Use of a Nursing Checklist to Facilitate Implementation of Therapeutic Hypothermia After Cardiac Arrest

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Therapeutic hypothermia has become a widely accepted intervention that is improving neurological outcomes following return of spontaneous circulation after cardiac arrest. This intervention is highly complex but infrequently used, and prompt implementation of the many steps involved, especially achieving the target body temperature, can be difficult. A checklist was introduced to guide nurses in implementing the therapeutic hypothermia protocol during the different phases of the intervention (initiation, maintenance, rewarming, and normothermia) in an intensive care unit. An interprofessional committee began by developing the protocol, a template for an order set, and a shivering algorithm. At first, implementation of the protocol was inconsistent, and a lack of clarity and urgency in managing patients during the different phases of the protocol was apparent. The nursing checklist has provided all of the intensive care nurses with an easy-to-follow reference to facilitate compliance with the required steps in the protocol for therapeutic hypothermia. Observations of practice and feedback from nursing staff in all units confirm the utility of the checklist. Use of the checklist has helped reduce the time from admission to the unit to reaching the target temperature and the time from admission to continuous electroencephalographic monitoring in the cardiac intensive care unit. Evaluation of patients’ outcomes as related to compliance with the protocol interventions is ongoing. (Critical Care Nurse. 2015;35[1]:29-38)

In the United States, 359,400 people experience an out-of-hospital cardiac arrest each year, and less than 9.5% of those people survive.¹ Out-of-hospital cardiac arrest continues to be associated with high mortality, and among those patients who do survive the initial cardiac arrest, two-thirds die as a result of neurological injury.² Postresuscitation care is increasingly recognized as an integral component in improving the quality of survival and neurological outcomes. Although advances have been made in initial resuscitative efforts; anoxic neurological injury remains a major concern after return of spontaneous circulation (ROSC).²³ Therapeutic hypothermia improves neurological outcomes after ROSC.³

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Despite recommendations from the American Heart Association,3 the European Resuscitation Council and the International Liaison Committee on Resuscitation4 that therapeutic hypothermia be used in comatose survivors following ROSC, challenges to implementation of therapeutic hypothermia in clinical practice remain. Therapeutic hypothermia is a complex but uncommon intervention, and because of this, prompt implementation of the many steps involved and quickly achieving the desired temperature goal can be difficult.

Background

In 2002, researchers in 2 studies5,6 reported improved neurological outcomes and a decrease in mortality with the use of therapeutic hypothermia after out-of-hospital cardiac arrest. Recently published guidelines from both the American Heart Association and the International Liaison Committee on Resuscitation incorporated evidence from research and recommended that clinicians implement therapeutic hypothermia to increase the likelihood of improved neurological outcome.7 Brain cells die because of several biochemical processes resulting from cardiac arrest and the inflammatory process following that injury. Therapeutic hypothermia is believed to be effective because it reduces cerebral metabolism, decreases cerebral blood flow, and decreases intracranial pressure.8-10 The neuroprotective mechanisms of therapeutic hypothermia are now widely recognized and implemented as a standard of care.3

The American Heart Association recommended that comatose adult patients with ROSC following out-of-hospital cardiac arrest be cooled to 32°C to 34°C (90°F-93°F) for 12 to 24 hours, with the strongest evidence of survival for those patients who had pulseless ventricular tachycardia or ventricular fibrillation rhythms.3 Less well understood is how the timing of these therapeutic hypothermia interventions affects patients’ outcomes. In the 2002 studies published by Bernard et al5 and the Hypothermia After Cardiac Arrest Study Group,6 target temperature was reached within 8 hours after ROSC. Although a prospective observational study11 of 986 patients did not reveal an association between the timing of therapeutic hypothermia and neurological outcomes, observational evidence demonstrates a 20% increase in risk of death for every hour delay in initiating therapeutic hypothermia.12 The evidence is not conclusive; however, the American Heart Association’s 2010 guidelines recommended initiating therapeutic hypothermia as soon as possible after ROSC.3 Our institution’s policy states that therapeutic hypothermia should be initiated within 6 hours of ROSC with a goal of achieving target temperature within 4 hours of initiation of therapeutic hypothermia. Therapeutic hypothermia has few absolute contraindications. The ultimate decision to initiate therapeutic hypothermia should be based on an assessment of the potential risks and benefits of hypothermia in each individual patient while considering the complete clinical situation and comorbid conditions.9,13

