Nearly 360,000 out-of-hospital and 209,000 in-hospital cardiac arrests occurred within the United States in 2013. It is well known that systematic post-arrest care improves overall mortality following return of spontaneous circulation (ROSC). Over the last decade, therapeutic hypothermia has become a vital part of post-arrest care due to its ability to improve the likelihood of meaningful neurologic recovery. In light of recent literature challenging the previously recommended hypothermic target temperature of 33°C, this “Resident Journal Review” will assess the initial evidence behind therapeutic hypothermia, the evidence allowing for its application to ever broader clinical scenarios, and the newest data pointing towards non-inferiority of higher target temperatures. We will attempt to reconcile the seemingly conflicting evidence provided by the newest studies of therapeutic hypothermia with our current standard practice, thereby providing recommendations of how therapeutic hypothermia should be implemented in 2014.

The Origins of Therapeutic Hypothermia
Severe neurological impairment occurs following cardiac arrest due to prolonged global cerebral ischemia. Prior to 2002, only animal models of therapeutic hypothermia had been used to demonstrate its usefulness in reducing these neurologic sequelae. In February 2002, two randomized control trials showing the utility of post-arrest therapeutic hypothermia in humans were published. These studies both showed substantial increases in the percentage of patients with meaningful neurological recovery who were treated with therapeutic hypothermia. This was a groundbreaking advance as no other intervention to date had been shown to improve neurological outcomes in post-arrest patients.


Along with a co-published study by The Hypothermia after Cardiac Arrest Study Group (also reviewed in this issue), this study provided the first evidence from a randomized, controlled trial supporting the use of therapeutic hypothermia for cardiac arrest survivors. Seventy-seven patients who had ROSC following out-of-hospital ventricular fibrillation (VF) arrest were enrolled. For inclusion, patients had to have an initial cardiac rhythm of VF (at the time of ambulance arrival), persistent coma after ROSC, and transport to a hospital participating in the study. Excluded patients were those less than 18 years of age for men or 50 years of age for women (to exclude potentially pregnant patients), those with onset of cardiogenic shock (defined as systolic BP less than 90mmHg despite infusion of epinephrine), those for whom the cause of coma was presumed to be other than the preceding arrest, and those for whom an intensive care bed was not immediately available at a participating hospital. Included patients were randomized based on whether their arrest occurred on an even or odd day of the month. All patients were mechanically ventilated, sedated with midazolam, paralyzed with vecuronium, and given epinephrine or nitroglycerin to maintain mean arterial blood pressure between 90 to 100mmHg. All patients were also given a lidocaine infusion, aspirin, and electrolyte correction. When appropriate, infusions of heparin or thrombolytic therapy were initiated.

For patients randomized to the therapeutic hypothermia group, cooling was performed by external application of ice packs both prior to and after hospital arrival, with a goal temperature of 33°C. This temperature was maintained for 12 hours after arrival, after which passive and then active rewarming was initiated with a goal of normothermia at 24 hours post-hospital arrival. Patients randomized to the control group were maintained at a goal temperature of 37°C for 24 hours, with active rewarming initiated for spontaneous hypothermia. During the study period hemodynamic parameters were monitored by pulmonary artery catheter, and routine lab values including electrolytes, glucose, blood counts, serum lactic acid and arterial blood gas were obtained.

The primary outcome of this study was sufficiently good neurological function to warrant discharge to home or a rehabilitation center, rather than discharge to a long-term nursing facility or death. Disposition was determined by a rehabilitation specialist, who was blinded to the treatment received. There was a statistically significant tendency toward discharge to home or rehabilitation in the therapeutic hypothermia group (49% vs 26%, p=0.046 for 95% CI). Secondary outcomes included differences in hemodynamic, biochemical and hematologic parameters. While there were some transient statistically significant differences in pulse, mean arterial pressure, systemic vascular resistance, cardiac index, serum potassium, serum glucose, and arterial pH between the groups, the clinical significance of these is uncertain.

While this study showed a significant improvement in neurologic outcome associated with therapeutic hypothermia, there were several limitations. There was no feasible way for the clinical teams to be blinded to randomization. Though the rehabilitation specialists determining disposition were blinded, the authors do not report on the methods by which they made these determinations, hence there is uncertainty about the degree of standardization of this decision. Finally, the relatively small sample size (77 subjects) allowed for statistically significant differences in baseline characteristics between the study groups despite randomization (more bystander-performed CPR and male sex in the normothermia group). Nonetheless, as one of the pioneer randomized trials on therapeutic hypothermia, this study remains a landmark in the field of post-arrest care.


