BARNES-JEWISH HOSPITAL
CRITICAL CARE POLICIES/PROCEDURES

TITLE: Targeted Temperature Regulation: Induced Cooling and Controlled Rewarming

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Policy Statements

A. Only an ED or ICU attending physician or qualified designee appointed by the attending will determine which patients are appropriate for induced hypothermia management.
B. Post-arrest Hypothermia (PAH) for out-of-hospital arrest survivors can be initiated in the emergency department with ongoing treatment in the Intensive Care Unit environment. PAH for in-hospital arrest survivors will begin upon arrival to either 8200 or 44ICU. Inpatient Code 7 team will provide screening for potential PAH inpatients, but will not initiate PAH outside the ICU.
C. Intravascular cooling is the primary method to induce hypothermia, but external cooling can also be pursued.
D. If external hypothermia treatment is ordered for post-arrest patients, a trained RN is responsible for making a baseline skin assessment, and documenting any skin issues at baseline, before application of the Gaymar Rapr•Round™ chest and leg wraps.
E. If intravascular cooling is indicated, a qualified physician is responsible for performing the insertion of the multi-lumen central venous catheter, maintaining the integrity of the heat exchange balloons during the procedures. A trained staff nurse is responsible for setting up, priming, initiating therapy and maintaining and removal of the thermo-regulation system.
F. The use of the ICU Post Arrest Intravascular Therapeutic Hypothermia Order set in the electronic medical record is available to assist in order entry.
G. See the BJH Organization Policy and Procedure "Central Venous Catheters (CVC): Insertion, Care, Use and Removal of CVC" for details regarding catheter insertion and maintenance.
H. The thermo-regulation system is indicated for use in fever reduction as an adjunct to other antipyretic therapy, neurological patients with a target temperature of 36-37 degrees, for induced hypothermia for post- arrest survivors, and for active re-warming of severely hypothermic patients. Target temperatures for each patient is based on the indication and physician orders.
I. Two temperature sources are required for safe monitoring of the patient's core temperature. Core temperature sources include esophageal probe, temperature-sensing urinary catheter, pulmonary artery catheter blood temperature, or rectal probe temperature.
    1. Bladder catheter temperature monitoring in patients who are anuric may be less reliable or have delayed changes. Presence of urine is required to provide an accurate core temperature reading.
J. CVP and arterial BP monitoring is recommended during PAH.
K. Indications for induced hypothermia for post arrest survivors:
    - Any in- or out- of hospital VT or VF witnessed arrest with uncomplicated co-morbid disease can be considered for PAH.
    - Unresponsive to verbal stimulation after ROSC (return of spontaneous circulation) for at least 15 minutes post-arrest.
    - Systolic blood pressure can be maintained at or above 90 mmHg with stability (including with vasopressors, fluids, meant to exclude patients in shock) for at least 15 consecutives minutes post-arrest.
L. Relative Contraindications:

- Pregnancy. All women of age 55 or younger need a negative urine or serum β-HCG
- Other reasons to be unconscious. Consider head CT where appropriate.
- Pre-existing hypothermia (temperature less than 30 ºC) before cooling efforts begin
- Known coagulopathy or bleeding problem
- IVC filter – excluded from long cooling catheter intravascular method (Icy); must use shorter cooling catheter (Cool-Line) via internal jugular or subclavian approach or select external cooling
- Existing DNR (do not resuscitate) or DNI (do not intubate) orders.
- Inability to maintain systolic blood pressure at or greater than 90 with vasopressors or fluids.

