



Post Resuscitation Therapeutic Hypothermia

Frequently Asked Questions – Last Updated Sept 11, 2008

[This is a cumulative document]

This Frequently Asked Questions (FAQs) document is a compilation of questions that have been asked during the related education or were addressed during the development of this new therapy for the City of Austin/Travis County EMS System.

Posted February 26, 2008

1. With regard to the data collected for the registry after implementation of therapeutic hypothermia, will the other Systems be using similar data points so that we are comparing “apples to apples”?

Yes. We (OMD and PPSD) have been defining the data elements in collaboration with the Montgomery County EMS staff. While our protocols may differ slightly, they both closely follow the Wake County EMS protocol in use for the past 1+ years. The key point is that the data elements (the information we collect) will be the same.

2. What are the requirements for a hospital to become a Resuscitation Center of Excellence in order to receive post arrest patients from the Austin/Travis County EMS System?

The detailed requirements are still being developed. In general, these requirements are: 1) the receiving hospital has a process in place and the capability to ensure cooling continues once the patient arrives (24x7), 2) the receiving hospital has PCI (cardiac cath) capabilities, and 3) the hospital agrees to coordinate with the EMS System to collect and exchange patient outcome data.

3. What are the definitions for the CPC?

The CPC is defined as the Cerebral Performance Category. It is a simple neurological score based on the patient's status at time of discharge from the hospital. This scoring mechanism is used by our System for data entry into the CARES (Cardiac Arrest Registry to Enhance Survival) database. The scores are as follows:

1 = Good Cerebral Performance – Conscious, Alert, able to work and lead a normal life

2 = Moderate Cerebral Disability – Conscious and able to function independently (dress, travel, prepare food), may have hemiplegia, seizures, or permanent memory or mental changes

3 = Severe Cerebral Disability – Conscious, dependent on others for daily support,

*functions only in an institution or at home with exceptional family effort
4 = Coma, vegetative state*

4. What should we do if the patient is already hypothermic?

If the initial assessment reveals the patient is hypothermic with an approximate temperature less than 93° F, the cooling procedure is NOT implemented. The basic life support cooling measure (Ice packs) may remain if already applied. This means if the ECA or EMT already applied ice packs to the patient after a return of palpable pulses these can be left in place. The cooling procedure medications and infused cold saline are NOT instituted.

5. What type of thermometers will be used to assess the patient's temperature?

Though the ideal method of temperature assessment of this patient would be a core temperature measuring type, this is not practical at this time. Rather than delay implementation of this therapy, we chose to measure an approximate temperature. The basic premise is to avoid overshooting the cooling (meaning, cooling the patient below the target temperature range for therapeutic hypothermia). So, the method to be used will provide an approximate temperature to determine if the patient is already hypothermic.

6. What if the cardiac arrest involves a traumatic mechanism but it appears the event was caused by a cardiac or medical cause?

The key concept is whether the patient is believed to be hemorrhaging from a non-compressible site. It is not possible to make this determination with 100% certainty. For this reason, the paramedics must use their scene and patient assessment findings to make the determination. If it appears the patient's arrest was before the traumatic event and there is no evidence of uncontrolled hemorrhage, the therapeutic hypothermia should be provided. There will obviously be times we are not correct. We will review all cases in which therapeutic hypothermia is provided. When the paramedic's decision-making is supported by the assessment findings, we will support the decision and learn from it.

7. Do we have to give midazolam before giving the vecuronium?

YES. This is a very key concept. Vecuronium is only provided once 1) the patient meets all the inclusion criteria and is determined to not meet exclusion criteria, and 2) has received midazolam just prior to administration of the vecuronium. Remember that we must make sure the patient is sedated (Midazolam) prior to being paralyzed (vecuronium). Additional doses may be required. If needed, administer additional sedation provided it is not contraindicated (e.g. low BP despite pressors).

8. If during the resuscitation a King LT airway is placed, can the airway be replaced with an endotracheal tube using a bougie after the cooling procedures including the vecuronium administration have begun?

This is a potentially dangerous practice once the vecuronium has been administered. The tube exchange procedure has the potential to interrupt ventilations for a prolonged period if difficulties are encountered. The greatest risk is removal of the King LT airway followed by the INABILITY to subsequently successfully place the endotracheal tube. This procedure should NOT be attempted unless the King LT airway is NOT allowing for EFFECTIVE ventilations.

9. What should I do if I have already given the 30 mL/kg fluid or the max 2 Liter fluid?

Ideally, we should try to time the administration of the fluid to closely coincide with arrival at the ED. While you could certainly request additional chilled saline through On Line Medical Consultation, we should recognize that the previous studies using IV chilled saline used a max of 40 mL/kg. So, additional fluid in this subset of patients has not been studied (to our knowledge). In the Hermann Hospital experience (Houston), they have added additional fluid (usually 10 mL/kg) in the ED to provide time for setup of their cooling devices. So, in essence, our approach of 30 mL/kg, allows our EDs to administer an additional 10 mL/kg until their cooling devices are ready for the patient.

10. If we know our transport time will be long and are delaying administration of the IV chilled saline, should we also delay administration of the midazolam and vecuronium?

Midazolam may be administered as needed under current COGs for sedation. So, if the patient is in need of sedation as a result of the advanced airway being in place, administer midazolam as you currently do. Prior to beginning the administration of the IV chilled saline, administer midazolam and vecuronium per the Cooling Procedures portion of the new COG. The primary purpose of the vecuronium is to avoid the muscular activity associated with shivering once the cold saline is infused.

11. Can we or should we use a pressure bag to infuse the cold saline?

The draft COG will have the pressure bag language removed. In the case of an IO, the pressure bag should definitely be used when infusing the cold saline. It can be used in other cases at the discretion of the paramedic. It is not required for IV access other than when using an IO route. (Completed)

12. What if we call the hospital to alert them we are bringing in a post resuscitation patient who is being cooled and the hospital states their cooling units or cath lab tables are all in use?