This study was a randomized controlled clinical trial taking place in nine European centers from 1996-2000, comparing mild hypothermia (HT) with standard normothermia (NT) following cardiac arrest.

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The population studied was 18-75 year olds with ROSC after witnessed cardiac arrest with ventricular tachycardia (VT) or VF as the initial cardiac rhythm. Additional inclusion criteria were an estimated down time of 5-15 minutes, and no more than 60 minutes without ROSC. Patients excluded were those with tympanic membrane temperatures less than 30°C on admission, comatose state prior to cardiac arrest, pregnancy, response to verbal commands after ROSC, hypotension (MAP less than 60mmHg) for more than 30 minutes before randomization, hypoxemia (arterial oxygen saturation <85% for more than 15 minutes after return of circulation), terminal illness that preceded arrest, inability to follow up, repeated cardiac arrest after ROSC, or preexisting coagulopathy. Consent was waived during initial enrollment, but the patient’s family had the right to withdraw the patient from the study.

Patients were sedated with midazolam and fentanyl, and treated with pancuronium to prevent shivering for 32 hours. The patients were then cooled to 32-34°C via external cooling devices. Temperature was monitored via infrared tympanic thermometer and bladder probes. The goal was to achieve target temperature within four hours of ROSC. Target temperature was maintained for 24 hours, followed by passive rewarming. Primary outcome was neurologic outcome at six months (score of 1-2 per the Pittsburgh Cerebral Performance Category score). Secondary endpoints were mortality at six months and complications (significant bleeding, pneumonia, sepsis, pancreatitis, renal failure, pulmonary edema, seizures, arrhythmias, pressure sores) within seven days after cardiac arrest.

Ultimately, 137 and 138 patients were enrolled into the HT and NT groups, respectively. Hypothermia had to be discontinued in 14 patients. One patient in each group was lost to follow up. Overall, the two groups had generally similar baseline characteristics. Fifty-five percent of HT had favorable neurologic outcomes at six month follow up, as compared to 39% in the NT group (risk ratio, 1.40; 95% CI, 1.08-1.81). This generated a number needed to treat (NNT) of 6 (95% CI, 4-25). Six-month mortality was 14 percentage points lower in HT group (risk ratio, 0.74; 95% CI, 0.58-0.95), yielding a NNT of 7 (95% CI, 4-33). Complication rates (70% in HT vs. 73% in NT) were similar, but did show a trend toward higher rates of infectious problems in HT group (37% vs. 29% for pneumonia; 13% vs. 7% for sepsis).

As with the Bernard study, a major limitation of this study was that personnel immediately involved in the initial 48 hours of patient care could not be blinded to treatment assignments. However, the physicians assessing neurologic status at six-month follow up were blinded. An additional limitation was that only 8% (275/3551) of patients assessed were enrolled due to the numerous exclusion criteria. Nevertheless, this study showed markedly significant improvements in both neurological function and mortality for patients treated with therapeutic hypothermia. Along with the Bernard study, this study provided the evidence leading to the routine use of hypothermia in post-arrest care.

**Current American Heart Association Guidelines**

Therapeutic hypothermia was incorporated into the American Heart Association (AHA) guidelines in 2005. The remaining studies that will be reviewed in this RJR were published after the most recent AHA Guidelines from 2010. A review of those guidelines follows.

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These guidelines recommend that all comatose adult patients with ROSC after out-of-hospital VF cardiac arrest should be cooled to 32°C to 34°C (Class I, LOE B). The data for this recommendation comes from the two studies reviewed above as well as additional studies with historical control groups showing improved neurological outcomes after therapeutic hypothermia for comatose survivors of VF cardiac arrest.

As of 2010, no randomized controlled trials had compared outcome between hypothermia and normothermia for non-VF arrest. However, there were six studies with historical control groups that reported a beneficial effect on outcome from use of TH in comatose survivors of out-of-hospital cardiac arrest associated with any arrest rhythm. Additionally, two nonrandomized studies indicated a possible benefit of hypothermia after in- and out-of-hospital cardiac arrest associated with non-VF initial rhythms. Only one study with historical controls reported better neurological outcome after VF cardiac arrest but no difference in outcome after cardiac arrest associated with other rhythms. This evidence led to the recommendation that induced hypothermia may also be considered in patients with ROSC after in-hospital cardiac arrest of any initial rhythm or after out-of-hospital PEA or asystolic arrest. (Class IIb; Level of Evidence C).

