrap and secure the filled Infant CureWrap™ around infant-maintain a finger width space between the baby's skin and the wrap.
- Place a piece of bubble wrap under and around head where wrap is touching skin because it helps maintain consistent head temperature during periods when cooling wrap temperature is fluctuating.
- Do not use hats.
- Circulation is confirmed when the "flow icon" (top right of display is turning).
- Ensure you have core and surface temperature readings. The infant's temperature should now be managed by the CritiCool™.

#### Special notes:

1. If baby using CFM monitor with needle electrodes, ensure electrodes adequately covered or consider using gel electrodes.
2. Be aware that needle electrodes can pierce cooling wrap if dislodged. When turning the baby be mindful with the needle electrodes to prevent sharp injury.
3. Do not use cooling wrap to lift or move baby.
4. Make sure cooling wrap is not folded or clamped.
5. Avoid handling cooling wrap with sharp objects to prevent damaging the wrap.

### 2.3.2 Observations during treatment

#### 1. Continuous monitoring of infant

- Monitor continuously and document hourly according to Waikato DHB Clinical management NICU Nursing Procedure: *Admission to Level 3 intensive care nursery (4571)*.

In addition:

- Rectal temperature and skin temperature
- Axilla temperature 4 hourly to correlate the readings of the core temperatures.
- Heart rate (HR), respirations, pulse oximetry, blood pressure, invasive blood pressure monitoring if possible
- HR alarms may need to be adjusted if HR slows during hypothermia: discuss with medical staff because heart rate may reduce during cooling as a normal physiological response as metabolism and activity slows
- aEEG monitoring

#### 2. Assessment of infant

- Assess pain & sedation score and sedation management is appropriate, according to Waikato DHB Clinical management NICU Nursing guideline: [Neonatal Pain and Ssedation: Assessment and Nursing Management](#).
- Report any difficulty in maintaining temperature at 33.5°C to ensure infant receives optimum therapy benefit. Document the approximate time that the therapeutic cooling was achieved in the observation sheet and clinical notes.
- Document recordings and report deviations to prescribed parameters.

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 7 of 11



## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

- Monitor skin integrity during cares and positioning to identify any compromised perfusion.

### 3. Medical review

Infant undergoing cooling should have a review by Registrar/Nurse Practitioner/Nurse Specialist if there is:

- Difficulty in maintaining core temperature between 33.5-34°C throughout the 72hr cooling period.
- Persistent bradycardia <75bpm or abnormal rhythm – may need increase temperature.
- Persistent hypoxaemia despite appropriate support – may need increase temperature.
- Persistent hypotension despite appropriate management – may need increase temperature.
- Break-through seizures on re-warming – may need to prolong cooling (to be discussed with on-call Neonatologist).

### 4. Observations on cooling equipment

- Monitor water level in CritiCool™ device – needs to remain between the two red marks in water level indicator.
- Ensure no kinking in the water tubes that may occlude water flow or folds and bends in CureWrap™ that cause pressure areas.

## 2.3.3 Rewarming

### 1. Prescriptions

- Start 72 hours after commencing hypothermia (not after delivery) unless specified by on-call Neonatologist.
- Medical staff chart start time on Daily Treatment Sheet (T1481HWF)
- Re-warming should be gradual.

### 2. Re-warming

- Leave cooling wrap and bubble wrap in place.
- Increase set temperature manually by 0.1°C every 30 minutes to re-warm slowly, i.e. warming rate of 0.3°C/hr.
- Record the time and set temperature every 30 minutes to ensure gradual and safe increase in temperature.

### Special notes:

- Re-warming should take approximately 6-10 hours. Slow rewarming is necessary to avoid peripheral vasodilation and blood pressure instability.
- Do not use automatic warming programme as this warms the baby faster than recommended.

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 8 of 11



## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 3. Observe for seizures and temperature instability

- Monitor continuously and document hourly infant's vital signs, according to Waikato DHB Clinical management NICU Nursing Procedure - [Admission to Level III Intensive Care Nursery](#).
- Observe for seizure activity during re-warming.
- Report seizure activity to medical staff immediately because infant may need to be re-cooled.
- Monitor temperature after normothermia is achieved to avoid hyperthermia (>37°C).
- Assess pain & sedation score and sedation management is appropriate.