Procedure

A. Assessment
1. Patient/ significant other understanding of procedure
2. Patient's ability to cooperate (comfort needs, cognitive ability), neurological assessment, and need for sedation and/or analgesia during the procedure
3. Assess patient's temperature using two different temperature sources.
   ***Key Point**: Continuous bladder temperature monitoring is contraindicated for patients who are anuric. Use esophageal, rectal, or blood temperature monitoring if it is available.
4. Perform a thorough head-to-toe skin assessment, measuring and documenting any abnormalities before starting hypothermia therapy. Consider using pressure relief mattress if indicated.
5. Consider arterial line placement before reaching goal temperature with set up of arterial lines. Refer to Critical Care Policy and Procedure. Maintain mean arterial pressure (MAP) above 80 with vasopressors, fluids and inotropes as ordered.
   ***Key Point**: Cooling results in vasoconstriction of vasculature making access more challenging in a potentially unstable patient
6. Monitor lab work as ordered during cooling and rewarming.
   ***Key Point**: Hypothermia decreases blood potassium, phosphorus and magnesium levels. Rewarming tends to increase potassium, magnesium and phosphorus. Monitor glucose levels closely maintaining glycemic control per orders.
7. Monitor heart rhythm observing for presence of bradycardia during hypothermia. The QT interval on the ECG tends to increase with the presence of cooling, and should be monitored closely.
8. Monitor patient for shivering. Shivering should be avoided. Neuromuscular blocking agents (paralytics) might be ordered to control shivering.
   ***Key Point**: Adequate sedation must be given before starting therapeutic paralysis with neuromuscular blocking agents. Monitor train-of-four with a peripheral nerve stimulator. See the Critical Care P&Ps "Sedation in the ICU Guidelines" and "Neuromuscular Blockade"
9. Set-up radial arterial pressure lines for monitoring. Maintain MAP above 80 with vasopressors and/or inotropes. Refer to the critical care P&Ps "Pressure Tubing / Transducer System Assembly" and "Pressure Monitoring Arterial" for further information.
10. Set-up CVP monitoring after central venous vascular access is achieved. Record CVP measurements as ordered. Refer to critical care P&P "CVP monitoring."
    ***Key Point**: During re-warming, CVP may decrease requiring fluid resuscitation. The Icy® CoolGard catheter is placed in the groin, but due to its extra-long length it extends into the patient's inferior vena cava and allows CVP monitoring. Central venous pressure monitoring is recommended via the Icy® CoolGard catheter per the manufacturer's guidelines.

B. Plan
1. Prepare the equipment and the patient.
2. Explain the procedure to the patient/significant other.
3. FOR POST-ARREST HYPOTHERMIA:
   a. If shivering is present, ensure that the patient is sedated to RASS level of -5 before starting therapeutic paralytic agents.
   b. Begin sedation and therapeutic paralysis as ordered. See the Critical Care P&Ps "Sedation in the ICU Guidelines" and "Neuromuscular Blockade."

Intravascular Procedure

Equipment

1. ZOLL ThermogardXP (or CoolGard) temperature regulation system console
2. ZOLL ICY® Cool Line® or Quattro® multi-lumen central venous catheter kit
   a. Note: if the patient has a known IVC filter, do not use an ICY® or Quattro® catheter. Instead, place a Cool Line® catheter via the internal jugular or subclavian vein.
   b. Cooling catheters are latex-free.
   c. For patients requiring re-warming therapy, the "ICY" catheter must be selected and placed in the femoral vein.
3. ZOLL startup kit
4. 500ml IV 0.9% normal saline
5. Central line insertion kit
6. Sterile gowns, gloves, masks and head covers for all personnel in patient's room during insertion.
7. Bladder temperature urinary catheter and insertion tray
8. Esophageal temperature probe.

C. Implementation

1. Prepare the ZOLL ThermogardXP console for treatment:
   a. Bring the ZOLL ThermogardXP console to the bedside. Plug the power cord into a red receptacle.
   b. Lock the two front casters by stepping down on the tab above each wheel.
   c. Turn the power on/off switch (see picture 2 on page 10), located at the rear of the console near the upper left corner, to ON. The green power indicator light will illuminate and the alarm will beep once.
   d. The ZOLL ThermogardXP performs a self-test. During this interval, the self-test screen appears on the display. If the self-test detects a problem, an error message displays. If this occurs, refer to operations manual, chapter 6 – Alarms and Corrective Actions for assistance.
   e. The ZOLL ThermogardXP. **24 hour support line (877) 225-7487** is posted on the front of the console for telephone assistance.
   f. When the self-test is completed, the System Set-Up screen displays the message:
      "System Pre-Cool? **YES NO**"
      1) Highlight "YES" and press the "Press the Menu/Enter" knob to enter the selection.
      2) If re-warming the patient, select "NO" and press the menu/enter knob once.
   g. When the CoolGard 3000 detects previous patient data, the System Set Up screen displays the message "New Patient?"
      1) Turn knob to highlight "YES." Press the knob once to enter the selection.
      2) The screen displays the message "Previous patient data must be downloaded or deleted to proceed"
         a) Turn knob to highlight "Delete" and press the knob once to enter the selection.
   h. The System Set-Up screen displays the message:
      "Select Pump Rate **Cool Line (200) Icy (240) Quattro**
      1) Turn the knob to highlight the appropriate catheter being inserted and press the knob once to enter the selection.
   i. The System Set-Up screen displays the message:
      "Override Secondary Temperature Probe (T2)? **YES NO**"
      1) If you have a secondary patient temperature probe, choose "NO" and press the knob once to enter the selection.
      2) If the patient is connected to an independent hospital temperature monitor, choose "YES" and press the knob once to enter the selection.

a) The patient must have either an esophageal, rectal or bladder temperature probe in place. Connect this temperature source to the ZOLL ThermogardXP via a cable for temperature monitoring.

j. To continue set up, choose "Continue" and press the knob once.