Additionally, the 2010 AHA guidelines state that active rewarming should be avoided in comatose patients who spontaneously develop a mild degree of hypothermia (>32°C [89.6°F]) after resuscitation from cardiac arrest during the first 48 hours after ROSC. (Class III, LOE C).

**The Use of Therapeutic Hypothermia for Non-shockable Rhythms**

Given that in the 2010 AHA guidelines, there were no randomized, control trials supporting the use of TH for patients presenting with non-shockable rhythms, an area of interest has been the use of hypothermia for these patients. Below we discuss a 2012 meta-analysis of all the studies done addressing this issue to date and then a look in detail at one study comparing neurological outcomes in patients with non-shockable versus shockable rhythms treated with TH.


This systematic review and meta-analysis examines two randomized and twelve non-randomized studies of adult cardiac arrest survivors who initially presented with non-shockable rhythms. It pools the data from these studies to compare survival and neurological outcomes in TH versus standard of care or normothermia.

Looking at the two randomized trials, the pooled relative risk (RR) for six-month mortality was 0.85 for patients in the hypothermia group compared

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to the standard of care group. However, this was not a statistically significant difference (95% CI 0.65-1.11). Furthermore, these two randomized studies were primarily undertaken to test specific interventions or strategies rather than to review the actual benefit of TH.

For the non-randomized studies, the hypothermia group did have a statistically significant reduction of in-hospital mortality with a pooled RR of 0.84 (95% CI 0.78-0.92). The pooled RR for poor neurological outcomes on discharge was not significant (0.96 [95% CI 0.90-1.01]).

This meta-analysis went on to highlight further subgroup analysis, specifically in-hospital versus out-of-hospital arrest, single study setting or multicenter study, and prospective versus retrospective study design. In the prospective nonrandomized study subgroup a significant difference in neurological outcome was seen, with a RR of 0.86 (95% CI 0.76-0.98; I2=0%) for the hypothermia group as compared with controls.

This study was limited in terms of the breadth and quality of evidence available for review. However, it did conclude that use of TH following non-shockable cardiac arrests is associated with reduced in-hospital mortality.


This study examined the efficacy of post-ROSC cooling in adult patients with witnessed out-of-hospital non-shockable cardiac arrest using data from the J-PULSE-Hypo registry. This registry contained data from 14 participating Japanese hospitals collected between January 2005 and December 2009. Four hundred and fifty-two comatose adult patients (GCS <7) were enrolled. Patients selected included those with a bystander witnessed cardiac arrest, target core temperature of 32-34°C, and cooling duration of 12-72 hours. Of the patients enrolled, 376 met inclusion criteria; four of these were excluded because the collapse-to-ROSC interval could not be determined. Initial cardiac arrest rhythms were used to place patients into a non-shockable group (NSG) and a shockable group (SG).

Twenty percent of the included patients had non-shockable initial rhythms. Baseline characteristics between the groups differed in terms of age, collapse-to-ROSC interval, underlying etiology of ACS, and use of emergency coronary angiography and PCI. All patients were treated with standard CPR and post-cardiac arrest care according to the 2005 AHA guidelines. Either non-invasive or invasive cooling methods were used to maintain core temperature. Temperatures were monitored via pulmonary artery catheters during the post-ROSC cooling period with target core temperatures of 32-34°C being maintained for 12-72 hours followed by gradual rewarming for 24-72 hours.

The primary endpoint of the study was favorable neurological outcome at 30 days. Secondary endpoints were survival at 30 days after cardiac arrest and complications (i.e., arrhythmia, infection, and the need for blood transfusion) in the first seven days after cardiac arrest. Subgroup analysis was performed based on collapse-to-ROSC intervals broken into the following quartiles: 16 minutes or less, 17-24 minutes, 25-36 minutes, and 37 minutes or longer.

