

Heatstroke

The overlooked risk

As a result, heat stroke and heat-related hospitalizations are on the rise. In 2019, Germany documented 16% more heat-related treatments (1,692) than the average for the years 2002 to 2022.¹

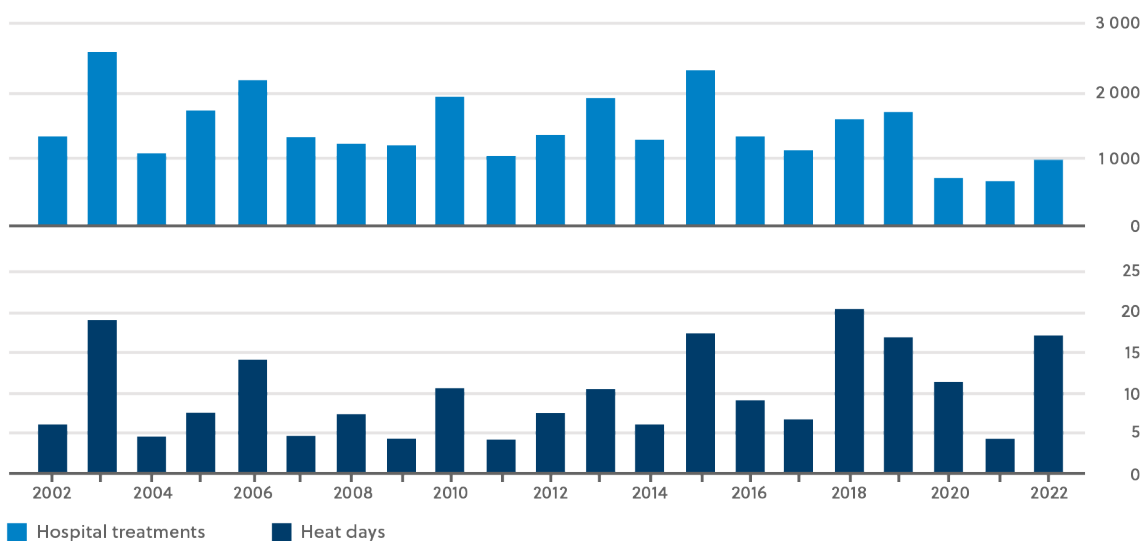
Rising temperatures also contribute to an increase in heat-related deaths. Studies have shown that mortality rates rise significantly during extreme heatwaves. Across Europe, at least 15,000 heat-related deaths have been recorded in recent years. People who already suffer from cardiovascular or respiratory diseases are particularly at risk.²

Heatwaves and extremely hot summers have increased in recent years. A heatwave is described as a period of unusually high temperatures that last for several days or weeks and during which there is no serious cooling—even at night. In Berlin alone, there were four significant heatwaves between 2000 and 2022.



Full in-patient hospital treatments due to damage caused by heat/sunlight and average heat days in Germany

Treatment cases per year and days with a maximum temperature of 30°C and more



Pathophysiology

From a core body temperature of 41.5°C, all mechanisms of thermoregulatory temperature regulation fail. Vasodilation and fluid loss lead to hypovolemia, which ends in hypotension and reduced perfusion of the kidneys. Oxygen consumption and CO₂ production increase. Depending on the duration and extent of this enormous heat stress, direct cell damage occurs, especially of hepatocytes, vascular endothelial cells, and neurons. As a result, a systemic inflammatory reaction with the release of cytokines can lead to multi-organ failure.³

Treatment*

Heat stroke is acutely life threatening and requires immediate medical treatment, as it can lead to serious complications such as multi-organ failure, brain damage, and even death. Core body temperature must be reduced to below 38.5°C as quickly as possible while ensuring vital functions using the ABCDE scheme: airway, breathing, circulation, disability, and exposure. Initial treatment of heat stroke includes immediately cooling down the body by applying cold compresses, spraying the body with water, or moving it to a cool room. In the context of intensive care, rapid and controlled cooling to normal temperature is of particular importance. Cooling rates of over 0.15°C/min (equivalent to 9°C/h) to target temperature are significantly associated with survival from heatstroke without medical complications.⁴ Precise management of body temperature is therefore essential, especially in the early stages of hospital care.⁵ At the same time, good shivering management should be ensured by providing warm air at 40°C via a warm air blower as part of the Choi⁶ protocol.

Challenges

Coma, rhabdomyolysis, liver failure and coagulation disorders cause heatstroke mortality of up to 50%.³

The recommended very high cooling rate cannot be achieved by a single measure, so feedback-controlled intravascular temperature management is gaining in importance due to its high performance in acute care in the central emergency department.