Another excellent question. We will discuss this with the hospitals as they develop their processes. It would certainly make sense that in this situation the patient would be better served by going to another authorized resuscitation center. In cases like this, the transport unit should contact and divert to the next closest resuscitation designated facility. (Completed)

Posted March 7, 2008

13. What words or phrase will be used to notify the receiving hospital that the patient has been resuscitated and is receiving IV chilled saline as part of our therapeutic hypothermia process?

There is no question that we need to have some standardized notification mechanism so that the ED can get their cooling devices and other staff ready for the patient's arrival. We have chosen to incorporate the term "Resuscitation Alert". This term along with the identification of this patient as a Delta or Echo patient provides a clear picture for the hospital. Even if prehospital cooling cannot be initiated (e.g. they don't meet the inclusion criteria or have one of the exclusion criteria), this Alert will motivate the ED to prepare their cooling devices and, possibly, activate the cardiac cath team. This new term will be added to the list of alerts including STEMI Alert, Stroke Alert, and Trauma Alert.

14. What specific infections do patients seem to get due to the increased risk of infections after therapeutic hypothermia?

The specific infection or explanation for this reported increased risk of infection are not really known. In 1999, Bernard published his group's initial attempt to study induced hypothermia (his second study was published in 2002). This article discussed the theoretical effect of prolonged hypothermia on platelet and white cell counts. In his initial study, the group found "no statistically significant differences between the two groups when hypothermia was used for 12 hours". In this study, Bernard reported two patients died of sepsis "both in the setting of nosocomial pneumonia". One of his citations was a study of 200 patients undergoing surgery in which hypothermia was associated with an increased rate of wound infection and duration of hospital stay. The HACA study also found an increased incidence of sepsis in the hypothermia group. No specific types of infections were noted. So, it appears none of the induced hypothermia studies show any increase in specific infections.

15. Can we start cooling the patient while we are working the cardiac arrest?

This is a very interesting question. Today, very little is known about the risks and benefits of “intra-arrest” cooling. There is some preliminary evidence from animal lab studies that this approach is beneficial. To our knowledge, no scientific research of this type has been done on humans. There are reports of patients being cooled in the hospital with ongoing mechanical CPR who are then transported to the cath lab for PCI. This approach is being looked at very closely by many (including our Community). This is a potential approach for the future but is not included now in the Therapeutic Hypothermia intervention being implemented in our System.

16. How long does it take for a 200 pound person to be cooled?

We can find no studies that focused on a relationship between weight and time of cooling other than those that resulted in the 30 mL/kg practice. Most of the research has focused on the typical cooling effect over time when using the 30 mL/kg approach. In February 2008, a study published in Annals of Emergency Medicine concluded that infusion of cold saline in healthy volunteers could achieve a reduction in core temperature of about 1.8° F over the 30 minute infusion time. The study also noted the most rapid cooling occurred during the first 14 minutes of infusion. It does seem reasonable that a greater amount of cooling (by any method) would be required for a larger body mass than for a smaller one. All of the recent studies on therapeutic hypothermia using chilled saline indicate a reduction in temperature of up to about 3.5° F. The Seattle study was only able to demonstrate a reduction of about 1.5° F most likely due to the short transport times of most patients in their system.

17. Can we use any IV device for the chilled saline?

The chilled saline should be infused through an IV or IO only. Medications should also be administered through an IV or IO only. This means intranasal midazolam is not the best route for this patient (especially since an IV is already available for the chilled saline).

18. Are we going to be providing pain management for patients during cooling?

These patients will be heavily sedated and paralyzed. Considering this and their recent cardiac event(s), their hemodynamic status is tenuous and has to be carefully monitored. Significant inadvertent lowering of the mean arterial pressure (MAP) is potentially harmful to these patients. If the patient is not neurologically intact and is receiving adequate sedation, this should be sufficient without increasing the risk of worsening their hemodynamic status.

19. Can we use an EJ for cooling?

It is preferable to use other peripheral vascular access or IO when administering the chilled saline. However, the EJ is an option for those trained in its use.

20. Why don't we also apply ice packs to the neck (carotids)?

When the concept of an external cooling was added to the American Heart Association guidelines, there were no specific criteria or any evidence in the literature regarding how to accomplish that cooling. When we initiated external ice pack application, we made a decision (along with several other systems) to exclude the carotids based on the possibility of creating local vasoconstriction, which may decrease cerebral blood flow. There is still not universal agreement on this issue so we have chosen only an axillary and inguinal approach

21. Is the maximum amount of chilled saline dependent on the amount of room temperature saline used during the resuscitation?

No. Once the patient is resuscitated, the weight-based dose of chilled saline is infused up to a total of 2 L.

22. What if the patient is accidentally extubated?

One of the key emphasis points for use of this new therapy and new COG is the need for meticulous attention to the airway. Extubation, particularly after administration of vecuronium, has the potential for a disastrous ending. If extubation occurs, attempts must be made to re-establish placement of an advanced airway. During endotracheal intubation attempts, one provider must maintain cricoid pressure. Paralyzed patients have a greater risk of regurgitation and aspiration. Every effort should be made to place an advanced airway in the shortest time period with the fewest attempts (minimize time without ventilations).

23. Considering the emphasis on attention to the advanced airway after administering vecuronium, how do we best accomplish this if we are using the most inexperienced provider to manage the airway?

This is something that the team leader and team members will need to address using the information at hand. Some EMTs are very experienced and proficient with the task of ventilating using an advanced airway. Others may not or may be inexperienced with the newer King LT airway. There are lots of possibilities. Regardless of the decision made, the person responsible for ventilating the patient should have CLEAR and SPECIFIC direction about how to ventilate the patient and how to avoid movement of the advanced airway.

24. Why is it important to document neurologic status prior to sedation and paralysis?

One of the important outcome measures in cardiac arrest is impact on the patient's neurologic status. It's important for us to clearly document our findings as close to return of spontaneous circulation as we can. This will allow a more accurate and focused assessment of the impact our interventions. This documentation also records the rationale for determining the patient meets the criteria for therapeutic hypothermia.