k. The System Set-Up screen displays the message:
"Select Target Temp"
1) Turn the knob until the target patient temperature is displayed and then press the knob once to enter the selection.
***Key Point**: In the PAH patient, the temperature target is usually 33 degrees Celsius with cooling rate at maximum for 18 hours; alternative target temperature may be 36 degrees Celsius. Re-warming occurs over 6 hours at the end of the 18-hour period. To re-warm, set the unit to 36.5 degrees Celsius at a rate of 0.65 degrees C/hour. When the patient's temperature reaches 36.5 C, turn off the CoolGard and prepare for cooling catheter removal. Ensure that another IV access is available.

l. The System Set-Up screen displays the message:
"Max power or controlled rate? **Max Power** **Controlled Rate** **Fever**
1) Highlight "Max Power," press the knob once to enter the selection. **Controlled rate should only be selected when using the catheter for rewarming.**

2. Install the ZOLL ThermogardXP Start-Up Kit following these steps:
a. Obtain a **500-ml** bag of sterile normal saline solution.
b. Open the top cover of the ZOLL ThermogardXP console. Remove the cap from the coolant well to check the level of the coolant (see picture 1 on page 10). The liquid level should be between the two indicator lines on the wall of the coolant well.
1) If the level is below the bottom of the indictor line, add distilled water until the liquid is at the top indicator line.
2) If the liquid level is unusually low because of spillage, contact Clinical Engineering to service the machine.
3) Open the ZOLL ThermogardXP Start-Up Kit tubing set (see picture 3 on page 10).
4) Insert the heat exchanger coil into the coolant well and temporarily slide the air trap into the holder (see picture 4 on page 10).
5) Secure the coolant well lid so that the tubing exits from a 3:00 o'clock position.
c. Undo the tubing bundle containing the spike (see picture 7 on page 10). Do not disconnect the tubing connection. The large section of tubing goes into the roller pump.
d. Open the transparent top cover of the roller pump. Lift the handle on the pump rollers. Manually rotate the pump into a 1:00 o'clock-7:00 o'clock position to facilitate loading of the tubing (see picture 8 on page 10).
e. Place the flange connector of the pump tubing into the slot on the right side of the pump head (refer to the diagram printed on the inside of the console top cover) (see picture 9 on page 11).
f. Load the pump tubing around the rollers and into the channel of the pump head. You must turn the handle counterclockwise as you feed the tubing into the channel. Press down <u>firmly</u> on the tubing until it settles into the bottom of the channel. Once the tubing is installed, press the handle down onto the rollers until it clicks into its detent. Close the top cover of the pump.
g. Using aseptic technique, connect the priming line to the sterile saline bag being careful not to puncture the bag or the spike port (spike tip is very sharp). Hang bag on the hook mounted on the rear of the display post. The container hands inside the circumference of the handle.
h. Remove the air trap from its holder and hold it upside down (with the tubing connections pointing downward) (see picture 10 on page 11).
i. Prime the air trap and the tubing circuit by pressing and holding the PRIME switch until the air trap and tubing are completely full of saline (approximately 2 minutes). The roller pump

will slowly start and takes about 20 seconds to get to operating speed. Observe the movement of saline until it fills the air trap and the entire length of the tubing (see picture 9 on page 11).
1) The prime switch will function after the system self-tests are completed.
2) When the air trap is completely filled with saline, tap it to dislodge any remaining air bubbles.
3) Observe the rotation of the inline flow indicator. The in-line flow indicator should rotate/spin when the air trap and tubing are free of air. If the inline flow indicator is not rotating at the end of priming, tap to dislodge any trapped air bubbles in the indicator.
4) Observe the saline container. When bubbles are no longer seen in the container, priming is complete.
5) Saline bag should have approximately 250ml of saline remaining. **Mark this level at 250-ml's.** This volume should remain a constant.
   a) If the saline bag becomes empty, **DO NOT HANG ANOTHER BAG OF FLUIDS. THERE IS A LEAK IN THE SYSTEM.**
   b) **DISCONNECT** the patient from the system by following procedure to end treatment, items 5a-c.

j. Release the prime switch.
k. Turn the air trap right side up and insert it into the holder.
l. Place the tubing to the catheter in the two notches at the front of the console. Place the priming tubing line and the saline return line in the channels leading to the rear of the console. Close the top cover. Slide saline bag into insulating jacket around the bag (see picture 11 on page 11).
m. When the self-tests are completed, the System Set Up screen displays the message "Check the following" list.
   1) Correct all of the indicated problems. When corrections have been made, the STANDBY screen appears. The console is ready to be connected to the patient's central venous catheter.

