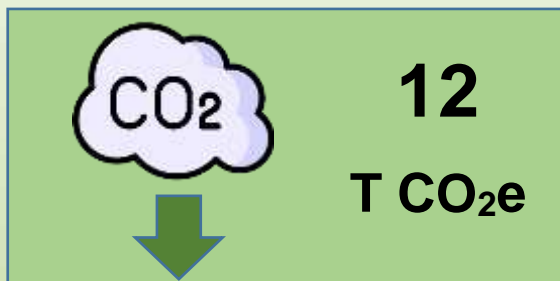


National Green Theatres Programme

Prògram Nàiseanta Lannsaireachd Uaine

Rationalising fluid giving sets and warming devices – Opportunity for Change

Publication Date: October 2023



1. Description of action

- 1.1 In elective cases clinicians, where appropriate, should opt for a more financially and environmentally sustainable fluid warming device as outlined in this opportunity for change.

2. Background

- 2.1 In many Scottish hospitals warming units that heat fluid as it flows to the patient are utilised to warm IV fluids (contemporaneous warming - CW) The advantage of these units is their ability to warm cold fluids or blood products rapidly whilst being delivered to the patient. This makes it excellent for when high volumes of fluid or blood transfusions are needed, such as in major bleeding or trauma. The downside is the cost, single-use plastic waste created and energy consumption. In elective cases, where appropriate, an alternative warming system should be used to help reduce cost and environmental impact.
- 2.2 Work is already underway at University Hospital Monklands in NHS Lanarkshire to address and adapt this practice. A snapshot audit identified that fluid/blood warming sets were being routinely used within theatre cases that would have no additional benefit or impact on the patient.¹ A questionnaire distributed within the department found that 78% of staff felt that fluid/blood warmer sets were being overused resulting in additional costs and waste. As a result of the audit and questionnaire clinicians at this site have produced theatre posters and held education and awareness sessions to help reduce the use of fluid warming sets. To find out more about this work see appendix 2.
- 2.3 By switching to an alternative warming device such as a warming cabinet or shelf a clinician will use approximately 100g less plastic per case when compared to the CW systems. Introductory figures suggest that reducing the use of the CW single use product by 50% could save over 3.5 tonnes of plastic waste per year across NHS Scotland.
- 2.4 An analysis of the embodied carbon² of the single use materials suggest that reducing use by 50% would save just under 12 tonnes of embodied Co2e annually.
- 2.5 Further to the carbon savings there is also a significant financial green dividend. Each single use set costs an average of £6.74³ and extrapolated figures based on the NRAC funding indicate that over 73,000 units are ordered each year, equating to an annual spend of £514,140.68, reducing the use of these devices by 50% would generate a saving of over £257,000 pounds nationally.

¹ See section 9 for information and evidence on the impact and uses of warmed intravenous fluids.

² Embodied carbon: the carbon footprint of an item based on the materials within it. The embodied carbon figures are 'cradle to gate' and include the embodied carbon used during raw material extraction, manufacturing and transportation before leaving the factory gate. [Sustainable Healthcare Learning](#).

³ Figures received from National Procurement 05/05/2023

3. Who needs to be involved in this change locally?

3.1 In order to implement this action it is recommended that the following groups should be consulted and involved:

- Anaesthetists
- Surgeons
- Theatre Staff / Managers
- Waste management officers
- Local Procurement staff
- National Procurement staff

4. Boundaries

4.1 The table below identifies the boundaries for this action:

In scope	Out of scope
<ul style="list-style-type: none"> • Elective Surgeries 	<ul style="list-style-type: none"> • Emergency surgeries • Major Obstetrics • Paediatric cases

5. What is the change and how will it be implemented?

5.1 Members of staff will use warming cabinets or shelf warmers such as the Enthermic IV Now warmers in preference to the high flow warming devices (CW). This will be a clinician led change.

6. What are the potential co-benefits of this change?

6.1 Based on national procurement figures and the Inventory of Carbon and Energy database the national opportunity has been calculated below:

Outcome	Potential Benefits
Carbon Savings	11.9 tonnes of embodied carbon and over 3.5 tonnes of plastic waste.
Cost Savings	£257,070.34 nationally.

7. Risks and Issues

7.1 As part of the development of this action there has been one risk identified to date, outlined below:

Description of risk or issue	Mitigation / Action Plan
There is a risk that clinicians do not make the change and continue with current practice.	The opportunity for change will be shared with sustainability leads and CfSD champion within each health board who will work to implement the change.

8. Implementation Guidance

- 8.1 The opportunity for change highlights the importance of implementing this action. This change will help your site and NHS Scotland achieve net-zero emissions by 2040 as stated in NHS Scotland’s Climate Emergency & Sustainability Strategy 2022-2026.
- 8.2 Below the National Green Theatres Programme has provided guidance on how you can implement this change within your area. If you require any further information or guidance, please contact the National Green Theatres programme team on: cfsdgreentheatres@gjnh.scot.nhs.uk

Local Sustainability or Green Theatre Group:	
1.	Review opportunity for change and validate what this means locally.
2.	Provides National Green Theatre Programme Team with validated information/local targets.
3.	Convene a discussion with the staff who need to implement it and those who are impacted by the action.
4.	Understand what the opportunity is for implementing the action locally: work already undertaken and challenges.
5.	Agree a local implementation plan.
6.	Implement local plan.
7.	Provide data as per measurement plan.
8.	Monitor implementation of action.

9. Evidence

The papers below provide background on the heat capacity of the human body and routes of heat loss. Secondly, they provide insight on the importance of warmed intravenous fluids for preventing perioperative hypothermia.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6769178/>

<https://www.sciencedirect.com/science/article/pii/S0196064407013017>

<https://www.liebertpub.com/doi/pdf/10.1089/ther.2020.0036>

Appendix 1 – Measurement plan

Name of measure (<i>carbon, cost, staff experience and patient outcomes</i>)	Type of measure (<i>Outcome, Process, Balancing</i>)	Concept being measured?	Where is the data available from?	Who is collecting the data?	Frequency of collection?
Carbon	Outcome	The plastic waste saved by implementing the change and carbon Co2e equivalent saved.	National procurement. Volume of high flow warming sets ordered before vs after the change	NGTP will collect latest data set for quarterly meetings.	Quarterly
Financial Savings	Outcome	Savings accrued from the change in practice	National Procurement	NGTP will collect latest data set for quarterly meetings.	Quarterly
Staff Experience and Engagement	Process	Staff pushback	Verbal	Captured at the SDG and measurement discussions	Quarterly

Appendix 2 – NHS Lanarkshire work

Appropriate Fluid Giving Set Usage





Situation

A blood giving set with a ranger warming device is widely used for fluid administration in theatre.

Background

Blood giving sets are required for blood administration because of the particulate filter. They can be useful when high flow rates are required (e.g. resuscitation).

NICE (CG65) recommends use of a fluid warmer or warmed fluids when >500ml of fluid will be given. Warm IV fluids may reduce perioperative hypothermia shivering – but there is little added benefit if patient warming devices are used. At flow rates of <500ml/hr fluid will have cooled again.

Product	Blood giving set	Standard Giving set	Ranger warmer	Extension (100cm) + injection port
				
Cost Prices: Dec 21	£0.77	£0.40	£7.26	£1.05
Weight (incl packaging)	79g	34g	98g	14g

Analysis

Appropriate giving set selection could save £7.63 per case. This could save upwards of £50,000* in UHM alone. Appropriate selection of giving set could save 143g of clinical waste per case, or approximately 1000kg/year*. This could save an additional £760, but also 1000kg of CO₂e.

Recommendations

A standard giving set should be used as default. An extension with an injection port can be added to allow easy drug injection. IV fluids should be taken from the warming cabinet as standard.

Blood giving sets/fluid warmers should be reserved for cases with high likelihood of blood transfusion/large volume resuscitation (e.g. 'major' cases or shocked patients.)

The anaesthetic department at UHM have agreed that warmers should only be run through as the default for the following cases:

- Emergency laparotomies
- Any emergency with a septic/shocked patient or a patient requiring blood transfusion
- Laryngectomies
- Bowel resections
- Cystectomies
- Nephrectomies

[Recommendations | Hypothermia: prevention and management in adults having surgery | Guidance | NICE](#)

[Warming of intravenous and irrigation fluids for preventing inadvertent perioperative hypothermia - Campbell, G - 2015 | Cochrane Library](#)

[Temperature management under general anesthesia: Compulsion or option \(nih.gov\)](#)

<https://www.sciencedirect.com/science/article/abs/pii/S0959652620354925>

*Based on pre-pandemic numbers of ~7,000 cases/yr; waste disposal costs of £760/tonne for orange stream waste; and estimated CO₂e of 1000kg/tonne for heat treated wasted disposal.



+
OR



Do you need to use a fluid/blood warmer giving set?

Aim: Frequent usage of fluid/blood warmer giving sets for the majority of theatre cases can lead to unnecessary wastage and cost. Anaesthetic contribution towards global warming is significant and must be considered for public health purposes (1,2,3).

Method: Departmental questionnaire regarding usage, indications for use and thoughts regarding reduction distributed. Opera search of the total number of theatre cases within the month of October 2021 and the cost and weight of each combination of giving sets were calculated to estimate wastage difference.

Findings: Respondents in their majority (78%) felt that fluid/blood warmers were overused and that they would be happy to use warmed IVF and giving sets as standard practice (85%). The main indications for fluid/blood warmer usage included laparotomies (100%) and long cases (92%).

An Opera search found that a total of 433 theatre cases were performed at Monklands during the month of October 2021. If we were to assume all of these cases used blood warmers and blood giving sets (as is frequently the default option/already set up by theatre staff) then there would be a cost

saving of over £3000 when compared to standard, cheaper giving sets. On comparing weight difference, there would be a reduction in plastic wastage of over 70kg per month between the two combinations.

Actions: Theatre posters, departmental/regional presentations and theatre staff education/awareness can promote greater rationalisation with regards to fluid/blood warmer usage.

References

1. European Society of Anaesthesiology and Intensive Care Sustainability Committee. Sustainability toolkit: how to reduce our carbon footprint in

the OR, in the hospital, on the planet? 2020. <https://www.esaic.org/uploads/2020/03/etopay-mobile1>

2. McGain F, Muret J, Lawson C, Sherman JD. Effects of the COVID-19 pandemic on environmental sustainability in anaesthesia. *British Journal of Anaesthesia* 2021;126: e119–22.
3. S.M. White et al. Principles of environmentally sustainable anaesthesia: a global consensus statement from the World Federation of Societies of Anaesthesiologists. *Anaesthesia* 2021; <https://doi.org/10.1111/anae.15588>