Recommendations for the Use of Checklists

The implementation of institution-specific standardized protocols, order sets, and a bundled care approach have proven a successful method in combating the barriers to implementation of therapeutic hypothermia14-20 and were associated with an increased efficiency in achieving target temperature.21,22

The effectiveness of a surgical safety checklist on rates of postoperative death and complications was documented by Haynes et al,31 who reported a decrease in death rate and complication rate after implementation of a checklist. In addition to decreasing mortality and complication rates, surgical checklists have improved compliance with safety measures, teamwork, and communication.24

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Beginning in 2009, checklists have been adapted and used to improve patients’ outcomes in other practice situations such as in interdisciplinary rounds and meetings, during shift handoff, and at discharge.25-29 Researchers have documented that tools such as checklists can increase adherence to evidence-based practice guidelines,30 so we considered adding a checklist to our therapeutic hypothermia bundle to support the safe, effective, and efficient implementation of the therapeutic hypothermia protocol.

Local Problem

At our hospital, we have implemented therapeutic hypothermia in 182 patients in the past 5 years. Until 2009, therapeutic hypothermia was exclusively implemented in the coronary care unit (CCU). Although most patients who are treated with therapeutic hypothermia continue to be admitted to the CCU (73%) or the medical intensive care unit (18%), therapeutic hypothermia is sometimes provided in the other intensive care units (ICUs). The number of patients receiving therapeutic hypothermia has increased steadily each year to a total of 59 patients in 2013 (Figure 1). Because of the low frequency of therapeutic hypothermia cases and the large number of nursing staff across different ICUs, months can pass between case exposures, and each exposure could be at a different phase of the protocol.

In a review of cases of therapeutic hypothermia at our institution, we found inconsistencies in the implementation of the protocol and a lack of clarity and urgency in managing the patients during the different phases of the protocol (initiation, maintenance, rewarming, and normothermia). Despite our having a standardized order template and nursing policy for therapeutic hypothermia, our data indicated a need for improvement in our implementation of the therapeutic hypothermia protocol.

Intended Improvement

Caring for patients after cardiac arrest in a critical care unit is a complex, tense, and time-sensitive undertaking. Applying an infrequently used but multifaceted procedure such as therapeutic hypothermia under these conditions is challenging and may diminish reliable and consistent implementation of the intervention. Barriers to timely implementation exist, including a delayed decision to implement therapeutic hypothermia, lack of protocols to guide implementation, the volume of cardiac arrest patients treated, training, and experience of staff.31 Providing therapeutic hypothermia requires an interdisciplinary collaborative approach initiated in the field by emergency medicine services (EMS) and continued by the emergency department, catheterization laboratory, and the ICUs. The different phases of therapeutic hypothermia cause physiological changes that require intense assessment, monitoring, and intervention to manage shifts in hemodynamics (bradycardia, hypotension, hypovolemia), electrolytes (hyper- and hypo-glycemia, hypo- and hyperkalemia), achieving desired temperature, managing infection, and assessing for evidence of myoclonus and seizure activity.8,9,32 Successful implementation of the therapeutic hypothermia protocol requires collaboration among many disciplines and is a labor-intensive task that requires continuous monitoring, assessment, and multitasking by the bedside nurse to rapidly initiate the many required protocol interventions during the 4 different phases of therapeutic hypothermia in a 3- to 5-day period.11,33 In addition, nurses are responsible for promoting patients’ comfort and providing support to patients’ families during the tenuous period after cardiac arrest.33-35

Although we were decreasing the time it took to achieve target temperature, we were not reliably achieving our
target temperature in fewer than 4 hours after the initiation of therapeutic hypothermia (see Table). We proposed a checklist as an intervention to improve achieving the desired temperature goal within the recommended 4 hours and to manage the various protocol interventions and minimize complications.