3. Connecting the patient to the console:
   a. If the bladder temperature urinary catheter or rectal probe has not been placed, this should be done now.
   b. Plug the cable from the primary temperature probe into the connector labeled "T1" and connect it to the bladder temperature probe or to the rectal temperature probe.
   c. If the cooling catheter has not been placed into the patient, leave the console in standby mode until the catheter is placed and ready to be connected to the saline line.
   d. If the cooling catheter has been placed and its position verified, using aseptic technique, disconnect the two connectors of the catheter and saline line.
      1) Connect the female tubing connector to the male connector on the catheter and the male tubing connector to the female connector on the catheter. Note that the return line is equipped with an inline flow-indicator.
      2) The ZOLL ThermogardXP is ready to begin treatment.
4. Starting treatment:
   a. When the standby banner is displayed, press the Standby/Run button once. The standby banner will disappear, the pump starts and treatment begins.
      1) If the inline flow indicator is not rotating, there is air in the inline flow indicator, air in the saline line tubing or there is not adequate flow through the saline line tubing.
         a) Verify that the air trap is completely filled with saline
         b) Inspect the tubing for leaking saline.
5. Ending treatment:
   a. Switch the ZOLL ThermogardXP to standby mode by pressing the Standby/Run button.
      1) The pump stops and the "Standby" screen appears.

b. Using aseptic technique, disconnect both tubing connectors from the catheter and reconnect the flow line connectors together on the catheter and saline line tubing.
c. Locate the cable to the temperature probe and disconnect it from temperature probe.
    1) Leave temperature cable connected to CoolGard 3000 console.
d. Press the Menu/Enter knob once. The menu displays. Highlight "End of Procedure" and press the knob once to enter the selection.
    1) To end the procedure, choose "YES."
    2) To cancel this selection and return to the menu, choose "Cancel/Exit."
e. If you chose to end the procedure, the screen displays the message "Patient data must be downloaded or deleted to proceed."
    1) Highlight "Delete" and press the knob once to enter the selection.
    2) The Set-Up screen displays the message: "Are you sure you want to delete previous patient data?" Select "Yes" to delete the data or choose "No" to return to the Patient Data Message screen.
f. The Set Up screen will display the message "Turn power off." Turn the power switch OFF. Dispose of used components.
    1) Dispose of saline bag and connected tubing in appropriate biohazard receptacle.

6. Transporting the patient
    a. To prepare the patient for transport follow the instructions above for "Ending Treatment," items a through c.
    b. Leave the ZOLL ThermogardXP in the standby mode while the patient transported off division.
    c. Restart treatment by pressing the Standby/Run button once. The standby banner will disappear, the pump will start, and the treatment will begin.

7. Alarm management
    a. ***Air Trap Fault*** alarm stops the operation of the ZOLL ThermogardXP..
        1) May be caused by air detected in the air trap. Verify that the air trap is completely filled with saline. Inspect the tubing circuit for leaking saline. If the problem persists, discontinue use and contact the company representative.
        2) May be caused by the saline level detector indicating a fault even when the air trap is full of saline. Check for condensation outside the air trap, dry completely if present. Verify that the air trap seats firmly at the bottom of the air trap holder. If the problems persist, contact the company representative.
    b. ***Coolant alarm*** stops the operation of the ZOLL ThermogardXP. Verify the level of the coolant well.
        1) If empty, contact Clinical Engineering to fill the well with the pre-mixed propylene glycol and distilled water.
        2) If the level is low, add distilled water until the liquid level reaches the top fill line in the coolant well.
    c. ***Primary temperature probe disconnected*** **or** ***dislodged*** stops the operation of the ZOLL ThermogardXP. . Verify the position of the temperature probe. Assure that the primary temperature probe or cable is plugged into socket T1

8. Troubleshooting: ZOLL ThermogardXP**: 24-hour support line (877) 225-7487**
    a. If the CoolGard 3000 will not start, verify that the machine is plugged into a working circuit.
    b. If the patient does not cool as indicated by the activity monitor indicating "max cooling" and the patient's temperature is increasing, there are several probable causes:
        1) The patient may be febrile and has overcome the cooling capability of the catheter. Use additional cooling methods as needed until the patient's temperature stabilizes.

2) The temperature controller setting was incorrectly set. Verify that the target temperature and that the cooling rate option is not used.
3) The saline flow is obstructed, as indicated by no rotation of the flow indicator. Inspect the entire length of the tubing, clear all restrictions, including kinks or twisting of the tubing. Check the flow indicator to confirm flow.
4) The heat exchanger coil is not in the coolant reservoir. Place the heat exchanger coil in the reservoir.

c. Saline reservoir bag is empty.
1) **There is a leak in the saline flow system**. Switch the CoolGard 3000 to standby by pressing the Standby/Run button, disconnect the patient from the tubing per procedure steps **5a-c and notify the physician**. Do NOT hang another 0.9% NaCl infusion bag.
2) Catheter needs to be replaced by the physician if the cooling treatment needs to be continued. When the new catheter is inserted, a new start kit and set up will be required.

d. Patient is shivering.
1) Verify if the catheter or saline tubing is lying on patient directly. Place a dry cloth between the patient and the tubing.
2) If the patient continues to shiver, place a bath blanket over patient and cover with sheet.
3) Adjust sedation and paralysis to prevent shivering per post-arrest hypothermia orders.

