PROTOCOL FOR TARGETED TEMPERATURE MANAGEMENT FOLLOWING CARDIAC ARREST

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Key Document Owner:	Dr Sian Bhardwaj
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Key Amendments

Date	Amendment	Approved by
30th May 2024	Added reference from NICE	Dr Gavin Nicol

INTRODUCTION

Out of hospital cardiac arrest is common and is associated with a high rate of mortality.[1] With early ambulance treatment, about 30% of these patients have a return of spontaneous circulation and are transported to hospital. However, many patients remain comatose owing to hypoxic brain injury, and this is the leading cause of feath after hospital admission.

Over the past decade, there has been considerable interest in the use of therapeutic hypothermia, where patients are cooled to a target temperature of 32-34ºC and this temperature is maintained for 12-24 hours. This approach is based on the results of two clinical trials published in 2002.[2 3]

More recently, a larger trial compared a target temperature of 36ºC with that of 33ºC.[4] The Targeted Temperature Management (TTM) trial randomised 939 patients who remained comatose after resuscitation from out of hospital cardiac arrest at hospitals in Europe and Australia. The primary outcome measure was all cause mortality at the end of the trial. Overall, 50% of the patients in the group allocated to 33ºC for 24 hours died compared with 48% of those allocated to the 36ºC group (hazard ratio 1.06, 95% confidence interval 0.89 to 1.28; P=0.51). This clinical trial was well conducted and the conclusion was clear- patients who are comatose after resuscitation from out of hospital cardiac arrest do not benefit from lowering the body temperature to 33ºC.

The compelling evidence from the TTM trial is that patients who have been resuscitated from an out of hospital cardiac arrest and who remain comatose should not receive therapeutic hypothermia (32-34ºC) after admission to hospital. Instead, a temperature target of 36ºC is appropriate and much more easily achieved. Importantly, prognostication in such patients should be delayed for at least 72 hours after sedation is stopped, except in cases of brain death or early myoclonus with bilaterally absent somatosensory evoked responses.

A recent paper in the New England Journal of Medicine looked at hypothermia versus normothermia after out-of-hospital cardiac arrest and concluded that, “In patients with coma after out-of-hospital cardiac arrest, targeted hypothermia did not lead to a lower incidence of

death by 6 months than targeted normothermia."[5] This supports the use of targeted temperature management post cardiac arrest.

This protocol is compliant with the latest NICE guidelines.[6]

INDICATIONS
Patients referred to ITU after cardiac arrest who have return of spontaneous cardiac output (ROSC) but remain comatose (GCS <9). This includes out of hospital and in hospital cardiac arrests of all rhythms- asystole, pulseless electrical activity (PEA), ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT).

EXCLUSIONS
- Do not attempt resuscitation (DNAR) order
- Severe systemic infection
- Severe cardiogenic shock (SBP <80mm Hg despite fluid loading/vasopressors and/or inotropes/ intra-aortic balloon pump)
- Established multi-organ failure
- Severe trauma
- Pre-existing medical coagulopathy (patients given thrombolytic therapy or an anticoagulant can be cooled)
- Pregnancy
- Suspected or confirmed intracranial bleed/ stroke

COMPLICATIONS
- Shivering and catecholamine release
- Vasoconstriction
- Infection
- Coagulopathy
- Diuresis and hypovolaemia
- ↓K+, ↓Ca2+, ↓Mg2+
- ↓ Insulin sensitivity and secretion
- Pancreatitis

BACKGROUND
Current practice at Worcestershire Acute Hospitals NHS Trust (WAHT) is to follow the recently published TTM trial that patients who have been resuscitated from an out of hospital cardiac arrest and who remain comatose should not receive therapeutic hypothermia (32-34ºC) after admission to hospital. Instead, a temperature target of 36ºC is appropriate and much more easily achieved.[3]

METHOD
Aim to reach a temperature of 36ºC within 2 hours of the return of spontaneous cardiac output (ROSC). This is achieved by using the Blanketrol III device unless the patient already has a temperature of 36ºC and maintains their temperature at 36ºC. Two devices have been purchased for use in the Accident and Emergency (A+E) departments and Intensive Care Units (ICUs) of the Alexandra Hospital, Redditch and the Worcestershire Royal Hospital. The Blanketrol III uses a water therapy system in cooling blankets to induce hypothermia. The Blanketrol devices and associated consumables, the '*Kool Kits'*, are stored on the ICUs but

can be wheeled into the A+E departments to initiated the cooling process. It should no longer be necessary to use the complete '*Kool* Kit', a temperature of 36ºC within 2 hours of admission should be achieved by using the blanket alone and not the associated jackets and head gear.The process of cooling should be initiated as soon as ROSC occurs and the time noted. The patient's temperature should be recorded hourly during the cooling and rewarming phases and two hourly during the maintenance phases using a naso-pharyngeal temperature probe.

Sedate the patient with propofol and remifentanil and if shivering is a problem use a bolus or infusion of a neuromuscular blocking agent. Tight glycaemic control should be achieved by following the insulin protocol. Consider giving phenytoin or levetiracetam if evidence of seizure activity or if the patient is paralysed.

After 24 hours of cooling use the Blanketrol III device to rewarm the patient to 37ºC. Keep the Blanketrol III device on the patient for a further 48 hours to prevent hyperthermia. If hyperthermia occurs use the Blanketrol III device to maintain the patient at 37ºC.

The patient should be checked regularly for pressure sores that potentially could develop from the incorrect fitting of the *Kool Kit* garments.

The Blanketrol device can also be used to rewarm hypothermic patients.