Posted March 18, 2008

25. *What is the expected roll-out time for implementation of therapeutic hypothermia?*

*No specific date can be set at this time. The key actions that must be accomplished first are: 1) purchasing the required equipment for each ambulance, 2) providing the required equipment to each ambulance, 3) designating specific hospitals to receive these patients, and 4) providing the initial and secondary education for the concepts, COG and operational aspects of this new intervention. All of these activities are being addressed now. Unfortunately, there are too many variables to provide a specific time frame at this point in time. **We are now estimating the implementation of therapeutic hypothermia to be early October.***

26. Is there a "magic" number or time to begin cooling to get the most benefit?

No one truly knows the answer to this. Most, particularly those in the out of hospital setting, believe earlier is better. The important concept to keep in mind is that once we begin cooling we do not want to rewarm them. This means the timing of our transport and time we begin cooling are critical.

27. Is there a timeframe that we know when necrosis of cells begins after cardiac arrest?

There is evidence that neurons begin to die and necrose within minutes of the cardiac arrest. Many believe apoptosis begins within minutes of return of spontaneous circulation. Unfortunately, specific times are not known. Our thought is the earlier the therapeutic hypothermia process is begun, the lower the likelihood of cells becoming nonsalvageable.

28. Why is there no maximum dose of Versed in this specific COG?

The only real limitations are the patient's blood pressure and the amount of available midazolam. If the patient's blood pressure is adequate, we want to make every effort to avoid under-sedation. Benzodiazepines help in a number of ways including minimizing the risk of seizures while also assisting with the cooling process.

29. If the patient is moving after vecuronium is administered and 15 minutes has not elapsed, what do we do?

*If the initial dose of vecuronium was appropriate for the patient's age and the IV route was patent, this should be a rare event. We are also minimizing the likelihood of this by not beginning the cooling procedures (which includes administration of the vecuronium) until about 10-20 minutes prior to arrival at the ED. Considering the typical duration of action for vecuronium, this occurrence should be rare. If it does occur, use the approach currently used for patients with an advanced airway in place who begin to move or awaken. This approach focuses on sedation with midazolam. **Clarification:** The manufacturer's recommendation for repeat IV dosing is 12-15 minutes. Many EMS Systems are NOT providing a neuromuscular blocking agent, only sedation when administering IV chilled saline. So, the focus should first be on adequate sedation rather than paralysis. Once again, this situation is highly unlikely if the dose is appropriate and the IV route is patent. Once adequate sedation is achieved and an advanced airway is in place, vecuronium should be administered.*

30. The COG states that IV/IO must be at least an 18 gauge catheter. The IO for pediatrics is a 21 gauge and getting an 18 gauge on some patients may be difficult.

*Good point. The COG will be modified so that this is the preferred IV access size. The minimum IV/IO access point for an adult should be an 18 ga. since this is size of the adult IO and a 21 ga. since this is the size of the pediatric IO. Obviously, you will need to utilize the largest IV/IO access site that can be obtained at the time.
(Completed)*

31. What type of equipment will the hospital be utilizing to maintain and further cool the patient once we deliver them?

There are a number of products available for this purpose. Most of the Austin area hospitals already have one or more of these types. One type of product uses blankets or wraps to perform external cooling. This is a fairly common method. Most of these types use a mechanism in which cold water flows through the blanket or wrap allowing heat to be conducted away from the body. The second type of product uses an endovascular approach. This type of device uses a central line catheter (femoral and some use subclavian). Most have the ability to accurately cool to a specific temperature, maintain the temperature and then rewarm at a specific rate. Both types of devices are expected to be used within different Austin area hospitals.

32. How much does chilled normal saline tend to reduce the heart rate?

Unfortunately, the answer is that there is a reduction but it is EXTREMELY variable. How variable? Well, the Seattle prehospital study using chilled saline found the heart rate decreased (from time of field randomization to time of ED arrival) by 15.7 ± 43.6 bpm. By most standards, this qualifies as tremendous variation. So, the answer is that it decreases the heart rate some but it is extremely variable between patients

33. After 24-48 hours, do the macrophages continue to attach to the cells during the apoptosis process?

Interesting question. Much is not known about how these processes are actually impacted by therapeutic hypothermia. Most of our discussions on this subject are theoretical. We did some studying on apoptosis. It appears cells enter apoptosis via 2 different pathways – intrinsic and extrinsic. Intrinsic is usually via damage, infection, or stress (oxygen deprivation can be included here). The theory behind therapeutic hypothermia is that two things seem to happen. First, the cooling process slows the cellular metabolism and slows the apoptosis process. This in turn reduces the need for oxygen thus giving the cell time to repair itself. If the cell repairs itself it (theoretically) will not go through the process of apoptosis because it is now a functioning cell. We also know that cooling decreases the immune and inflammatory responses. So (theoretically) when the cell is repaired the macrophages, the macrophages hopefully have also been slowed down enough that they never are attracted to the cell when patient rewarming begins. That's not to say that the macrophage cannot cause extrinsic apoptosis if it recognizes a cell as damaged (which it can) resulting in the destruction process continuing. The theory is that the cell will be repaired enough that this is not the case.

Posted March 27, 2008

34. How did we/they arrive at the 2 liters of normal saline?

We are not yet able to find information regarding how the 2 liter maximum was derived. What we do know from the Seattle pilot study is that adverse effects in the hypothermia group were not significantly higher than the control group. In this pilot study, a 2 liter maximum was in place. In fact, the incidence of cardiomegaly or pulmonary edema appeared to actually be lower in the hypothermia group as compared to the control group (not statistically significant).

35. Should we begin the Cooling Procedure even if the patient is hypotensive? What if the patient is hypotensive even after dopamine administration? Should we administer midazolam if the BP is less than 100 mm Hg?

If the patient is hypotensive, cooling should not be immediately initiated. This includes the cooling procedures involving midazolam, vecuronium and IV chilled saline. If after dopamine administration the blood pressure is greater than 100 mm Hg, the cooling procedures should begin.