8. Catheter removal:
a. Critical care RNs with verified competency in CVC removal may remove the intravascular cooling catheter. Attach syringe to balloon lumen and withdraw saline. Leave the balloon lumen ends open and allow the water to passively empty as the catheter is removed. Refer to BJH Organizational Policy and Procedure "Central Venous Catheters (CVC): Insertion, Care, Use and Removal of CVC" for all other aspects of central line removal.

D. Documentation/Evaluation
1. Document per the BJH Organizational Policy and Procedure "Central Venous Catheters (CVC): Insertion, Care, Use and Removal of CVC."
2. Document temperature-probe measurements at the ordered frequency. Verify with oral temperature at least once a shift.
3. Document in electronic medical record using the temperature regulation parameter. Cooling or warming device settings, patient temperatures recorded from two separate sources.
4. Record vital signs (temperature, pulse, blood pressure, respiration rate/ ventilator settings) every hour

E. Patient / Family Teaching
1. Explain the procedure to the patient/family and answer questions as needed.

External Cooling Hypothermia Procedure

A. Assemble equipment
1. Gaymar "Rapr Round" chest and leg wraps
2. Gaymar Medi-Therm®III MTA7900 Hyper/Hypothermia System
3. Chilled 0.9% normal saline as ordered
4. Sterile water to fill reservoir on Gaymar hyper/hypothermia system if needed.
5. Temperature probe for bladder/urinary catheter and catheter insertion tray
6. Esophageal temperature probe.
7. Peripheral nerve stimulator
8. Radial arterial pressure monitoring setup
9. Central venous pressure monitoring setup as ordered.
10. Sedation and paralytic as ordered to prevent shivering

B. Plan
   1. Prepare equipment and patient
   2. Explain procedure to patient/significant other
   3. Perform thorough skin assessment
   4. Induce cooling with ice bags wrapped in linen to protect patient's skin, and infuse chilled saline as ordered
      ***Key Point**: Remove ice bags within 20 minutes to avoid thermal burns to patient's skin.
   5. Pre-fill the Gaymar "Rapr Round" body wraps before placing them on the patient

C. Implementation
   1. Document a thorough anterior and posterior skin assessment.
   2. Place ice bags on patient if indicated.
   3. Set up for placement of an arterial-line
   4. Set up for central line or ensure that the patient has adequate peripheral IV access
   5. Place urinary bladder temperature catheter (or esophageal temp probe if patient is anuric)
   6. Infuse chilled 0.9% normal saline (4 degrees Celsius) as ordered over 30 minutes
      ***Key Point**: Chilled saline infused rapidly helps induce cooling so that the target temperature may be reached more efficiently.
   7. Place an appropriate temperature probe in the patient and connect it to the Gaymar cooling unit
      ***Key Point**: Cooling unit must have a patient temperature source plugged into the cooling unit to auto regulate the machine for automatic cooling.
   8. Place second temperature probe in the patient and connect it to the bedside monitor. Verify that there is not a difference greater than 0.5 to 1 degree Celsius between the temperature sources. Consider changing the cooling units if greater than 1 degree difference from temperature sources to ensure patient safety.
   9. Turn on the cooling machine and pre-fill cooling wraps/blankets before applying them to patient.
   10. If cooling blanket is used, see layers below to correctly layer 2 cooling blankets with appropriate linen to protect patient from thermal burns. The layering of linen also assists with holding the cool air close to the patient.

       Cooling Blanket Layers:
       Mattress
       Sheet
       Cooling Blanket
       Sheet
       Patient
       Sheet
       Cooling Blanket
       Sheet
   11. If using the "Rapr Round" chest and leg wraps, the patient may lie on the bed linens as usual. No linen layering is required. The body wraps are designed to be used directly on the patient's skin.
   12. Set cooling on the Gaymar machine on **Auto mode, Rapid**, at **34 degrees C or if ordered, 36 degrees C.**
   13. When the patient's target temp**. of 34 degrees C has been met,** change the cooling unit settings to **33 degrees Celsius, Auto,** and from **RAPID** to **Gradual. Skip this step if target temp is 36 degrees C.**
   14. Maintain patient between 32 and 34 degrees or 36 degrees Celsius for 18 hours as ordered. **The patient's temp will vary slightly depending on the water circulation through wraps/ blankets even though machine temperature is set at 33 or 36 degrees Celsius.**
   15. Turn the patient q 1 hour, and release the Velcro body wraps to examine the skin for signs or symptoms of pressure or frostbite. Re-adjust the wraps, and secure them until the next turn.
   16. Continue sedation to maintain RASS at – 5 as ordered.