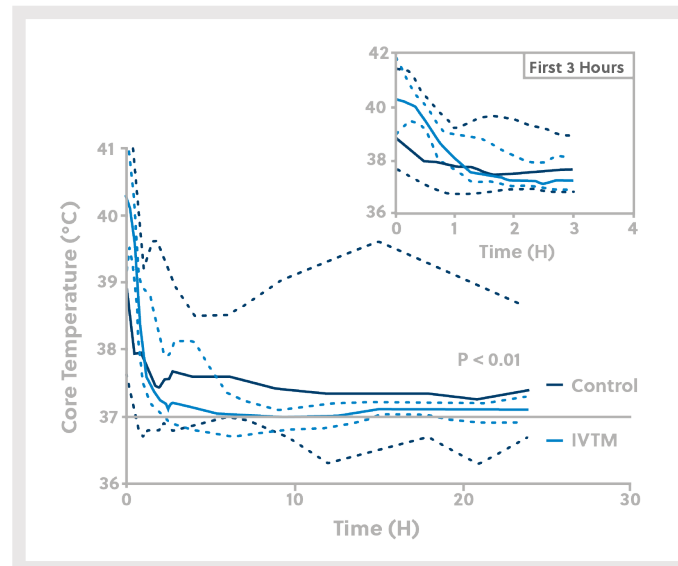


Figure 1. Core body temperature over time: comparison of IVTM™ and surface cooling⁵

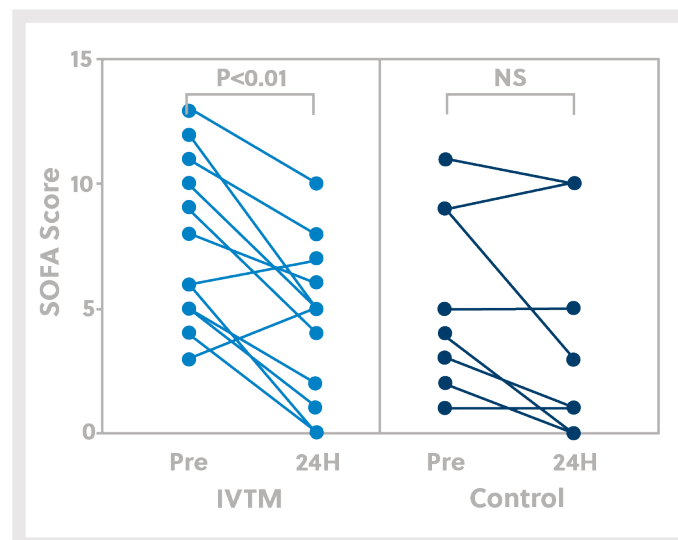


Figure 2. SOFA score after 24 hours: comparison of IVTM and surface cooling

In addition, due to the cell damage and increased intracranial pressure in severe cases, it may be necessary to perform mild therapeutic hypothermia to maintain the patient's good neurological function.^{7,8}

Yokobori et al. demonstrated in a 2018 multicenter study that intravascular temperature control (IVTM) is a viable and safe method for treating severe heat stroke, even in elderly patients. In addition, the IVTM enabled more precise temperature management compared to conventional cooling (CC) alone.⁹

A comprehensive solution

Thermogard XP® and Thermogard HQ™ offer all-in-one solutions for the treatment of patients diagnosed with heat stroke. They offer both initial rapid treatment using the surface solution and intravascular cooling using a catheter.

The decisive factor when choosing which solution to use for temperature control is the patient's condition and the specific therapy.

Core temperature management

- Options for placement in femoral vein (Quattro® and Icy®) or subclavian internal jugular vein (Solex 7®, Cool Line®**)
- Unhindered patient access
- Reduced monitoring of temperature, shivering and burden on nursing workload by 74%¹⁰
- Doubles as a CVC

Surface temperature management

- Gel-free, adhesive-free vest
- Flexible, non-woven fabric
- Leak-free connectors
- Sizes S/M and L/XL



Simplicity of One

One platform with

- Core and surface treatment
- Normothermia, hypothermia, and fever management
- Personalize treatment as needed
- Efficient device management

Thermogard Platform enables closed-loop control of either core or surface management devices with an anti-bacterial coolant for minimal disruption in patient care.

*There is no possibility of targeted medical treatment.



Deliver individualized core and surface temperature management the Thermogard platform

¹ Federal Statistical Office website, www.destatis.de/DE/Presse/Pressemitteilungen/2024/07/PD24_N035_231.html. Accessed Sept. 19, 2024.

² DPA 2024, www.zdf.de/nachrichten/panorama/klima-hitze-extreme-krankte-statistik-100.html. Accessed Sept. 19, 2024.

³ Sommer, Sonne, Hitzefall; D.Naß, E.Bauderer. *Notfallmedizin* up2date 2020;15(2):137–146. ISSN 1611–6550.

⁴ Yoram Epstein and Ran Yanovich. *N Engl J Med* 2019;380:2449–59. Doi:10.1056/NEJMra1810762.

⁵ Chen Lan, et al. *Internal and emergency medicine*. 2023;18. Doi:10.1007/s11739-023-03291-y.

⁶ Choi HA, et al. *Neurocrit Care*. 2011 Jun;14(3):389–94. Doi: 10.1007/s12028-010-9474-7.

⁷ Hong J-Y, et al. *Ann Emerg Med*. 2012 Jun;59(6):491–3. Doi:10.1016/j.annemergmed.2011.09.013

⁸ Broessner G, et al. *Critical Care*. 2005;9:R498–R501. Doi:10.1186/cc3771

⁹ Yokobori S, et al. *Crit Care Med*. 2018 Jul;46(7):e670–e676. Doi: 10.1097/CCM.0000000000003153

¹⁰ Deye N, et al. *Circulation*. 2015;132:182–193. Doi: 10.1161/CIRCULATIONAHA.114.012805

**Not available in all countries

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