36. What if air transport would be faster for this patient in terms of arrival to the ED? Should we give the cold saline while waiting for the helicopter or give the cold saline bags to the helicopter for use in flight? Should we call StarFlight if the patient should receive therapeutic hypothermia?

In most cases (according to current data), air may not be much faster within most of Travis County when considering launch, landing, take off, flight to hospital and unloading at the hospital. Having said this, STARFlight should certainly be considered if the overall time to patient arrival at the ED is less than ground transport and provided air transport does not further delay transport to the hospital. Regardless of which method is used, the principles remain the same. IV chilled saline administration should not begin until the transporting unit is about 10-20 minutes out from the hospital.

37. What if the patient is deaf or can't speak English?

That's a challenge. One suggestion for the awake deaf person is to write a question asking them to follow a command and show them the written question. Of course, if they are not awake then they can't follow a command. If the person is deaf and can't speak or read English, we have real difficulty. In some cases, it might be necessary to contact the Language Line through Comm and ask the question in their language.

38. Is there a possibility to use the chilled saline for the hyperthermic patients since it will be available to us?

Probably not a bad idea down the road. At this point, we plan to roll out the post-ROSC process and explore expansion to other patients once we're comfortable with logistics in post ROSC and as we gain more data on the subject.

39. Are bilateral humeral head IOs allowed? It is my understanding that a humeral head IO is analogous to a central line. Is this true?

While there is no contraindication for bilateral humeral head IOs, the question would be why we need them. Bilateral humeral head IOs should be a rare circumstance. For the purposes of therapeutic hypothermia, IO is vascular access as is peripheral IV. The information we obtained from Vidacare did not indicate a humeral head IO is equivalent to a central line. We would agree, however, that a humeral head IO is a more proximal access site than most traditional peripheral IV sites. So, while a humeral head IO is a good approach and definitely a more proximal site, the focus for therapeutic hypothermia is to obtain IV or IO access.

40. Since the EMS System is the driving force for prehospital cooling, should there be concern about backlash from the hospitals?

We doubt we will have any "backlash" per se. This is a community-based approach and if a hospital does not have the capability for (or chooses not to initiate) cooling, we will not transport post-ROSC patients to them. Indeed, to date, all facilities we've had discussions with are on board. That was part of the rationale behind the hospital symposium several weeks ago. Most of the hospitals that are capable of providing or plan to gain the capability to provide therapeutic hypothermia are actually embracing the idea.

41. Are we planning on doing a "study"?

At this point in time, we are not implementing therapeutic hypothermia as a research project. Instead, we have chosen to classify therapeutic hypothermia as a standard of care rather than an investigational therapy. We will be collecting data from a quality improvement perspective to later evaluate the entire process (this is why we are using the Data Registry approach). It is certainly possible that we may choose to analyze this data using a research protocol and publish our findings. If we were to make that decision, we would need to first begin the process of obtaining Institutional Review Board (IRB) approval before analyzing or publishing our data. For now, it is a quality improvement effort using a data registry.

42. How is vecuronium metabolized? Should we be concerned with patients that have liver problems?

Vecuronium is metabolized by the liver (about 30%). The remainder, including active metabolites, is excreted in the urine. The currently available information suggests patients with liver disease who receive vecuronium may have longer time periods of recovery from the vecuronium (meaning the paralysis lasts longer). In our use, this is not an issue since the patient will likely remain paralyzed for 12-24 hours or more. So, for our purposes, there is no reason to change the dosing of vecuronium for patients with liver disease.

43. What if the patient is already hypothermic meaning their temperature is at or below 93 degrees F?

The cooling procedures other than ice packs and exposure should not be initiated. This includes withholding midazolam (other than that required to maintain the advanced airway), vecuronium, and IV cold saline. The reason for this is to avoid "overshoot". If the patient's temperature is already in the "target range" of 90 – 93 degrees F, additional cooling active cooling may decrease the temperature below 90 degrees and increase the risk of irritable myocardium.

Posted April 9, 2008

44. What if you call the ED MD for an order for RSI – Can you use the vecuronium then?

*This could be a potentially hazardous choice. Vecuronium is not an ideal medication for the initial placement of an advanced airway. It's onset of action is longer than other medications typically used for this purpose such as etomidate, rocuronium or succinylcholine. As discussed in the hypothermia training, the primary use of vecuronium is for maintenance of the already placed advanced airway in the patient who is about to receive chilled saline. **Clarification:** The use of vecuronium as a pharmacologic assisted intubation approach is not authorized by this therapeutic hypothermia intervention or any other aspect of the current COGs.. Such a practice is non-standard and is not authorized by the Office of the Medical Director. The therapeutic hypothermia approach presented to the local Hospitals, Travis County Medical Society and the OMD Quality and Medical Oversight Team did not include the use of vecuronium to facilitate initial placement of an advanced airway.*

45. Do you still give the patients 2 liters of chilled saline (or the 30 mL/kg) if the patient is already “full” of fluid such as in a patient with CHF?

If the patient is truly volume overloaded, we should delay infusing the chilled saline until the patient is at the hospital. The same holds true if the patient developed significant pulmonary edema during the infusion of the chilled saline. In this case, the infusion of chilled saline should be stopped.

46. Are there any complications of running chilled saline through an IO?

None that we are aware of. This is the primary method used by Wake County EMS over the past year. We have not heard of any concerns from them on this topic.

47. Dr. Racht once talked about the ineffectiveness of an IO placed in the tibia. Is this still a concern?

There has been much discussion about vascular access below the diaphragm during chest compressions. Philosophically, the potential problem is that the positive pressure in the chest during compressions would decrease the movement of drug or fluid into the thoracic cavity if the infusion site was outside the chest or below the diaphragm. While this has always been a concern, it's never been conclusively identified as a problem. So, it is preferable to have an infusion site higher up (e.g. arm IV site, humeral IO site) but tibial IO is acceptable if that is the only IV site available.

48. How do we know that receiving hospitals will take care of and continue to cool our patients when we sometimes have problems with them “sitting” on a confirmed STEMI patient?