17. If patient is shivering, start therapeutic paralytics as ordered after obtaining baseline train of four (TOF) measurements. Continue to monitor for shivering and check the TOF q 1 hour. Maintain therapeutic paralysis with TOF between 1-2 twitches as ordered.

REWARMING

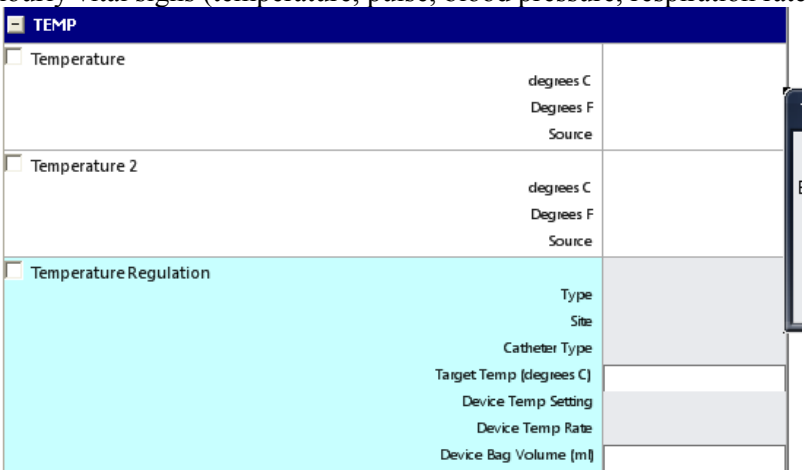
1. Change the cooling unit to **Auto, Moderate mode** and increase the patient's temperature set point by 0.5 degrees Celsius q 1 hour.
2. Gradually re-warm the patient 0.5 degrees Celsius q 1 hour. May discontinue warming and remove body wraps when the patient's temp reaches 36.5 C

D. Troubleshooting
   1. In the event a patient's chest and or legs are too large for the large size of cooling wrap, the patient may receive cooling therapy by fastening two chest wraps together with the Velcro connections and fitting on the patient. An additional cooling machine will be required to ensure that enough cool water is available to circulate through both vests.

E. Patient / Family Teaching
   1. Explain the procedure to the patient/family and answer questions as needed.

Documentation/Evaluation

A. Document temperature-probe measurements at the ordered frequency. Verify with oral temperature at least once a shift.
B. Document in electronic medical record using temperature regulation parameter. Cooling or warming device settings, patient temperatures recorded from two separate sources.
C. Record hourly vital signs (temperature, pulse, blood pressure, respiration rate/ ventilator settings).



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Zoll ThermoguardXP: 24 hour support line (877) 225-7487

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Approval:	**Date:**
Critical Care Policy and Procedure Committee	August 2015
Coreen Vlodarchyk, RN, Chief Nurse Executive	August 2015

Barnes-Jewish Hospital
Critical Care Competency Skills

Temperature Regulation Induced Hypothermia and Controlled Rewarming

Name _____ Unit: _____ Date: _____

Refer to the related BJH Critical Care Policy & Procedure by the same title

Clinical objective: Demonstrates safe and appropriate care of the patient who is undergoing induced hypothermia and controlled rewarming using intravascular and/or external methods.

A. Intravascular Cooling with ZOLL ThermogardXP CoolGard® 3000Console	Evaluator's initials / Date	**B. External Cooling with Gaymar Medi-Therm®III Hyper/Hypothermia System**	Evaluator's initials / Date
1. Assembles equipment		1. Assembles equipment	
2. Sets up and primes ZOLL ThermogardXP CoolGard® 3000 tubing. a. Assures that tubing is inserted properly in roller pump.		2. Monitors patient via two temperature sources - one to the bedside monitor and other to the Gaymar Medi-Therm®III	
3. Assists physician with CoolLine™ catheter placement and its connection to ZOLL ThermogardXP CoolGard® 3000 a. Assures proper connection with saline flow line connectors		3. Performs thorough skin assessment ensuring any wounds are measured and documented prior to initiation of therapy.	
4. Initiates thermoregulation treatment a. Observe flow of fluid through the tubing. b. Observe spinning of inline flow indicator.		4. Connects tubing leading from cooling console to body wraps a. Turns machine on b. Pre-fills wraps before placing them on patient	
5. Prepares patient for temporary disconnection i.e., patient transport or treatment completion. a. Turn to standby. b. Disconnect tubing from infusion lumen. c. Connect saline lines together and catheter lumens together.		5. Applies "RaprRound" chest and leg wraps to patient correctly 6. Describes correct linen layers if cooling blankets are used. 7. Sets cooling console to correct mode and temperature. 8. Describes skin monitoring steps for external cooling.	
6. Troubleshoots alarms appropriately: a. Air in saline bag b. Air trap alarm c. Coolant alarm d. Temperature probe alarm 7. Describes what to do if saline bag is found empty		9. Refills machine reservoir with sterile water if indicated. 10. Describes re-warming steps at the end of therapeutic cooling.	
8. Manages patient shivering		11. Manages patient shivering	
9. Documents intravascular cooling		12. Documents external cooling	