Overall this study found significant differences between the two groups in 30-day favorable neurological outcomes (32% NSG and 66% SG; odds ratio 0.25; CI 0.14-0.42). The NSG also had a significantly decreased survival (59% NSG vs 85% SG; odds ratio 0.25; CI 0.15-0.44). There were no significant differences between the two groups in regards to occurrence of complications during the first seven days after cardiac arrest. With regards to the subgroup analysis, both groups had equally favorable neurological outcomes in the first quarter (90% NSG vs. 92% SG, OR 0.80; CI 0.09-7.24). However, with a longer time to ROSC, patients in the NSG had less favorable neurological outcomes than those in the SG.

This study showed that when time to ROSC is short, patients treated with hypothermia have favorable neurological outcomes regardless of their initial rhythm. This refuted prior evidence that TH is less effective in producing favorable neurological outcomes in patients with non-shockable rhythms as compared to those with shockable rhythms. However, this study did show that the benefits of TH for patients with non-shockable rhythms decrease as the time to ROSC increases. Major limitations of this study were the lack of a control group of patients not receiving TH and differences in the size and baseline characteristics between the groups.

Early Initiation of Therapeutic Hypothermia

Optimal time to cooling has been an area of active research, and both animal and human studies have shown early cooling to be ideal. The next two articles discuss two topics particularly relevant to emergency medicine providers, namely pre-hospital and intra-arrest initiation of hypothermia.


In this randomized, controlled trial, Kim, et al., studied the effect of prehospital institution of TH on survival in unconscious patients with out of hospital cardiac arrest who had return of circulation.

The intervention group was treated with up to 2 liters of normal saline cooled to 4°C, while the control group received standard prehospital care. Both groups received standard BLS and ACLS-based interventions. Patients were enrolled in the trial regardless of the rhythm [i.e., VF (“shockable”) vs non-VF (“non-shockable”)]. The primary outcome data was stratified by initial rhythm.

The data suggested that the intervention did produce a lower temperature on emergency department (ED) arrival (decrease of 1.2°C in intervention group with VF and 1.3°C in intervention group without VF). Additionally, on average the intervention group achieved a temperature of less than 34°C about one hour faster than the control group (4.2 hours compared with 5.5 hours in patients with VF). However, there was no difference in survival to hospital discharge (62.7% of intervention group vs 64.3% of control group, p=0.69 for VF patients, and 19.2% of the intervention group and 16.3% of the control group in non-VF). There was also no difference in percentage of patients with favorable neurologic outcome at discharge between the intervention and control groups with either initial

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rhythm. Importantly, the intervention was associated with a significantly increased rate of re-arrest in the field (26% of intervention group vs 21% of control group, p=0.08), presence of pulmonary edema on initial chest X-ray (41% vs 30%, p<0.001) and use of diuretics in the first 12 hours after hospital arrival (18% vs 13%, p=0.009).

Overall, given a lack of expected benefit, and an increase in some adverse effects, this study does not support the institution of TH using cold intravenous fluids in the prehospital setting.


Animal studies have shown that intra-arrest therapeutic hypothermia (IATH) has both cardiac and neurologic benefits. The authors of this study performed a systematic review to evaluate the effects of IATH on survival as well as neurological and cardiac function. They searched multiple online databases for articles pertaining to TH during cardiac arrest. Two authors reviewed and selected articles where IATH was the lone intervention. Animal studies were included if they had appropriate controls and reported the selected outcomes. Data from studies was independently abstracted by two authors and agreement at each step was noted to be high (kappa 0.87-1.00). Of 17,628 citations, 28 articles were selected (23 animal studies, five human).

When IATH was compared to normothermia, nine animal studies reported no benefit on mortality while seven reported some survival benefit. There was only one human RCT comparing IATH to normothermia, but none of the 22 patients enrolled in this study survived. When IATH was compared to post-arrest therapeutic hypothermia (PATH), two animal studies showed improved survival while four found no differences. Only one human RCT compared IATH to PATH. Here no statistically significant overall mortality difference was noted, but a post hoc analysis of patients with time to CPR less than 10 minutes showed statistically significant increased survival with IATH.

When evaluating IATH with respect to neurologic outcome, 10 animal studies and only one human study were identified, and the results were mixed. For the subgroup of patients with short time to CPR, there was a pronounced and significant improvement in neurologic function.

The authors of this review conclude that IATH improves survival and neurologic outcome when compared to PATH or normothermia. However, this is mostly based on experimental improvements in cardiac or neurologic function. The human data on IATH is very limited, and survival benefit has also been difficult to show. To date, human data has not shown a statistically significant benefit in survival apart from subgroup analysis for patients with short CPR time. While IATH seems promising in experimental models, further human studies are needed to prove any clinical usefulness.