Good question. Post arrest patients will only be transported to hospitals who have met the requirements for designation as a Resuscitation Center of Excellence. These requirements are specific and detailed with a focus on the ability to demonstrate performance over time. Meeting these requirements will take some significant commitment due to the need for extensive processes and expensive equipment. One requirement specifically asks the hospital to demonstrate the ability to receive a cooled patient from EMS and prevent rewarming of the patient. The transporting EMS unit will notify the receiving hospital using a “Resuscitation Alert”. When the hospital hears this alert, they will “gear up” their processes in the ED so that cooling may be continued and maintained. The performance will be tracked over time and quality improvement efforts will be jointly addressed.

49. What are the potential implications for the fetus when we cool a ROSC pregnant patient?

Since this has not been and may not be studied, there is little known about this. We are likely to see similar effects on the fetus that we do on the mother when she is chilled. The basis for this decision-making lies in the belief that typically the best care for the unborn baby is whatever is the best care for the mother.

50. Will we be carrying more midazolam on the trucks?

At this point, considering the amounts of midazolam already carried and the relative infrequency of ROSC there will not likely be an increase in inventory initially. However, if over time we see the need for an increase, that can certainly be changed.

51. Are we potentially decreasing the VF threshold by infusing cold saline rapidly in close proximity to the heart (e.g. via humeral IO)?

There is no evidence that this can or will occur. Given the small drop in temperature that we may affect with chilled saline, there should be no need for concern. As stated earlier, Wake County EMS has had a practice of primarily using humeral IO for cardiac arrest patients. Our discussions with Wake County so far have not included any concerns with use of the IO for the chilled saline.

52. How long does it take 1 liter of saline to cool down to the 4° C temp. needed for cooling? It's also a logistical question concerning the possibility of back to back arrest calls with need for cooling.

The speed at which saline is chilled is dependent on the manufacturer of the cooling unit that is ultimately purchased. Whichever unit is purchased, it should hold a minimum of 4 bags of saline. In the event that you use 2 bags on a cardiac arrest, as soon as feasible, you will want to add two new bags to the cooler and place on the bottom so that the already cooled saline will be on top and immediately available for the next ROSC patient. Seems like a good problem to have, too! . . . back to back Saves!

53. What if the patient is a dialysis patient with a shunt? Can we access the shunt to administer the chilled saline?

If no other access points including IO are available, it is likely that the patient's shunt was already accessed as part of the resuscitation efforts. In this case, it would make sense to continue using this access point including for the infusion of chilled saline. We should avoid accessing the patient's shunt unless there are no other options available.

54. Why is the second dose of vecuronium 1/10th of the initial dose?

The second dose is a maintenance dose. We are simply trying to maintain paralysis rather than induce it. It takes a lot less of the drug to maintain paralysis since the initial drug is still active at the receptor sites.

55. If the blood pressure post arrest is low even after fluids and dopamine, do we still use the vecuronium, versed and IV chilled saline?

No. If the systolic blood pressure is less than approximately 100 mm Hg, the versed, vecuronium and IV chilled saline should not be initiated. If the systolic BP remains low, we will simply defer the cooling until we reach the hospital (see FAQ #35). We have also updated the draft COG to reflect the BP concern.

56. Should we do everything (sedation, paralysis and chilled saline) in the truck or can we do some of these at the patient's side prior to moving to the truck?

The therapeutic hypothermia approach developed for our system was intended to be implemented in the truck, preferably during transport. This was decided for two reasons. First, one of the objectives is to avoid delays in transport to initiate cooling. Next, movement of the patient creates an increased risk of dislodgement of the advanced airway. Paralysis creates increased risk to airway management and it was determined that this needs to be implemented after the patient has been packaged and is secure in the unit with someone assigned to maintain the airway.

57. Is vecuronium incompatible with other drugs (i.e. does it precipitate if given in the same IV line as another drug)?

Yes. Vecuronium is incompatible with several medications including diazepam and furosemide. There appears to be some question regarding compatibility with opioids and other benzodiazepines. For these reasons, the safe practice is to flush the IV line between doses of different medications including vecuronium. FYI – There are several drugs that may inhibit the action, decrease the effect or increase the effect of vecuronium. Of course this is not unique to vecuronium. This is one of the reasons repeat dosing of midazolam and vecuronium based on the patient's movement, awakening or shivering presentation are provided in the COG.

***Clarification:** The initial focus must be on achieving adequate sedation assuming no contraindications to additional sedation doses exist. Once adequate sedation is achieved and an advanced airway is in place, vecuronium should be administered (assuming the patient meets all criteria)*

58. Do we know whether packing the patient in ice is as efficient as the chilled saline? Are we using a different type of external device?

We do know that external cooling is not as efficient as internal cooling. There are many variables to consider. The only study that really looked at applying external ice packs was the Australian study by Bernard. Their study showed minimal decrease in temp on arrival at the ED as compared to the normothermia control group. So, external cooling is a good start but doesn't seem to lower the temperature very much. As for the device, we have chosen the IV chilled saline. However, the receiving hospital may choose to use an external cooling device or an endovascular device. There are several types of each currently available. Unfortunately, these devices are not easy to deploy and utilize in the out of hospital setting. For this reason, EMS systems are choosing to use external ice packs and/or IV chilled saline as their approach to initiate the therapeutic hypothermia process. It's possible that someone will come along in the future and develop something better for the EMS environment.

Posted April 16, 2008

59. How would we handle fluid overload issues in a patient that we had begun chilled saline since we are concerned with rewarming of a patient?

We should manage a fluid overloaded patient that is receiving chilled saline just like any other fluid overloaded patient. We have to assume that the indication for fluid overload is the lung sounds are "wet". If that is the case, we would first maintain infusion of fluid at a slower rate and positive pressure ventilations at the appropriate rate for the patient's age. A consideration is that by judiciously administering fluids at a slower rate and continuing passive cooling our goal at this point would be to prevent rewarming and maintaining the temperature that we had reached.