Comments:
If assistance is required, your manager or clinical educator will develop an action plan with you.
Action plan:

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Appendix 1

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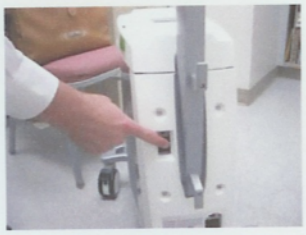
CoolGard 3000 Tubing Set-Up

Refer To Quick Reference Guide For Complete Instructions

1.

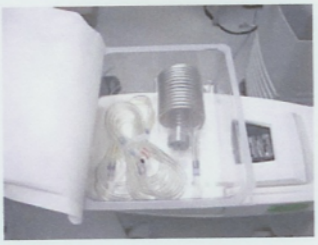
Always check coolant level.

2.



Power switch

3.

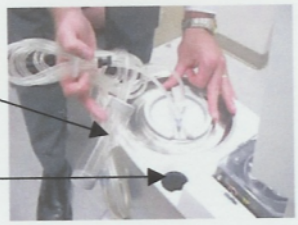


Start-Up kit tubing set

4.

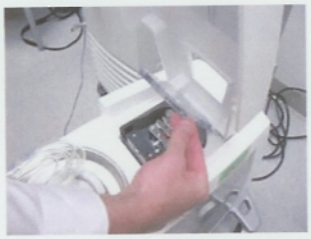
Place coil into coolant.

5.



Secure coldwell lid and put air trap in its holder.

6.

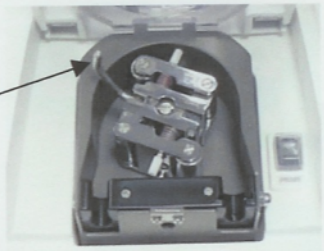


Open lid of roller pump.

7.

Undo the tubing bundle containing the spike. The large section of tubing goes into the roller pump.

8.



Manually rotate the pump into this position to facilitate loading of tubing.

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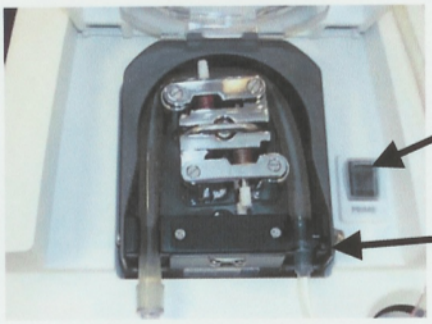
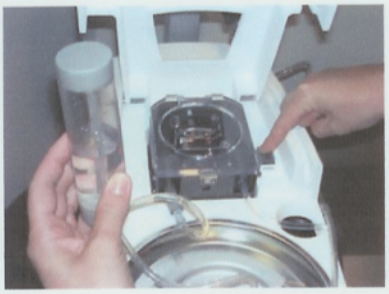
9. 

Load tubing into pump.

10. 

After spiking the saline bag, lift out the air trap from its holder and turn it upside down. Press and hold down the Prime Switch until the air trap and tubing are completely full of saline. (This will take approximately 2 minutes.)

11. 

Final configuration of the CoolGard 3000. Note that the coolant lid is rotated so that the tubing exits from a 3:00 o'clock position.

CE 0344

Caution: Limited by law for sale by or on the order of a physician.

103489-001 Rev A

Appendix 2

External Cooling Procedure (Quick Reference)