Optimal Target Temperature in Hypothermia

The temperature used for TH traditionally has been 32-34°C as this was the temperature used in the original 2002 studies. This target temperature was extrapolated from prior work done in animal studies. Here we will discuss a study that attempts to identify the exact optimal target temperature within this range, and finish with the new landmark study published in the New England Journal of Medicine that compares a target temperature of 33°C to 36°C.


The authors of this paper set out to assess outcomes as well as early and late complications associated with each target temperature within the range set forth by the AHA guidelines, i.e. 32°C, 33°C, and 34°C respectfully. This was a non-randomized study performed at a large tertiary care center. The authors enrolled patients by lot assignment into each target temperature group of 32°C, 33°C, and 34°C respectfully. Patients were sequentially enrolled over a 22 month period. They were included in the study if they were older than 18 years, had ROSC for <24 hours, informed consent was able to be obtained from next of kin, and they were not pregnant, coagulopathic, severely acidic (pH<7.1), or unstable despite inotropic support. After the patients were cooled to their respective temperature for 24 hours, they were rewarmed at 0.3°C/hr and kept normothermic for three days.

Overall, there were 62 patients enrolled. Thirteen patients were selected for a target temperature of 32°C, 21 patients for 33°C, and 28 patients for 34°C. Of those enrolled 71% were male and 29% female with a mean age of 54 years. The most common presenting rhythm was asystole and the most common etiology of arrest was cardiac. The mean time from arrest to CPR was 14 minutes, and an average of 34 minutes of CPR performed before ROSC was established.

There was no difference in neurologic outcome or mortality between the target temperatures. Complications were assessed, and there was a higher incidence of hypotension during the maintenance phase in the group achieving a target temperature of 32°C (OR=6.8, p=0.023). This paper suggested that the lower targets of the recommended therapeutic range (32-34°C) are associated with an increased number of complications without added neurologic benefit.


The TTM Trial was an international, multicenter, randomized, controlled trial of 939 comatose adult patients between 2009 and 2012 with out-of-hospital cardiac arrest (OHCA) secondary to presumed cardiac cause, with sustained (>20 minutes) ROSC. Investigators looked at the difference in outcomes between patients cooled to a goal temperature of 33°C v. 36°C. Primary outcome was all-cause mortality at the end of the trial period, while secondary outcomes included measure of neurologic function by Cerebral Performance Category (CPC) and modified Rankin Scale (mRS) scores at 180 days, CPC scores at ICU and hospital discharge, and lowest (best) CPC score attained in the trial period.

Patients were excluded if the time between ROSC to screening for the study was >4 hours, their cardiac arrest was unwitnessed with asystole...
as the initial rhythm, they had suspected or known acute ICH or CVA, their body temperature was less than 30°C, trauma was the cause of cardiac arrest, they were pregnant, and if they had known inherent coagulopathy, terminal illness, or poor CPC prior to cardiac arrest.

Cooling methods were left to the discretion of the treating physician, with a goal to reach target temperature as quickly as possible. Sedation was mandated in both groups until 36 hours after randomization, and then discontinued or tapered. After 28 hours, patients were gradually rewarmed at a rate of 0.5°C per hour to normothermia (37°C) and maintained there, +/- 0.5°C, until 72 hours after cardiac arrest, at which time a decision was made to continue or withdraw life-sustaining therapy based on pre-specified criteria. While the treating physicians were not blinded to patient body temperatures, blinding was maintained for the study authors and physicians responsible for neurologic scoring and prognostication. A sample size of 900 participants was calculated prior to the study to provide 90% power in detecting a 20% reduction in hazard ratio for mortality. Follow-up of patients was either in person or via telephone call to patient or proxy, with mean final follow-up of 256 days.

Investigators found no mortality benefit to cooling to a goal of 33°C versus 36°C (50% v. 48% mortality, p=0.51) and no difference between groups in the composite outcome of death or poor neurologic function (either by CPC or Rankin scale) at 180 days (RR 1.02, 95% CI 0.88-1.16, p=0.78). When using the best/lowest documented CPC, there was still no benefit in the 33°C group (RR 1.04, 95% CI 0.89 – 1.17). There was a trend towards a 3% higher risk of serious adverse events (pneumonia, catheter-site bleeding, etc.) in the 33°C group (p=0.09), with a 6% higher rate of hyperkalemia reaching significance (p=0.02). An exception was for intracranial bleeding, for which there was a trend towards increased risk in the 36°C group (1.1%, p=0.09).

