

IVTM™ Intravascular Temperature Management

ZOLL®



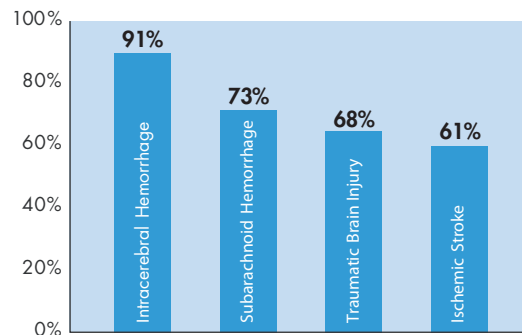
Cooling from the Inside Out
Precise, Efficient Fever Control

Fever Control is Critical

Fever Impacts Patient Outcomes

Management of the body's core temperature is fundamental to patient health and is key to proper neurological function. This is especially true for patients in Neurointensive Care Units. Fever, commonly found in both neurologically injured and neurosurgical patients, is associated with poor outcomes.¹ A small increase in temperature can lead to secondary neurological injuries that can produce an overall greater zone of injury and neuronal loss.²

Incidence of Fever in Neurointensive Care

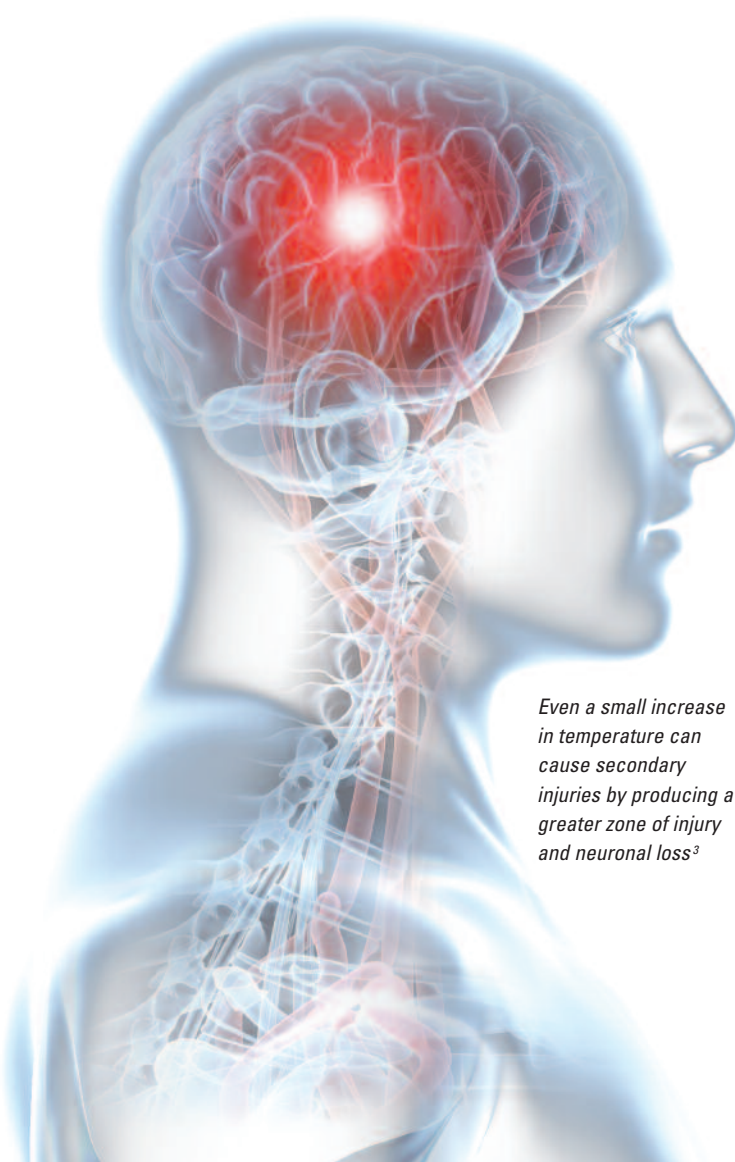


An increase in temperature as small as one degree can raise the risk of poor outcomes by 2.2 times.² Moderate fever has been reported to almost double patient mortality, while extremely high fever can triple mortality.³

Fever Management is Standard of Care

Fever management is recommended by the following associations for the management of neurological injuries such as ischemic stroke, intracerebral hemorrhage, subarachnoid hemorrhage, and traumatic brain injury.

- American Stroke Association
- American Association of Neurological Surgeons
- European Stroke Initiative
- American Heart Association
- International Liaison Committee of Resuscitation



Even a small increase in temperature can cause secondary injuries by producing a greater zone of injury and neuronal loss³

Cool from the Core

IVTM Provides the Speed and Control Needed for Today's Fever Management Protocols

Cooling from the inside out is the most efficient method of temperature management. With ZOLL's unique system, patients are cooled in a quick, precise manner and are easily and reliably maintained at target temperature.

The majority of critically ill patients require central venous access to monitor and manage fluid status and for rapid administration of blood products and intravenous medications. The IVTM catheter design combines superior fever management with the function of a standard central venous catheter.

