SHIVERING

The impact of shivering

Shivering can cause multiple challenges in patient management. Sustained and vigorous shivering can increase metabolic heat production up to 600% above basal level[1] and can double or even triple oxygen consumption,[2] breathing effort, and heart rate. Heat production makes cooling itself much more difficult, and in certain cases cooling devices can no longer cope with the body temperature and patients cannot be cooled.[3] You need a system that efficiently manages the patient's temperature from the core, like ZOLL's Thermogard XP® (TGXP).

Shivering:

- Is counter-productive to the efforts of cooling[4]
- Results in longer cooling time to reach target temperature[5]
- Can decrease the ability to maintain target temperature precisely[5]
- Requires the use of more paralytics[6]

> Intravascular temperature management therapy results in a lower rate of shivering (4% vs 85% with surface)[7, 8] than other methods of cooling.

ZOLL®

IVTM System Thermogard XP®

Available from DELTA

Call 01782 637009

[1]Popovic R, et al. *Anesthesiology*. 2000;92:5:1343–49.
[2]Dempsey RJ, et al. *Neurosurg*. 1987;21:2:177–181.
[3]Clifton GL, et al. *Neurology*. 2010;10:2:131–139.
[4]Doufas AG, Wadhwa A, et al. Neither arm nor face warming reduces the shivering threshold in unanesthetized humans. *Stroke* 2003;34:1736-1740.
[5]Mayer, SA, Sessler, DI, eds. *Therapeutic Hypothermia*. New York: Informa Healthcare; 2005. 293–321.
[6]Lord AS, et al. *Neurocrit Care*. 2014;21:2:200–206.
[7]Diringer MN, et al. *Critical Care Medicine*. 2004;32(2):559-564.
[8]Carhuapoma JR, et al. *Journal of Neurosurgical Anesthesiology*. 2003;15(4):313-318.

IVTM™ Intravascular Temperature Management

Case Study

HOSPITAL SIZE
235 beds

PATIENT HISTORY	
Age	36
Weight	400 lbs
Gender	Male

SPEED TO COOL	
ZOLL Temperature Management System Utilized	Thermogard XP® (TGXP)
ZOLL IVTM Catheter Utilized	Quattro® Catheter
Starting Temperature	35°C
Target Temperature	33°C
Time to Target Temperature	**75 minutes; 1.6°C/hr (See Figure 1)**
IVTM Performance Summary	Patient was cooled quickly and reached target temperature in 75 minutes. Once target temperature was attained, the patient was maintained at 33°C for 24 hours and then rewarmed at 0.25°C per hour. Nurses noted that the level of shivering was very minimal. This shows that on the very first attempt, a large (400-lb) patient can be cooled quickly and effectively with very little shivering.

Figure 1: IVTM Patient Data