REFERENCES

1. Deasy C, Bray J, Smith K et al. Cardiac arrest outcomes before and after the 2005 resuscitation guidelines implementation: evidence of improvement? *Resuscitation* 2011; 82: 984-8.
2. The Hypothermia After Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *N Eng J Med* 2002; 346(22): 549-556.
3. Bernard S, Gray T, Buist M et al. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. *N Eng J Med* 2002; 346(8): 557-563.
4. Nielsen N, Wetterslev J, Cronberg T et al. Targeted temperature management at 33ºC versus 36ºC after cardiac arrest. *N Engl J Med* 2013; 369: 2197-206.
5. Dankiewicz J, Cronberg T, Lilja G et al. Hypothermia versus normothermia after out-of-hospital cardiac arrest. *N Eng J Med* 2021: 384: 2283-2294.
6. NICE IPG782. Temperature control to improve neurological outcomes after cardiac arrest. www.nice.org.uk/guidance/IPG782

Supporting Document 1 – Equality Impact Assessment form

Worcestershire Acute Hospitals NHS Trust

Herefordshire & Worcestershire STP - Equality Impact Assessment (EIA) Form
Please read EIA guidelines when completing this form

Section 1 - Name of Organisation (please tick)

Herefordshire & Worcestershire STP		Herefordshire Council		Herefordshire CCG	
Worcestershire Acute Hospitals NHS Trust	x	Worcestershire County Council		Worcestershire CCGs	
Worcestershire Health and Care NHS Trust		Wye Valley NHS Trust		Other (please state)	

Name of Lead for Activity	**Dr Gavin Nicol**

Details of individuals completing this assessment	**Name**	**Job title**	**e-mail contact**
	Dr Gavin Nicol	**Consultant Anaesthetist**	**gavin.nicol@nhs.net**
Date assessment completed			

Section 2

Activity being assessed (e.g. policy/procedure, document, service redesign, policy, strategy etc.)	**Title: PROTOCOL FOR TARGETED TEMPERATURE MANAGEMENT FOLLOWING CARDIAC ARREST**			
What is the aim, purpose and/or intended outcomes of this Activity?				
Who will be affected by the development & implementation of this activity?	❑ x ❑	Service User Patient Carers	❑ ❑ ❑	Staff Communities Other _____

	❑	Visitors	❑	
Is this:	x Review of an existing activity ❑ New activity ❑ Planning to withdraw or reduce a service, activity or presence?			
What information and evidence have you reviewed to help inform this assessment? (Please name sources, eg demographic information for patients / services / staff groups affected, complaints etc.				
Summary of engagement or consultation undertaken (e.g. who and how have you engaged with, or why do you believe this is not required)				
Summary of relevant findings				

Section 3

Please consider the potential impact of this activity (during development & implementation) on each of the equality groups outlined below. **Please tick one or more impact box below for each Equality Group and explain your rationale**. Please note it is possible for the potential impact to be both positive and negative within the same equality group and this should be recorded. Remember to consider the impact on e.g. staff, public, patients, carers etc. in these equality groups.

Equality Group	**Potential positive impact**	**Potential neutral impact**	**Potential negative impact**	**Please explain your reasons for any potential positive, neutral or negative impact identified**
Age				
Disability				
Gender Reassignment				
Marriage & Civil Partnerships				
Pregnancy & Maternity				
Race including Traveling Communities				
Religion & Belief				
Sex				
Sexual Orientation				

Equality Group	Potential positive impact	Potential neutral impact	Potential negative impact	Please explain your reasons for any potential positive, neutral or negative impact identified
Other Vulnerable and Disadvantaged Groups (e.g. carers; care leavers; homeless; Social/Economic deprivation, travelling communities etc.)				
Health Inequalities (any preventable, unfair & unjust differences in health status between groups, populations or individuals that arise from the unequal distribution of social, environmental & economic conditions within societies)				

Section 4

What actions will you take to mitigate any potential negative impacts?	Risk identified	Actions required to reduce / eliminate negative impact	Who will lead on the action?	Timeframe
		.		
How will you monitor these actions?				
When will you review this EIA? (e.g in a service redesign, this EIA should be revisited regularly throughout the design & implementation)				

Section 5 - Please read and agree to the following Equality Statement

1. Equality Statement

1.1. All public bodies have a statutory duty under the Equality Act 2010 to set out arrangements to assess and consult on how their policies and functions impact on the 9 protected characteristics: Age; Disability; Gender Reassignment; Marriage & Civil Partnership; Pregnancy & Maternity; Race; Religion & Belief; Sex; Sexual Orientation

1.2. Our Organisations will challenge discrimination, promote equality, respect human rights, and aims to design and implement services, policies and measures that meet the diverse needs of our service, and population, ensuring that none are placed at a disadvantage over others.

1.3. All staff are expected to deliver services and provide services and care in a manner which respects the individuality of service users, patients, carer's etc, and as such treat them and members of the workforce respectfully, paying due regard to the 9 protected characteristics.

Signature of person completing EIA	
Date signed	
Comments:	
Signature of person the Leader Person for this activity	
Date signed	
Comments:	

Supporting Document 2 – Financial Impact Assessment

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document:	Yes/No
1.	Does the implementation of this document require any additional Capital resources	
2.	Does the implementation of this document require additional revenue	
3.	Does the implementation of this document require additional manpower	
4.	Does the implementation of this document release any manpower costs through a change in practice	
5.	Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programmes or allocated training times for staff	
	Other comments:	

If the response to any of the above is yes, please complete a business case and which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval