



**Making the critical  
uncomplicated**

°M Warmer – The instant, intuitive and portable blood and fluid warming system

**°MEQU**

## Hypothermia – A lethal complication for trauma patients

Trauma patients can require emergency blood transfusions at the accident site or during transportation to hospital. Patients waiting for help or hospital transport can lose additional heat due to environmental exposure and injuries<sup>1</sup>, and those experiencing substantial bleeding are already at increased risk of hypothermia. Their body temperature drops even further if cold fluids are administered<sup>2</sup>.

The human body seeks to maintain an average core temperature close to 37°C. Hypothermia occurs when the body's own heat production is unable to match its heat loss to the surrounding environment<sup>3</sup>.

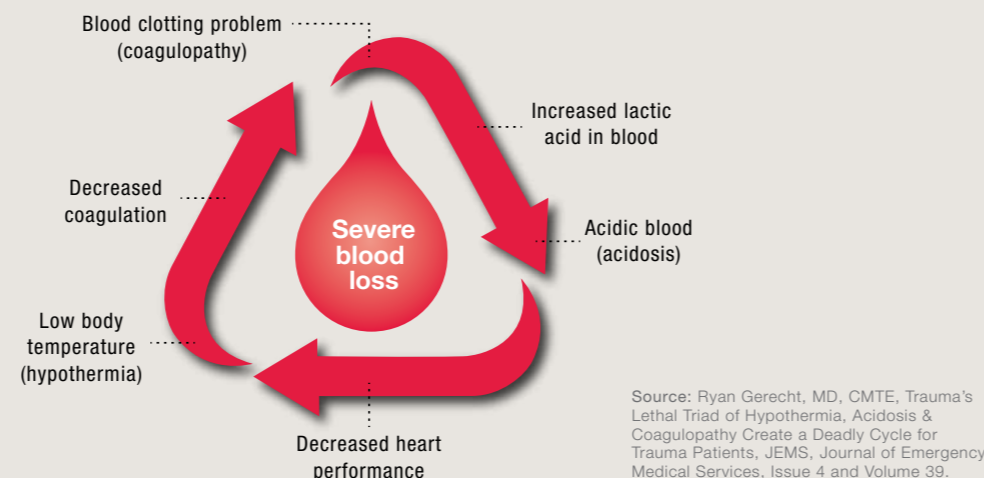
<sup>1</sup> Smith CE, Soreide E. Hypothermia in trauma victims. American Society of Anesthesiologists' Newsletter 2005;69(11):17-9.

<sup>2</sup> A randomised single blinded study of the administration of pre-warmed fluid vs active fluid warming on the incidence of peri-operative hypothermia in short surgical procedures, JC Andrzejowski et al. Anaesthesia, Volume 65, Issue 9, September 2010, Pages 942-945.

<sup>3</sup> Intraoperative warming therapies a comparison of three devices, Sessler D, J. Clin. Anesth., vol 4 1992.



**Figure 1:** The trauma triad of death is a medical term that describes the combination of hypothermia, acidosis and coagulopathy. Severe bleeding during trauma reduces the delivery of oxygen and can lead to hypothermia. This can prevent blood from clotting, increasing blood loss.



## Hypothermia increases blood loss

When the body core temperature – or BCT – drops, the acidity in the blood increases and the blood loses its ability to coagulate, making it more difficult to stop the bleeding<sup>4</sup>. Bleeding causes the body to lose red blood cells that carry oxygen to the brain and other vital organs. A BCT of below 36°C is defined as hypothermia when combined with a severe injury.

According to the American Center for Army Lessons Learned (CALL), 80 percent of those who died after trauma in Iraq and Afghanistan had a body core temperature below 34°C. When compared to a normal BCT of 37°C, blood loss increases 2.4 times when the BCT drops below 34°C<sup>5</sup>.

<sup>4</sup> Martin, R Shayn;et al. Injury-associated hypothermia: an analysis, Shock Vol 24(2), Aug. 2005, pp 114.

<sup>5</sup> Jarvis – OEF OIF Casualty Statistics & Lessons Learned-REVISED 18 April 2005, C.A.L.L.