60. Do we know how many hospitals and which ones will be receiving cooled patients?

*We recently were told most of the hospitals are wanting to receive these patients. Approximately 2 weeks ago, ATCOMD provided each hospital in the system with the requirements to become a Resuscitation Center of Excellence and thus become designated as a receiving center for these patients. All of hospitals that currently meet the requirements will receive our cooled patients. **The list of hospitals initially designated as resuscitation centers of excellence will be published by the end of August. (Completed)***

61. Is there a correlation of successful resuscitation between the patient arresting in the hospital versus the field and the number of shocks received or precipitating rhythms?

There are several papers correlating survival to number of shocks (and comparing monophasic vs biphasic which is no longer an issue). There is also recently published data from the NRCPR (national registry of CPR) on in-hospital arrest survival that could be compared to any of a number of out of hospital studies. Historically, in-hospital arrest survival rates are lower than out of hospital (which makes sense because these patients are sicker to begin with).

62. Will we be allowed to paralyze the patient without cooling? For example, advanced airway in place with a long transport time and we will have to wait to begin cooling for an extended period of time.

*We currently have versed that we can sedate and manage the patient with. If we haven't begun cooling, there is no need to paralyze the patient since we are not concerned with movement, micro-shivering, etc to generate heat and rewarm. Our focus should be on liberal use of Versed and then use of vecuronium when chilled saline is about to be infused. **Clarification:** The addition of vecuronium is only intended to maintain the already placed advanced airway. It is not intended or authorized for use to initially place an advanced airway. This point was discussed in the initial hypothermia training.*

63. Why are we restricting the use of temperature controlled solutions to just ROSC patients and not using them for other patient populations where it may be indicated?

We will explore future indications for chilled saline infusion down the line. Currently, there is not enough data to support this practice on other types of patients. At this point, our focus is on the ROSC patient. New evidence along with our own experience with therapeutic hypothermia should help guide us. We are watching the data closely. It is possible that we will use hypothermia in other patient populations in the future.

64. Can we use water or cold water to assist in further cooling (both before and during initiation of chilled saline)?

There is little reason to say you should not do this other than it is messy. There is probably not much value to this as compared to the ice packs, exposure and medications once cooling has begun.

65. If the patient re-arrests, we are supposed to stop administering chilled saline and begin again if pulses return. Should we stop the chilled saline if the BP drops below 100 mmHg (with pressor support) and manage the hemodynamic instability until we get above 100 mmHg systolic and then re-initiate cooling?

Any systolic blood pressure drop below 100 mm Hg should stop the chilled saline infusion. Addition of dopamine resulting in an increased SBP greater than 100 would permit re-initiation of the chilled saline. If the dopamine infusion can quickly raise the SBP above 100 mm Hg, then there is no need to stop the chilled saline infusion.

66. Do we transmit post-arrest ROSC ECGs as in STEMI?

This can be done but ONLY if it does not interfere with continuous patient monitoring and time permits. We recognize everyone will be very busy so this ECG transmission is not required.

Posted April 29, 2008

67. Is the System Cooling initiative an actual research study?

No. We are implementing therapeutic hypothermia using a standard of care approach. We currently have no plans to conduct research in our system related to hypothermia. We will be collecting data for entry into a Registry with at least one other EMS System (Montgomery County). It is certainly possible that this data could be used for a future research project but it would require following the normal process for research. This would include the requirement to obtain Institution Review Board approval to conduct such research.

68. How are we ensuring that the treatment modalities in the various hospitals around town are consistent?

The specific treatments and mechanisms/devices used to accomplish these treatments will not be exactly alike among all hospitals. The Resuscitation Center of Excellence criteria that was communicated to area hospitals focused on performance objectives. Each hospital may identify slightly different methods of meeting a specific performance objective. As an example, a Resuscitation Center of Excellence Hospital would be required to develop a process that ensures cooled post arrest patients are not inadvertently rewarmed. The methods used to accomplish this may vary from one hospital to another.

69. Are the hospitals designated to receive cooled patients the same ones designated as STEMI centers?

Probably so. At this point, we have communicated the criteria to each hospital and asked them to apply for designation as a Resuscitation Center of Excellence if they so desire. Up to this point, it appears those hospitals currently meeting the criteria as a STEMI receiving center for Delta/Echo patients will apply for designation as a Resuscitation Center of Excellence. .

70. In relation to patient outcome, do we think the data in the Pittsburgh study is about as good as we can hope for?

Good question. It is too early for anyone to predict how much more a Community can improve its rate of survival to discharge with good neurologic function. All of the current data seems to support the likelihood of improvement. Of course, any improvement in survival to discharge depends on several factors, only one of which is post ROSC Cooling. We shouldn't lose sight of the importance of continuing to improve the quality of CPR, the timing (early) of CPR and AED application, and avoiding potentially harmful practices including interruptions to compressions and hyperventilation.

71. Are the blood pressure and/or neonate exclusions coming out of the Cooling COG draft?

*We have learned several things from the questions asked during the Cooling training sessions. One thing we learned was that the early draft did not address two exclusions. One exclusion that has been added to the COG is blood pressure less than 100 mm Hg. A second exclusion added is neonates. At this point, we know that the blood pressure and neonate exclusions will remain in the final COG. **Since this question was first answered, the age exclusion question has been answered. We will only use therapeutic hypothermia for patients greater than or equal to 18 years of age.***

72. Was the test to determine how long it takes to infuse a bag of NS done with an IO?

Initially the 10-20 minutes was based on experience. Since that point a simple test of infusing fluid through an 18 g IV and IO into manikin legs was performed (not scientific but provides a good estimate). When infused at a wide open rate, it required about 10-15 minutes to infuse two liters. The objective is to run the infusion of chilled saline relatively quickly. The ideal would be to infuse the calculated volume (up to 2 L) over about 10-20 minutes. If a pressure bag is used, the provider should monitor the infusion rate so that the overall time is about 10-20 minutes for the total amount infused. There is no hard science to support any specific rate or time frame currently available.

73. Since airway is so important due to the paralysis, what if the agency you are responding with “will not” send a responder with you to help?