Since the release of the World Health Organization’s surgical safety checklist study,23 checklists have gained prominence in clinical care as visual tools for standardizing communication, especially during high-risk processes.24 Because checklists have been documented as effective tools to improve teamwork and communication,24 we theorized that a checklist could improve performance in reaching target temperature during therapeutic hypothermia.

**Study Purpose**

The purpose of our checklist was to guide ICU nurses and the health care team in safely, effectively, and efficiently implementing the therapeutic hypothermia protocol during the different phases of the intervention in the ICU to decrease the time required to achieve the target temperature.

**Methods**

**Ethics**

Our cardiac arrest registry was reviewed by the Human Research Committee and was approved as research limited to health medical records. Data from the cardiac arrest registry were collected and managed by using REDCap electronic data capture tools hosted at Brigham and Women’s Hospital. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies.25 All patient identifiers (date of birth, medical record number) are restricted from data reporting within REDCap to protect the confidentiality of the data.

**Setting**

Brigham and Women’s Hospital is a 793-bed academic medical center with 100 adult ICU beds in 6 units and a total of 436 critical care staff nurses.

**Planning the Intervention: Improving Therapeutic Hypothermia Implementation With a Checklist**

To achieve optimal, consistent standardized care for patients receiving therapeutic hypothermia in our hospital, an interprofessional committee on therapeutic hypothermia was established in 2008 with representation from nursing, pharmacy, cardiology, neurology, pulmonary critical care, emergency medicine, and interventional cardiology.27 Our committee began by developing a protocol in 2009, an order template in 2010, and a shivering algorithm in 2011. These resources had been developed as we gained experience with the implementation of therapeutic hypothermia and were based on current evidence. Nurses received ongoing education on the therapeutic hypothermia protocol via in-service training sessions and annual competency sessions. As we gained experience in caring for patients receiving therapeutic hypothermia and as new data were published, our hospital’s protocol for therapeutic hypothermia underwent annual revisions.

Based on the positive feedback from the ICU nursing staff on the 1-page shivering algorithm and building on the success of the World Health Organization’s surgical

### Table

<table>
<thead>
<tr>
<th>Time measured</th>
<th>Before checklist (n=60)</th>
<th>After checklist (n=61)</th>
<th>Goal time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of therapeutic hypothermia to target temperature</td>
<td>7:00 (5:30-8:11)</td>
<td>6:30 (4:32-9:57)</td>
<td>≤4:00</td>
</tr>
<tr>
<td>Admission to unit to target temperature</td>
<td>5:47 (4:22-8:03)</td>
<td>4:00 (2:00-6:56)</td>
<td>≤3:00</td>
</tr>
<tr>
<td>Admission to unit to placement of Arctic Sun</td>
<td>1:05 (0:30-2:29)</td>
<td>0:30 (0:30-1:00)</td>
<td>—</td>
</tr>
<tr>
<td>Admission to unit to continuous electroencephalographic monitoring</td>
<td>37:27 (15:00-55:27)</td>
<td>14:17 (9:15-22:42)</td>
<td>&lt;18:00</td>
</tr>
</tbody>
</table>

Checklists have been documented as effective tools to improve teamwork and communication.
safety checklist, the nursing representatives on the Therapeutic Hypothermia Committee proposed developing a checklist on therapeutic hypothermia for intensive care nurses. The goal of this checklist was to improve the timeliness of achieving the target temperature within the recommended 4 hours and to manage the various interventions at all phases of the therapeutic hypothermia protocol while minimizing complications and maintaining safe and high-quality patient care. Relying on a standardized protocol improves the quality and outcomes of an intervention such as therapeutic hypothermia. Checklists have also been used as tools to increase the quality and safety in many industries and have gained popularity in health care. Checklists standardize the tasks that must be completed and provide a transparent framework to ensure protocol adherence, all while establishing a process to share information and support among caregivers.