## Hypothermia can lead to death

A study of more than 700,000 trauma patients in the USA showed that there is a correlation between dying from an trauma and BCT. Those whose temperature was below 35°C when admitted to hospital had a significantly higher mortality rate<sup>6</sup>.

Studies also show that hypothermia is the most common cause of clotting disorder<sup>7</sup> and that approximately 57 percent of trauma victims need immediate surgery experience

hypothermia between the time of injury and the completion of the surgery<sup>8</sup>.

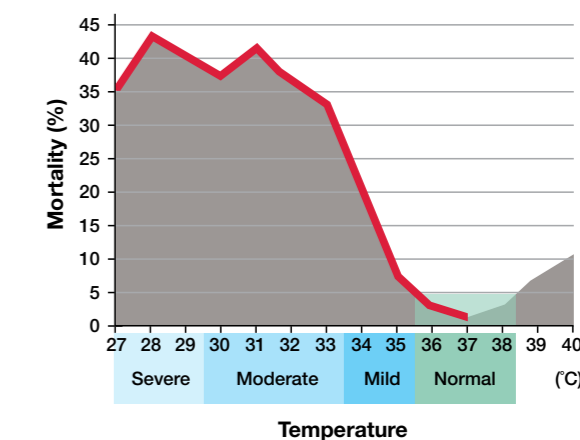
The evidence is clear – hypothermia can lead to death, and early intervention is vital when it comes to controlling the body temperature of trauma patients. Waiting until arriving at the hospital could be too late – and this is where a warm blood transfusion can make a lifesaving difference.

<sup>6</sup> Martin, R Shayn;et al. Injury-associated hypothermia: an analysis, Shock Vol 24(2), Aug. 2005, pp 114.

<sup>7</sup> Kjærgård, B et. al, Behandling af den hypoterme patient, UGESKR LÆGER 170/23, 2008.

<sup>8</sup> Betty J. Tsuei, Hypothermia in the trauma patient, Int. J. Care Injured (2004) 35, 7–15.

**Figure 2:** The relationship between body core temperature (BCT) and mortality in trauma patients.



Source: Martin, R Shayn;et al. Injury-associated hypothermia: an analysis, Shock Vol 24(2), Aug. 2005, pp 114.

## °M Warmer System can help prevent hypothermia

°MEQU has developed a solution for emergency transfusions – a portable fluid warmer which warms fluids, including blood, from cold to body temperature within seconds.

This means that every trauma patient can receive warm blood no matter where they are located. Both at the accident site and during transport, the °M Warmer System can help prevent hypothermia and associated complications<sup>9</sup>.

<sup>9</sup> Campbell G, Alderson P, Smith AF, Warttig S, Warming of intravenous and irrigation fluids for preventing in advertent perioperative hypothermia (Review).



## Intuitive, portable and robust

Originally developed to meet the demands of the Special Forces in Europe and the US, the °M Warmer's exceptional Danish design and quality ensures optimal performance every time.

In spite of its small size and light weight, the °M Warmer is robust and sturdy, and can tolerate water and rough treatment. It is approved for use in ambulances, helicopters and airplanes.

The °M Warmer's intuitive set-up means that it is ready for use in seconds. Even in extreme circumstances, the unique adhesive fixation solution drastically reduces the risk of compromising the IV-access, with the device attached close to the infusion site. The instant warming capability and high flow rate empower the user to quickly administer infusion fluid or warm blood to the trauma patient.

## Making the critical uncomplicated

The °M Warmer's unique features make warm blood transfusions at the site of an accident rapid, safe and reliable.

### 1. Intuitive use

The °M Warmer is fast and intuitive to use, with a total set-up time of less than 30 seconds. It fits to a standard IV giving set, and it cannot be assembled incorrectly.

### 2. High flow rates

The °M Warmer warms fluids – including blood – from 5°C to 37°C at flow rates up to 150ml/min.

### 3. Large warming capacity

A single charge of the Power Pack can warm two liters of 5°C cold blood or four liters of ambient temperature fluid.

### 4. Portability

The system is lightweight and compact, with the total weight of the Power Pack and the °M Warmer ranging from 760 grams to 820 grams.

### 5. Secure attachment

The unique patient fixation solution offers extra safety in extreme situations and ensures secure attachment close to the infusion site. This drastically reduces the risk of pulling out the catheter.