Current practice for obtaining additional resources should still be followed. We will be providing informational training to all first responders so that they understand the new therapy and the roles they play in the management of these patients. If the instance occurs where a first responder agency is not able to send at least one responder, you should follow your Organization’s standard process for communicating opportunities for improvement (event review process).

74. What if Communications is not responding to my Resuscitation Alert? Should I call the hospital anyway?

Just as with STEMI, Stroke and Trauma Alerts, it is critical that a Resuscitation Alert be provided to Communications as soon as possible. This will alert hospitals of the need to mobilize specific resources. Providers should continue to contact the receiving hospitals as is current practice. If there are barriers to accomplishing either of these, you should follow your Organization’s standard process for communicating opportunities for improvement (event review process).

75. Can the PCG for Versed use read the same as it does elsewhere in the COGs (i.e. SBP > 100 mm Hg or peripheral pulses present)?

Elsewhere in the COGs, Midazolam is used in patient for which a BP may be difficult to obtain (active seizure). Considering the Post ROSC patient is much “sicker” with less tolerance for inadequate perfusion, we must be more diligent in assessing the risk of making the patient hypotensive before administering midazolam and the chilled saline.

76. What if there is a delay in getting to the hospital (or a delay at the hospital) and the 30 mL/kg of chilled saline is either almost completely infused or has been completely infused?

*This is a definite concern since there is evidence that rewarming a patient once the cooling process has begun can be detrimental. We would like to focus more on the timing of beginning the cooling process so that we can avoid this situation. However, we realize that situations arise that simply cannot be avoided. If still in transit with the patient, our suggestion is to contact online medical consultation and discuss your situation with the ED Physician. You may suggest infusing another 10 mL/kg of chilled saline to maintain the cooling that you have begun to prevent rewarming of the patient. It would probably benefit OLMC to discuss your concerns with rewarming and your approximate ETA to the hospital. If you are arriving or in the receiving facility and are faced with this situation, it certainly is appropriate to discuss with the ED physician the possibility of hanging another bag of chilled saline and infusing an additional 10 mL/kg while the ED staff prepares or begins their cooling process, if there is a concern about rewarming in the ED. A key point to remember is that you are infusing a significant volume of fluid into many of these patients. Judicious use and constant evaluation of the patient for evidence of fluid overload are critical. The primary reason for limiting the total fluid infusion to 40mL/kg is that this is maximum dose used in previous studies. Our decision was the initial infusion of chilled saline to 30 mL/kg with a maximum of 2 liters. This then allows for a 10 mL/kg buffer. **Clarification:** If the OLMC physician denies the order there is a potential for rewarming. However, the approach should be to avoid such situations requiring additional chilled saline. In the event the situation occurs, the physician must choose based on the information provided whether an additional 10 mL/kg should be administered. If the request for an additional 10 mL/kg of chilled saline is not authorized by OLMC, the paramedic should document this in the PCR. OMD will review every cardiac arrest case, particularly those in which hypothermia was initiated prior to hospital arrival. Such situations will be addressed using the Resuscitation Center of Excellence criteria for performance improvement processes.*

77. What are the hemodynamic effects of vecuronium?

Good question. Vecuronium has no specific or direct effects on hemodynamics. The hemodynamic effect you may see after administering vecuronium will be the indirect effect of the paralysis of skeletal muscles considering their role in maintaining blood pressure and hemodynamic stability.

78. Do you take the temp of the patient as you're transferring at the hospital so you know how much they've cooled?

Great question....as with any patient it is important to continually assess their vital signs, especially a ROSC patient. It is advisable for your documentation and report to the hospital to give them an idea on how much you have cooled the patient prior to turning them over. This would include the amount of time that the patient has

been receiving the chilled saline. We should keep in mind that our temperature measurements and change in temperature as a result of the cooling measures are approximates only. While on the subject of recording temperatures, we are also asking that as you remove the saline from the cooler to begin administration that you note the temperature of the cooler at the time you remove the saline and document that on your PCR.

79. Can there be a check-off sheet for neuro and/or the whole process?

The check off sheet has been discussed but felt that simple documentation on the PCR would be best since there are many acceptable ways to evaluate neuro status. PPSD is developing a decision aid and dosing chart as well. These should be useful as memory aids for the overall process.

80. Can we stop on the way to the hospital and pick up more ice in the event we need to use more passive cooling?

While it may seem appropriate to get ice to assist in the cooling process, it is not advisable to delay transport of the patient for any reason. External cooling with ice will not necessarily have a very big impact on the lowering of the temperature for the relatively short duration that the patient will be under your care. For this reason, the first key consideration listed in the PCG is to avoid delaying transport for the purposes of cooling.

Posted May 20, 2008

81. Are we going to see a lot of medication changes or additions with the implementation of prehospital cooling?

We do not foresee any major medication changes related to cooling other than the addition of vecuronium as a neuromuscular blocker used in conjunction with versed prior to infusing chilled saline.

82. Are CPC scores adjusted for age or mental status prior to ROSC?

No. CPC scores are given based on the neuro status at the time of discharge from the hospital. The score does not take into account the patient's neuro status prior to resuscitation. While it might seem that this method would negatively skew the outcome data, it actually does not. As you know, it is extremely uncommon that patients who are neurologically impaired prior to their cardiac arrest are successfully resuscitated and able to leave the hospital alive. Sudden cardiac arrest victims with good outcomes (ROSC and discharged alive) are generally those who are functioning normally and then experience sudden death.

83. Is there any data showing a decrease in glucose levels post ROSC?

We are not aware of any data indicating post-ROSC patients have a decreased glucose level in the absence of other factors causing glucose level decreases. What we do know is that there is an association between elevated glucose levels and poor resuscitation outcomes.

84. Is there a "magic time" for assessing neuro status to determine whether to cool or not? Should we be doing serial neuro assessments?

There is no magic time frame to assess the neuro status prior to beginning the Cooling process. In most cases, this will be quickly apparent as you begin your post-ROSC assessment of the patient. The patient with a neuro assessment that is not rapidly improving will likely benefit from hypothermia. Conversely, the patient with rapidly improving neuro function is not likely to benefit from hypothermia.