Checklist Development

The design of our checklist was motivated by our desire to shorten the time required to reach the target temperature and provide direction to managing the many treatment interventions at each stage of the therapeutic hypothermia protocol. Our existing guideline and order template became the key interventions captured on the checklist. Based on the American Heart Association’s guidelines for postresuscitation care and our guidelines of care for use of therapeutic hypothermia after cardiac arrest, we divided interventions into the 4 stages of the therapeutic hypothermia protocol. The first phase is the “initiation of cooling” from 0 to 4 hours. The goal is that the patient will reach the target temperature of 33°C (91.4°F) within 4 hours of initiation of therapeutic hypothermia. The next phase is “maintenance of cooling” from 4 to 24 hours. Cooling is maintained for 24 hours from the initiation of therapeutic hypothermia. Twenty-four hours after the initiation of therapeutic hypothermia, the “rewarming” phase begins. Rewarming is done very slowly at a rate of 0.25°C (0.5°F) per hour and takes 12 to 16 hours. Once the patient reaches 37°C (98.6°F), the last phase, “normothermia,” is maintained for 48 hours. We were now able to identify all of the interventions that needed to be completed to achieve our first goal of target temperature within 4 hours.

The checklist is designed as 1 page to be kept at the bedside. It is a quick, easy, just-in-time resource for nurses, includes a box to be checked when each item is completed, and is used during handoff communication. The checklist was first pilot tested in the CCU and was revised on the basis of staff feedback. We incorporated the checklist into the hospital policy available online, and we placed hard copies in a reference book on the unit for nurses to integrate into patient care. This therapeutic hypothermia checklist (Figure 2) for intensive care nurses has been in use since September 2012.

Evaluation and Analysis

Data are collected in real time by our research coordinator. An initiation of therapeutic hypothermia report is generated each time orders for therapeutic hypothermia are implemented and is sent to all members of the therapeutic hypothermia committee for review. This report includes patients’ demographics (eg, age), initial rhythm, downtime, times from ROSC to arrival in the emergency department, from emergency department to ICU admission, from ROSC to target temperature, from ICU admission to target temperature, from ICU admission to placement of Arctic Sun surface cooling device, and from ICU admission to electroencephalography. The reports allow us to accurately track the use of therapeutic hypothermia throughout the hospital and to review cases both as they occur and over time.

The development and implementation of the therapeutic hypothermia checklist have provided the nursing staff in all ICUs with an easy-to-follow reference to facilitate compliance with the required interventions in the therapeutic hypothermia protocol. Since 2009, we have cared for 183 patients receiving therapeutic hypothermia at our institution. Despite the various systems in place, the median time to target temperature from ROSC was 8 hours, double our desired goal of 4 hours. Since we began using the checklist, we have reduced our time from CCU admission to target temperature from a median time of 5 hours 47 minutes (2009-2011) to 4 hours (2012-2013) in the CCU, where the checklist was first pilot tested and used consistently. The time from CCU admission to placement of the Arctic Sun cooling device has decreased from 1 hour before use of the checklist to 30 minutes since implementation of the checklist (see Table).
### Table: Therapeutic Hypothermia (TH) after Cardiac Arrest: ICU Nursing Checklist