### 4. On completion of re-warming

- Remove cooling wrap when core temperature reaches 36.5°C.
- Turn off CritiCool™ or switch to standby.
- Wait a few seconds then close cooling wrap clamps to stop water leaking from wrap once disconnected.
- Disconnect water tubes from cooling wrap.
- Unwrap baby.
- Discard wrap.
- Disconnect hoses.
- Disconnect core temperature and surface temperature sensors.
- Disconnect cables from cooling wrap and CritiCool™ device.
- **NB: the hoses and cable of CritiCool™ device are not disposable.**
- Turn radiant warmer on to "Baby Mode" to ensure infant stays within normothermic range.
- Allow time for core temperature to stabilise and maintain.
- Connect rectal probe to Phillips™ monitor.
- Remove rectal probe once temperature is stable at 37°C.
- Discard short blue rectal temp probe.

### 5. Emptying water after use

- Connect the unit to a power source and turn on the device.
- Select Service from the menu then select empty and touch to confirm.
- Connect the water hoses and make sure that the draining plug is connected.
- Place "out" water hose with inserted drain plug into a sink or water receptacle
- Touch "Start" and wait for the message: "Water tank is empty"
- Switch off system and unplug from power source
- Clean and disinfect the machine and accessories as per the hospital protocol
- Turn unit on and water will automatically drain.

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 9 of 11

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

### 6. Cleaning of CritiCool™: Nurses' responsibility

- Clean with disinfectant wipes the CritiCool™ device after use, including the basket, cooling hoses, cables and sensor cables
- Restock basket with
  - cooling wrap
  - bubble wrap
  - rectal temperature probe
  - probe cover
  - water-out connector
- Put the CritiCool™ device + accessories in store room ready for next use.

### 2.4 Potential complications

- Bradycardia
- Potential for pulmonary hypertension
- Potential increase in BP support
- Potential disturbance of coagulation cascade

### 2.5 Audit

- Indicators – CritiCool™ device has the label “Safety tested to required NZ standards for use on medical equipment only”

## 3 Evidence base

### 3.1 Bibliography

- MTRE (2016). *CritiCool® User Manual*. Retrieved on August 27, 2018 from <http://mtre.com/wp-content/uploads/2016/08/DDT136000-Rev-L.-CritiCool-6.1-User-Manual-June-2016-WEB.pdf>
- Newborn Services Practice Committee (2019). Cooling-therapeutic hypothermia in neonates. Retrieved from <https://starship.org.nz/guidelines/cooling-therapeutic-hypothermia-in-the-neonate/>
- Royal Children's Hospital (2019). Therapeutic hypothermia in the neonate. Retrieved from [https://www.rch.org.au/rchcpg/hospital\\_clinical\\_guideline\\_index/Therapeutic\\_hypothermia\\_in\\_the\\_neonate/](https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Therapeutic_hypothermia_in_the_neonate/)
- Sakr, M. & Balasundaram, P. (2021). Neonatal therapeutic hypothermia. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK567714/>
- Staffordshire, Shropshire and Black Country Neonatal Operational Delivery Network and Southern West Midlands Neonatal Operational Delivery Network (2018). Hypoxic ischaemic encephalopathy (HIE). *Neonatal Guidelines 2017-19* (7th Ed.), p168-171. Retrieved on August 27, 2019 from <https://www.networks.nhs.uk/nhs-networks/staffordshire-shropshire-and-black-country-newborn/neonatal-guidelines>

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 10 of 11

---

## CritiCool™ Device for Infants in Newborn Intensive Care Unit (NICU)

---

### 3.2 Associated Waikato DHB Documents

- Waikato DHB NICU Medical Protocol: [Neonatal Encephalopathy Management](#) (1588)
- Waikato DHB NICU Nursing Procedure: NICU Nursing Procedure - [Admission to Level III Intensive Care Nursery](#) (4571)
- Waikato DHB NICU Nursing Guideline: [Neonatal Pain and Sedation: Assessment and Nursing Management](#) (1684)

Doc ID:	1639	Version:	03	Issue Date:	15 OCT 2021	Review Date:	15 OCT 2024
Facilitator Title:	Registered Nurse			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 11 of 11