Proactively Manage Fever with IVTM

The system constantly monitors the patient and automatically adjusts to changes in core temperature. IVTM regulates the temperature of the circulating intra-balloon saline to achieve and maintain the selected target temperature.

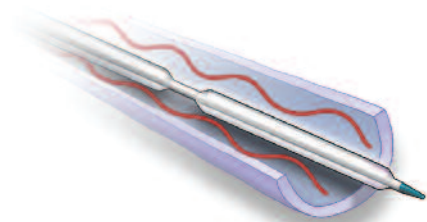
IVTM is Superior to Surface Cooling

IVTM is the most reliable method of temperature management:

- Fever burden reduced by 85%⁵
- Intracranial hypertension burden reduced by 76%⁵
- Target temperature maintained 96% of the time⁶

Since IVTM cools from the core, patients have a lower rate of shivering (3.7%) and require less use of sedatives, narcotics and neuromuscular blocking agents.¹

IVTM simplifies patient management. It is the only cooling technology that allows superior patient access, eliminating the need to cover 40-70% of the body surface with pads.⁷ It reduces nursing time, since management of potential skin damage and the need to exchange soiled pads are eliminated. Additionally, efficient and precise fever control achieved with IVTM reduces the workload on nursing personnel.⁸ Nurses can focus on the patient rather than the technology.



Cool or warm saline is circulated within a closed-loop multi-balloon catheter. The patient is cooled or warmed as venous blood passes over each balloon. The process is rapid and precise, offering unlimited patient access and minimal nursing time.



ZOLL's IVTM offers superior clinical efficiency over external surface cooling methods in reaching and maintaining target temperature.

IVTM – State of the Art Temperature Management. The Clear Choice with Evidence-Based Performance.

Temperature Management Objectives	Surface Cooling: ice packs, gel pads, water pads, etc.	Intravascular Cooling ZOLL® IVTM
Control of Target Temperature	Poor: 25% of time in range ($\pm 0.2^{\circ}\text{C}$) ³	Superior: 96.8% of time in range ($\pm 0.2^{\circ}\text{C}$) ³
Time to Target Temperature	Slow: 193 minutes ⁴	Rapid: 53-83 minutes ^{5,6}
Rewarm Control – Prevention of Rebound Intracranial Pressure	Poor: Lacks precise temperature control	Superior: Controlled rewarming (0.1°C/hr minimum)
Shivering	High: Rate of shivering (85%); requires higher doses of paralytics ⁷	Low: Rate of shivering (3.7%); requires less sedation and lower doses of paralytics ⁸
Patient Limitations	Restricted: Not suited for spinal injury patients, patients with compromised skin integrity, or on vasopressors ⁹	Few: Able to use in a broad spectrum of patients
Nursing Time	Extensive: Requires management for temperature overshoot/undershoot, pad management, shivering and potential skin damage	Minimal: Set and device auto adjusts to desired temperature. Focus on other aspects of patient care
Patient Access	Severely limited: 40-70% patient covered with pads and tubing	Unhindered
Skin Issues	Potential for compromised skin integrity or skin necrosis ¹⁰	Generally none
Central Venous Catheter (CVC) Requirement	Additional: Separate CVC required for Neuro ICU patients	Integrated: CVC integral to IVTM catheter design

¹ Diringier MN, et al. *Crit Care Med* [2004] 32, 2:559-564.

² Reith J, et al. *Lancet* [1996] 347:422-425.

³ Diringier MN, et al. *Crit Care Med* [2004] 32, 7:1489-1495.

⁴ Reaven NL, et al. *J of Intensive Care Med* [2009] 24, 2:131-137.

⁵ Puccio A, et al. *Neurocrit Care* [2009] 11:82-87.

⁶ Hoedemaekers CW, Ezzahhi M, Gerritsen A, van der Hoeven JG. *Critical Care* [2007], 11:R91.

⁷ Vaga A, et al *Resuscitation* [2008] 76, 25-30.

⁸ Lemons, Nancy AACN Abstract, Region 6 Meeting, September 27, 2004.

⁹ Heard K, et al: The Medivance RESCUE trial, AHA 2007.

¹⁰ Hinchey P, et al: ACAD EMERG MED, Vol.15, No. 6, [May 2008], Abstract 221, pages S91-S92.

¹¹ Kliegel A, et al: *Resuscitation* 64 [2005] 347-351.

¹² Carhuapoma JR, et al. *J Neurosurgical Anesthesiology* [2003]15, 4:313-318.

¹³ Medivance Arctic Sun® Energy Transfer Pad™ Instructions for Use.

¹⁴ Varon J, et al *Resuscitation* [2008] 78, 248-249.

ZOLL Medical Corporation (NASDAQ: GS) is the world leader in resuscitation technologies for hospitals with advanced solutions that increase clinical and operational efficiency and enhance patient care. From early intervention through post-resuscitation care, ZOLL's innovative technologies, including Real CPR Help® and See-Thru CPR®, help clinicians provide CPR, defibrillation, and ALS care with confidence; simplify device operation; and capture and analyze vital patient data. ZOLL also develops market-leading temperature control therapies that enable powerful and precise temperature management for critical care and surgical patients.

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