<table>
<thead>
<tr>
<th>Initiation of Cooling 0-4 hours (goal: target temp within 4 hours)</th>
<th>Maintenance of Cooling 4-24 hours</th>
<th>Rewarming 24-38 hours</th>
<th>Normothermia x 48 hours AFTER target temp 98.6°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>- BICS OE template completed by house staff</td>
<td>- BIS monitoring</td>
<td>- Rewarming begins 24 hours after initiation of TH</td>
<td>- Keep Arctic Sun pads on and target temp set at 98.6°F/37°C for 48 hours</td>
</tr>
<tr>
<td>- EEG ordered in Precipio</td>
<td>- Continue sedation/analgesia infusions</td>
<td>- Set Arctic Sun to:</td>
<td>- Wane/discontinue sedation/analgesia infusions</td>
</tr>
<tr>
<td>- Establish 2 sources of temperature</td>
<td>- BSAS q 1 hour</td>
<td>- target temp of 98.6°F/37°C</td>
<td>- If NMBA infusion</td>
</tr>
<tr>
<td>- Monitoring to Arctic Sun — preferred order is Foley, esophageal, rectal</td>
<td>- If BSAS ≥ 1, follow shivering algorithm</td>
<td>- rewarm at rate of 0.5°F (0.25°C) per hour (it will take 12-16 hours to rewarm)</td>
<td>- D/C NMBA infusion</td>
</tr>
<tr>
<td>- Place Arctic Sun pads on admission to ICU</td>
<td>- BBG q 1 hour</td>
<td>- Refer to directions on Arctic Sun and in nursing policy</td>
<td>- Assess TOF every hour</td>
</tr>
<tr>
<td>- Sedation infusion (propofol or midazolam)</td>
<td>- If Glu &gt; 200, start modified BHIP</td>
<td>- Continue sedation/analgesia infusions</td>
<td>- When TOF 4/4, wean/discontinue sedation/analgesia</td>
</tr>
<tr>
<td>- Analgesia infusion (fentanyl or hydromorphone)</td>
<td>- Turn insulin OFF if Glu &lt; 200</td>
<td>- Draw labs q 4 hours after TH initiation at:</td>
<td>- Observe for temp spikes and rigors</td>
</tr>
<tr>
<td>- BIS monitoring</td>
<td>- MAP goal ≥ 75 mm Hg</td>
<td>- 8 hours: Chem 7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td>- Refer to normothermia section of shivering algorithm</td>
</tr>
<tr>
<td>- Baseline TOF</td>
<td>- CVP goal &gt; 12 mm Hg</td>
<td>- 12 hours: Glu, K, cultures: blood, sputum, urine</td>
<td>- Document hourly: patient temp, Arctic Sun flow, water temp</td>
</tr>
<tr>
<td>- Magnesium 4 g IVB over 4 hours</td>
<td>- Document hourly: Patient temp, Arctic Sun flow, water temp</td>
<td>- 16 hours: Chem 7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td>- Draw labs every 8 hours x 2:</td>
</tr>
<tr>
<td>- Cover head, hands, feet with towels/blankets</td>
<td>- Observe for temp spikes and rigors</td>
<td>- 20 hours: Glu, K</td>
<td>- Glu, K, Mg, Ca</td>
</tr>
<tr>
<td>- BSAS every hour</td>
<td>- Refer to directions on Arctic Sun troubleshooting chart/guidelines</td>
<td>- 24 hours: Chem7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td>- Keep Arctic Sun pads on and target temp set at 98.6°F/37°C for 48 hours</td>
</tr>
<tr>
<td>- If BSAS ≥ 1, follow shivering algorithm</td>
<td>- Draw baseline admission labs:</td>
<td>- Hold K+ replacement 4 hours prior to rewarming (unless K &lt; 3.5)</td>
<td>- Wean/discontinue sedation/analgesia infusions</td>
</tr>
<tr>
<td>- BBG q 1 hour</td>
<td>Chem 20, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td></td>
<td>- If NMBA infusion</td>
</tr>
<tr>
<td>- If Glu &gt; 200, start modified BHIP</td>
<td>- 4 hours after initiation: serum GLU, K</td>
<td></td>
<td>- D/C NMBA infusion</td>
</tr>
<tr>
<td>- Turn insulin OFF if Glu &lt; 200</td>
<td>- BIS monitoring</td>
<td></td>
<td>- Assess TOF every hour</td>
</tr>
<tr>
<td>- Draw labs q 4 hours after TH initiation at:</td>
<td>- BSAS q 1 hour</td>
<td></td>
<td>- When TOF 4/4, wean/discontinue sedation/analgesia</td>
</tr>
<tr>
<td>- 8 hours: Chem 7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td>- If BSAS ≥ 1, follow shivering algorithm</td>
<td></td>
<td>- Observe for temp spikes and rigors</td>
</tr>
<tr>
<td>- 12 hours: Glu, K</td>
<td>- Draw labs every 8 hours x 2:</td>
<td></td>
<td>- Refer to normothermia section of shivering algorithm</td>
</tr>
<tr>
<td>- 16 hours: Chem 7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td>Glu, K</td>
<td></td>
<td>- Document hourly: patient temp, Arctic Sun flow, water temp</td>
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<td>- 20 hours: Glu, K</td>
<td></td>
<td></td>
<td>- Draw labs every 8 hours x 2:</td>
</tr>
<tr>
<td>- 24 hours: Chem7, CBC, CK, CK-MB, cTnt, lactic acid, ABG</td>
<td></td>
<td></td>
<td>Glu, K, Mg, Ca</td>
</tr>
<tr>
<td>- Target temp (91.4°F) achieved within 4 hours of initiating TH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF NOT—refer to shivering algorithm and Arctic Sun troubleshooting chart/guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2** Therapeutic hypothermia (TH) after cardiac arrest: ICU nursing checklist.