Limitations noted by the authors include the non-blinding of treating physicians to the assigned trial arm — the same physicians could decide to withdraw life-sustaining therapy. The authors also comment on the lack of data on types of sedation and neuromuscular blockade agents (NMBs) used, although they note there was no significant difference between groups in rates of shivering. This fact, despite the differences in temperature, might indicate differences in the usage of NMBs, which may have confounding effects on neurologic outcome. On review of the data, more of the patients from the 33°C group met criteria for withdrawal of therapy at initial review — this may indicate that there were sicker patients in this group. Some critics have also noted the possibility that the rapid rate of rewarming over a greater temperature difference may have negated the benefits of cooling in the 33°C group. More notably, while the TTM trial is the best-powered study so far, it did not have the sample size to detect a less than 20% relative risk reduction in mortality, meaning there may be a smaller but still clinically important benefit to lower temperatures that the study was unable to detect (to be fair, lower mortality reductions would require thousands of patients). Also, the less-selective inclusion of a variety of patients may have limited the study’s ability to demonstrate possibly existing benefits to a subgroup of patients. The study was not specifically powered to detect benefits to neurologic outcome; it may still be that subgroups of patients, such as those with more neurologic injury or prolonged times to ROSC, may be better benefitted by cooling to 33°C.

While not without its limitations, this study is the best-designed investigation into TH yet, with higher numbers, inclusion of patients with non-shockable rhythms and OHCA, and a pre-specified protocol for withdrawal of life-sustaining measures with intention-to-treat analysis and relatively distant follow-up. Instead of comparing TH to no temperature control at all, the TTM trial looks at a comparison of different actively-maintained temperatures. The lack of difference between the two groups perhaps indicates that it is not the temperature per se but the amount of effort invested in patient care and monitoring or the active prevention of fever in both study arms that provides the benefits to survival and improved neurologic functioning post-cardiac arrest.

Conclusion

Some people have interpreted the Nielsen, et al., study to mean that TH has no benefit. This is a misinterpretation. Nielsen, et al., did not compare 33°C to no temperature control. Rather it was a study designed to determine the optimal dosing of an intervention already proven to work. While some may find the limitations mentioned above as reasons to hold off on employing a target temperature of 36°C, this was the largest and best-conducted study to date in the field of therapeutic hypothermia. Many hospitals have already started using a target temperature of 36°C. When determining a target temperature for your patient, it is important to follow your hospital’s protocol while also considering that there may be different optimal hypothermia doses for different patients depending on factors such as co-morbidities and time to ROSC.

Regardless of the target temperature chosen, temperature in post-arrest patients should be tightly controlled and monitored. While 36°C may be a sufficient temperature goal, with no temperature control many post-arrest patients may become febrile with detrimental affects on mortality and neurologic function. Post-cardiac arrest patients not only need to be closely monitored for temperature control, but it is important that they receive ICU level care with close attention paid to other important parameters such as hemodynamics, oxygenation, ventilation, fluid balance, acid-base status, and electrolyte repletion. It is likely that the good outcomes obtained by patients undergoing hypothermia protocol are a reflection not only of tight temperature control but also close monitoring and optimization of other parameters.

The use of TH remains a Class I recommendation for patients who have undergone VT/VF arrest. Although the evidence for the use of TH following arrests with non-shockable rhythms is not as strong, most studies favor the use of TH. It may be difficult for TH in non-shockable rhythms to ever receive a Class I recommendation, as this would likely require a randomized control trial that randomizes the control to no temperature control.

Early initiation of cooling is theoretically appealing and has shown benefit in animal studies. However, neither pre-hospital cooling nor intra-arrest cooling has shown benefit in clinical studies. More evidence is needed before either of these early intervention methods can be recommended.

We look forward to seeing how the recent literature is incorporated into the 2015 AHA Cardiopulmonary Resuscitation Guidelines. In the
meantime, based on the literature reviewed above, we continue to recommend that therapeutic hypothermia be initiated in the ED as soon after ROSC as possible. Both a 33°C and 36°C temperature goal are reasonable, and goal temperature should be chosen according to your individual patient and your hospital’s protocol. Therapeutic hypothermia should be practiced with attention to providing optimal overall post-arrest care.

**Additional References**