### 6. Instant warming

The system warms fluids or blood to 37°C in less than 10 seconds.



Unpack



Attach



Connect

See video at [mequ.dk](http://mequ.dk)





**Military**

**Created in collaboration with military experts**

“The °M Warmer makes sense for us, as it is a battery-operated blood warming device with the flow rates and run time that we need. Battery run-time is important for us – as is the ability to charge the device from any power source. Right now, we’re installing chargers for the °M Warmer onboard our ambulances, so that the devices can be charged and ready for us at all times and can be carried to trauma patients when needed.

Battery-operated devices also simplify the time-consuming approval rounds needed for helicopter use. If we had to draw power from the airframe itself to charge the device, a lot of extra testing and approvals would be required. The °M Warmer needs only approval to be carried onboard and basically halves the amount of approval rounds required.”

THOR HOLM-ELLEFSEN  
Master sergeant – Medical section,  
Norwegian Defence Material Agency

**Light, compact and portable**

“Everyone taking part on a mission carries a large pack – and every medic needs to carry two. So it is important that the °M Warmer is small and light-weight.

In the Special Forces, a transfusion can potentially take place at any time if recommended by the medical supervisor – before or during an evacuation. And it could take place anywhere from the point of injury to a vehicle or to the point of care. So it is necessary that the device can be used safely during transportation, and that it is quick and intuitive to use.”

THOR HOLM-ELLEFSEN  
Master sergeant – Medical section,  
Norwegian Defence Material Agency

**Special forces**



**Helicopter  
Emergency  
Medical  
Services**

**Approved for use in helicopters**

“Size and weight were important for us when choosing a blood warmer. We wanted to find a reliable device that was strong enough to work in a hostile environment and reach the target temperature. The research papers we saw indicated that devices similar to the °M Warmer were not robust and had high failure rates. So far, we’ve tested the device in pre-hospital situations about 30 times with good feedback – it has never failed and has reached the temperature required every time.

We use the °M Warmer for code red patients who need pre-hospital blood transfusions. It’s really simple to use, right down to the red and the blue coding of the Luer-locks and it basically does exactly what it is supposed to do.”

SCOTT MCILWAINE  
Operations Manager, Essex & Herts Air Ambulance

**Empowering paramedics to save lives**

“We chose the °M Warmer as it’s compact, easy to use, and works reliably – and we were excited that it was a Danish company offering a high quality device and excellent service to get us started.

The fact that it’s battery powered is also important for us, as we’ve access to electricity in the ambulance but not on the ground. Blood is stored at 4-6°C in the physician-staffed EMS car, and it needs to be warmed immediately to body temperature for use in a transfusion.

I’ve used the °M Warmer personally and found it as easy to use and set up as in training, so I’m quite confident using it.”

KASPER K. KRÆMER  
Doctor, Aalborg University Hospital

**Rapid  
Response  
Vehicles &  
Ambulances**



## About °MEQU

°MEQU was founded in 2011 by Ulrik Krogh Andersen. Ulrik first became aware of the importance of an effective and portable fluid and blood warming system after the Danish Defence asked the Technical University of Denmark to investigate the development of such a device.

### Passion and perseverance

From the initial university project to retraining as paramedic and working the busy streets of NYC, it took Ulrik and the °MEQU team ten years of true perseverance – of inventing, understanding, testing, failing, redesigning and testing again – to create the °M Warmer System as known today.

The entire process was made in close collaboration with military and medical experts to ensure that the product meets their requirements.

#### °M Warmer System

– The intuitive, portable blood and fluid warmer, making the critical uncomplicated.



#### °M Warmer facts

- Easy to use - Impossible to assemble the system incorrectly
- Rapid set-up time – Takes less than 30 seconds to set-up
- Small, compact and lightweight – Total system weight ranges from 760 grams to 820 grams
- Robust and sturdy – Complete system has IP54 rating
- Large warming capacity – Warms two liters of 5°C cold fluid
- High flow rate – Maintains body temperature at flow rates up to 150ml/min
- Battery operated, with rechargeable Power Pack
- Adhesive fixation solution reduces the risk of compromising the IV access