Abbreviations: ABG, arterial blood gas analysis; BBG, bedside blood glucose; BHIP, Brigham and Women’s Hospital intravenous insulin protocol; BICS OE, Brigham Integrated Computing System order entry; BIS, bispectral index monitoring; BSAS, Bedside Shivering Assessment Scale; Ca, calcium; CBC, complete blood cell count; CK, creatine kinase; CK-MB, creatine kinase-MB fraction; cTnt, cardiac troponin T; CVP, central venous pressure; D/C, discontinue; EEG, continuous electroencephalographic monitoring; Glu, glucose; ICU, intensive care unit; IVB, intravenous bolus; K, potassium; labs, samples for laboratory tests; MAP, mean arterial pressure; Mg, magnesium; NMBA, neuromuscular blocking agent; q, every; temp, temperature; TOF, train of four.

Courtesy Brigham and Women’s Hospital, Boston, Massachusetts.
The management of shivering. The checklist has provided an opportunity for case discussions with the clinical nurse educator and has led to an increased understanding of the rationale for the different therapeutic hypothermia interventions, including the early use of electroencephalographic monitoring. We have noted a decrease in time from CCU admission to initiation of continuous electroencephalographic monitoring from 37.5 hours to 14.25 hours (see Table). The nurses have stated that the therapeutic hypothermia checklist aids in clinical decision making by providing prompts to assist with maintaining hemodynamic stability and preventing complications from therapeutic hypothermia.

Discussion

The use of the therapeutic hypothermia checklist helps maintain consistent care of patients in the dynamic ICU

Mr C, a 55-year-old man, was out jogging one evening when he experienced a witnessed ventricular fibrillation cardiac arrest. Bystander cardiopulmonary resuscitation was initiated, and EMS-activated prompt defibrillation and ROSC were achieved within 10 minutes. EMS initiated therapeutic hypothermia with an infusion of iced normal saline (4°C) and ice packs applied to the neck, axillae, and groin. Mr C arrived in the emergency department at 9:05 PM with a body temperature of 36.5°C (97.8°F). Despite Mr C’s history of hypertension and coronary artery disease (drug-eluting stent to circumflex artery 5 years earlier), the 12-lead electrocardiogram did not show evidence of myocardial ischemia or infarction.