COOLING

1. Conduct thorough anterior and posterior total skin assessment and document
2. Place ICE bags on patient
3. Set up and place A-line ASAP
4. Set up for Central Line
5. Place large bore IV's
6. Place bladder/urinary temperature catheter (or esophageal temp probe if anuric)
7. Rapidly infuse 2 liters of iced saline at 4 degrees Centigrade over 30 minutes (with pressure bags not on IV pump)
8. Place esophageal temperature probe in patient and connect to Gaymar cooling unit
9. Cooling unit must have a patient temperature to use to regulate machine cooling/warming.
10. Place second temperature source in patient (esophageal temp. probe, and connect to bedside monitor). Ensure that there is not a difference greater than 0.5 to 1 degree Celsius between temperature sources. Consider changing cooling units if greater than 1 degree difference from temperature sources to ensure patient safety.
11. Turn on Cooling machine and pre-fill cooling wraps/blankets before applying to patient.
12. If using cooling blankets place, layer linen with cooling surfaces as listed below.
    Mattress
    Sheet
    Cooling Blanket
    Sheet
    Patient
    Sheet
    Cooling Blanket
    Sheet
13. Set cooling (Gaymar) machine on **Auto mode, Rapid**, at **34 degrees C.**
14. When pt. temp **of 34 or 36 degrees C has been met, change cooling unit setting from Auto mode, Rapid to Auto mode Gradual.** Maintain patient temperature at **32 and 34 or 36 degrees** Celsius for **18 hours**. **Patient temp will slightly vary depending on water circulation through wraps/ blankets even though machine temperature is set at 33 or 36 degrees Celsius.**
15. Turn Patient q 1 hour, and un-velcro body wraps to examine skin for signs or symptoms of pressure or frostbite. Re-adjust, and secure until next turn.
16. Continue sedation to maintain RASS at - 5
17. Get Baseline TOF and record.
18. If patient is shivering, start therapeutic paralytics as ordered after obtaining baseline train of four (TOF) measurements. Continue to monitor for shivering and check the TOF q 1 hour. Maintain therapeutic paralysis with TOF between 1-2 twitches as ordered.

REWARMING

1. Change cooling unit to **Auto, Moderate mode** and increase the patient's set point by 0.5 degrees Celsius q 1 hour.
2. Gradually re-warm patient slowly 0.5 degrees Celsius q 1 hour until temperature of 36.5 degrees Celsius has been reached. Follow checklist for required lab work.

Appendix 3

Hypothermia Checklist (reviewed 8/2013)

Pt. Sticker Here

Start Time of Cooling $etCO_2$ _____	Date / Time_____ **External or Internal** (Circle One)	**Comments:**
Stat Labs arrival to ICU **Date/ Time** _____ $etCO_2$ _____	Labs due: ❒ ABG ❒ Phos ❒ CBC ❒ PT/INR ❒ BMP ❒ PTT ❒ Mg ❒ Trop ❒ Lactate ❒ Accucheck _____	Comments: **Accucheck q 8h** or more frequently if needed
Target Temp Met (33°C or 36C) **Date/ Time** _____ $etCO_2$ _____	Labs due: ❒ ABG ❒ Phos ❒ CBC ❒ PT/INR ❒ BMP ❒ PTT ❒ Mg ❒ Trop ❒ Lactate	Comments:
18 hr Cooling Maintenance Phase		
9 hr labs Date/ Time _____ $etCO_2$ _____	Labs due: ❒ ABG ❒ Phos ❒ CBC ❒ PT/INR ❒ BMP ❒ PTT ❒ Mg ❒ Trop ❒ Lactate	Comments:
18 hr labs Date/ Time _____ $etCO_2$ _____	Labs due: ❒ ABG ❒ Phos ❒ CBC ❒ PT/INR ❒ BMP ❒ PTT ❒ Mg ❒ Trop ❒ Lactate	Comments:
Rewarming Phase Begins Date Time /	Target = 36.5° C, **Internal Protocol:** Controlled rate =0.65° C **External Protocol:** Switch to Auto Manual, Increase by 0.3° C q 1 hr.	Comments:
BMP q2 hrs	**during rewarming**	
BMP#1	Date	Time
BMP#2	Date	Time
BMP #3	Date	Time
BMP #4	Date	Time
Rewarming Phase Ends Temp reaches 36.5	Date	Time
Vecuronium drip d/c	Date/Time	**Document TOF q1H until 4/4**

Hypothermia Considerations	
MAP	Maintain > **80** use inotropes; vasopressors if needed
CVP	Follow closely. May connect CVP tubing to distal port of Icy catheter even though femoral; can follow trends
TOF	Goal 1/4 twitches; if pt. becomes 0/4, notify MD to reduce paralytic drip or turn it off. NEVER paralyze a pt. before SEDATION
I&O	Q1h (Pts. tend to diurese during cooling
Bleeding/ Coagulopathy	Cooling induces bleeding/ abnormal clotting times. May require cooling to be stopped
Glucose	Hypothermia increases glucose levels. Goal to keep glucose < 150
Q-T interval	May prolong Q-T interval during cooling
Alarm Limit Set Coolgard	Cooling 32.8-33° C Rewarming 32.8-37° C
Skin	Turn, monitor for signs of frostbite q 2 H
Temp Sources	Urinary/Bladder temperature probe to cooling device; esophageal/rectal probe to bedside monitor

NOT PART OF THE PERMANENT RECORD

Do Not Discard – Return to APRN / Unit Educator