An assessment by the emergency department’s team and a neurology consultant confirmed that Mr C met the criteria for therapeutic hypothermia: he had experienced a ventricular fibrillation cardiac arrest with ROSC after 10 minutes, he was comatose (no meaningful response to verbal stimuli), and there were no contraindications for therapeutic hypothermia. The emergency department continued cooling with ice packs and initiated continuous infusions of propofol and fentanyl.

Mr C was admitted to the CCU at 12:30 AM with a body temperature of 35°C (95.2°F). The CCU nursing staff had prepared for his arrival and anticipated Mr C’s care needs by using the therapeutic hypothermia checklist. The physicians had entered the therapeutic hypothermia order set and the necessary equipment including the Arctic Sun surface cooling device was ready for placement upon Mr C’s arrival and was started at 12:40 AM. Interventions to prevent shivering and maintain comfort were initiated. Bispectral monitoring was initiated, and a baseline train of 4 was obtained. Blood samples for laboratory tests were collected per the therapeutic hypothermia protocol. Mr C did experience some shivering that was promptly treated by referring to the shivering algorithm from the therapeutic hypothermia checklist and a target temperature of 32.7°C (90.9°F) was achieved at 2 AM. Electroencephalographic monitoring was initiated at 9 AM. Cooling was maintained for 24 hours from the start of therapeutic hypothermia. The nurse coming on for the next shift was alerted that Mr C would be due to be rewarmed in 2 hours. Using the checklist, the nurses reviewed the completed interventions during the maintenance phase. A potassium level of 3.2 mEq/L had been repleted per protocol 2 hours previously. The glucose levels had remained less than 200 mg/dL, so insulin had not been initiated during the cooling phase. Mr C rewarmed at a rate of 0.25°C (0.5°F) per hour without significant hypotension, hypoglycemia, or hyperkalemia. Normothermia (37°C, 98.6°F) was achieved in 14 hours and maintained per protocol for 48 hours. Mr C’s neurological and cardiac status improved during his 5-day stay in the CCU, and he was discharged home on day 10 after receiving an implantable cardioverter defibrillator. He had good neurological recovery as evidenced by a Cerebral Performance Category score of 1. Mr C returned to work 2 weeks after discharge from the hospital and resumed his exercise regimen.

Observations of practice and feedback from the nursing staff in all the ICUs all support the utility of the therapeutic hypothermia checklist for intensive care nurses. The checklist has been implemented in units other than the CCU where therapeutic hypothermia is used less often. Nurses have reported that using the therapeutic hypothermia checklist helps them prepare, prioritize, and organize their interventions when admitting a critically ill patient. Nurses have reported that the checklist guides nursing documentation and ensures that future interventions remain on schedule, while also supporting teamwork and communication. The checklist helps the nurses to focus on the immediate tasks and simultaneously view the entire process from beginning to end so that they can anticipate changes as the patient progresses. We have observed increased use of the shivering algorithm and nursing documentation of the management of shivering. The checklist has provided an opportunity for case discussions with the clinical nurse educator and has led to an increased understanding of the rationale for the different therapeutic hypothermia interventions, including the early use of electroencephalographic monitoring. We have noted a decrease in time from CCU admission to initiation of continuous electroencephalographic monitoring from 37.5 hours to 14.25 hours (see Table). The nurses have stated that the therapeutic hypothermia checklist aids in clinical decision making by providing prompts to assist with maintaining hemodynamic stability and preventing complications from therapeutic hypothermia.

Discussion

The use of the therapeutic hypothermia checklist helps maintain consistent care of patients in the dynamic ICU
environment, where many team members need to collaborate with one another. Further, it supports nursing practice by decreasing the uncertainty for nurses less familiar with implementing the protocol in this complex time-pressured situation.

We have introduced a novel checklist for the implementation of therapeutic hypothermia and demonstrated further support for the growing body of evidence indicating that checklists and other types of cognitive aids are effective in improving various complex processes. Using a checklist for therapeutic hypothermia has many implications in addition to the potential to improve patients’ outcomes. Given that checklists have been documented as improving teamwork and communication, their use in therapeutic hypothermia could lead to improved interdisciplinary collaboration. Further, this type of support for nursing work increases nurses’ autonomy and allows them more time to focus on providing holistic care to patients and patients’ families.

Limitations

This report of the implementation of an ICU nursing checklist for therapeutic hypothermia to integrate the evidence for therapeutic hypothermia into practice is limited by the lack of control over possible confounding variables that may have affected the time to achieve the temperature target. Although our practice has improved, we cannot conclude that this is solely a result of using the checklist. Nonetheless, we easily integrated the checklist into practice, and it can be adapted for use in other institutions.

Summary

Thus far, the therapeutic hypothermia checklist for intensive care nurses has helped the CCU improve 2 metrics related to the implementation of evidence-based practice of therapeutic hypothermia: the time from CCU admission to achieving the target temperature and the time from CCU admission to continuous electroencephalographic monitoring.

Our next challenge will be to focus on the processes within our system to continue the cooling initiated by EMS and decrease the time from ROSC to ICU admission. Further evaluation of compliance with the therapeutic hypothermia checklist and the effects on patients’ outcomes is needed for continuous quality improvement.

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None reported.

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To learn more about therapeutic hypothermia, read “Use of Therapeutic Hypothermia in Cocaine-Induced Cardiac Arrest: Further Evidence” by Scantling et al in the American Journal of Critical Care, January 2014;23:89-92. Available at www.ajconline.org.

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Use of a Nursing Checklist to Facilitate Implementation of Therapeutic Hypothermia After Cardiac Arrest

Facts
Therapeutic hypothermia has become a widely accepted intervention that is improving neurological outcomes following return of spontaneous circulation (ROSC) after cardiac arrest. This intervention is highly complex but infrequently used, and prompt implementation of the many steps involved, especially achieving the target body temperature, can be difficult.

• A checklist was introduced to guide nurses in implementing the therapeutic hypothermia protocol during the different phases of the intervention (initiation, maintenance, rewarming, and normothermia) in an intensive care unit.
• We divided interventions into the 4 stages of the therapeutic hypothermia protocol so that we were able to identify all of the interventions that needed to be completed to achieve our first goal of target temperature within 4 hours.
• The first phase is the “initiation of cooling” from 0 to 4 hours. The goal is that the patient will reach the target temperature of 33°C (91.4°F) within 4 hours of initiation of therapeutic hypothermia.
• The next phase is “maintenance of cooling” from 4 to 24 hours. Cooling is maintained for 24 hours from the initiation of therapeutic hypothermia.
• Twenty-four hours after the initiation of therapeutic hypothermia, the “rewarming” phase begins. Rewarming is done very slowly at a rate of 0.25°C (0.5°F) per hour and takes 12 to 16 hours.
• Once the patient reaches 37°C (98.6°F), the last phase, “normothermia,” is maintained for 48 hours.
• The checklist is a quick, easy resource for nurses, and is used during handoff communication. The nursing checklist has provided all of the intensive care nurses with an easy-to-follow reference to facilitate compliance with the required steps in the protocol for therapeutic hypothermia.
• Using a checklist for therapeutic hypothermia has many implications in addition to the potential to improve patients’ outcomes. Given that checklists have been documented as improving teamwork and communication, their use in therapeutic hypothermia could lead to improved interdisciplinary collaboration. Further, this type of support for nursing work increases nurses’ autonomy and allows them more time to focus on providing holistic care to patients and patients’ families.
• Use of the checklist has helped reduce the time from admission to the unit to reaching the target temperature and the time from admission to continuous electroencephalographic monitoring in the cardiac intensive care unit. Evaluation of patients’ outcomes as related to compliance with the protocol interventions is ongoing. CCN

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