85. Why not infuse the chilled saline at a KVO (keep vein open) rate and start the infusion sooner instead of waiting until 20 minutes out from the hospital?

The idea is to rapidly begin the cooling process with the intent of lowering the core body temperature toward the target temperature. If the chilled saline is infused at a slow rate, the patient's body has an easier opportunity to respond by the normal rewarming mechanisms. All of the published literature used similar rapid cooling methods.

86. Are there any issues with cooling if we know the patient is going to the cath lab?

There are no issues with the cooling itself. For some cath lab teams and interventional cardiologists, this approach will require some familiarization over time. The cath lab does need to have access to the catheterization insertion area and the chest during the procedure.

87. If the first responder places ice packs post-resuscitation after an AED shock but the patient does not meet all the inclusion criteria (the most obvious one is the lack of an advanced airway), are the ice packs a problem?

Probably not. The ice packs are not likely to lower the core temperature significantly or rapidly. The lack of an advanced airway does not apply to the use of ice packs. For this reason, the placement of ice packs in the PCG is authorized in the ECA section. First responders should place ice packs as noted in the PCG once the patient is determined to have a palpable pulse following cardiac arrest.

88. In one class, someone had heard that another service doing cooling using versed had switched to etomidate because they were having problems with decreases in pressure. Any thoughts on this?

We are not aware of any documented information related to this concern. As we begin our new approach to therapeutic hypothermia for post ROSC patients, we will definitely evaluate the patient data as we collect it. If we find concerns with any part of the process, we will evaluate them and determine if changes are needed. This is consistent with the fact that we are using a quality improvement approach to therapeutic hypothermia rather than a research approach.

89. If the patient is intubated, sedated and paralyzed, can we give them some pain meds (morphine or fentanyl) to make sure they are comfortable?

The concern with adding pain meds to this patient (who already has poor neuro function in order to receive therapeutic hypothermia) is that the patient has a higher likelihood of being hypovolemic, having decreased myocardial contractility, and having unknown vasomotor characteristics all of which places the patient at an increased risk for hypotension. We do not want to compromise the sedation provided to the patient as this benefits him/her from the standpoint of tolerating the procedure, enhancing cooling and providing amnestic effects. Adding analgesics increases the risk of hypotension. What we do not want to do is create another problem (hypotension) that can put the patient at risk of even more myocardial ischemia (due to the new hypotension). While pain management is important, this patient is likely to benefit most from a cardiac catheterization. The interventionalist would much rather perform this procedure without having to simultaneously manage the patient's hypotension.

90. If the heart rate drops after you begin cooling, can you pace the patient?

Yes. All other therapies that would normally be provided to maintain adequate ventilation and perfusion status should still be done. The therapeutic hypothermia is an enhancement to our post resuscitation care and is focused on improving the neurological outcome of the patient discharged alive from the hospital.

91. The draft COG says you “must” use an 18 ga. IV. Is this required?

No. We have changed this language in the draft COG/PCG. It is preferred to establish and use a large bore IV when possible.

92. One of the inclusion criteria is “palpable pulse”. Can that also be an “auscultated pulse”?

Yes. However, the patient must have a SBP > 100 so a palpable pulse is likely to also be present.

93. If you are giving pressors, then give versed and the patient’s blood pressure drops below 100 mm Hg and then even with the pressors you are unable to get the BP above 100, do you stop the cooling/paralysis/versed?

Yes. Though it is unlikely that the Versed alone will lower the SBP, it is possible. If the SBP is less than 100 mm Hg, we should stop the chilled saline and versed administration. Since this process is not started until the estimated time of arrival at the hospital is about 10-20 minutes, the time of stopping should be fairly minimal. While it is not ideal, we also want to avoid further hypotension and the risk of further myocardial ischemia. We want to AVOID rewarming when Cooling is indicated. If the SBP is lower than 100, it is not indicated and the cooling procedure (IV chilled saline and meds) should be stopped.

94. Why Versed and not another amnestic?

We chose midazolam (Versed) because we already have it, we are familiar with its use and it is very simple to administer. Additionally, it provides the sedative and amnestic effects while also enhancing cooling.

95. Why 30 mL/kg?

This dose is closely in-line with the dose used by other EMS Systems who have implemented therapeutic hypothermia. The standard dose being used is either 30 or 40 mL/kg to a max of 2 liters (for adults).

96. Have you heard anything about using Benadryl for preempting histamine release post resuscitation? We sometimes do this in the ICU but not always.

We are not aware of anything in the literature that suggests this is useful in the post resuscitation patient.

97. Vecuronium has a reversal agent. Why don't we carry it in case we lose the advanced airway?

Though there is a reversal agent for vecuronium (neostigmine), our goal is to maintain the airway and focus our efforts on not losing it. The disadvantages of using a reversal agent far outweigh the potential benefits. One potential side effect is that the patient could vomit and compromise the airway. If chilled saline has already been infused, the risk of shivering would also be increased which could increase the risk of rewarming. And finally, if the patient was able to have an advanced airway placed later, the continued action (longer half-life) of the neostigmine could interfere with the effectiveness of additional non-depolarizing agents.

98. Is there an upper limit of temperature that we would not cool a patient (e.g. the septic patient)?

No. There is no upper limit on the temperature such that we would choose not to cool a patient with ROSC who otherwise meets the indications for cooling.

99. How do we stratify the outcomes of our resuscitation attempts (e.g. effective compressions, cooling, ITD, etc)?

Good question. Since the introduction of therapeutic hypothermia to our System is not part of a research proposal, it is not critical that we can sort out the impact of each specific intervention provided. Instead, we believe the standard of care in our community should be to use the available tools to get the best patient outcome (e.g. survival to hospital discharge with good neurologic outcome).

Posted July 7, 2008

100. Are there considerations for use of hypothermia in trauma?

At this point, we are only considering therapeutic hypothermia for cardiac arrest without suspicion or evidence of non-compressible hemorrhage. With the concern for potential coagulopathy and the minimal available evidence for trauma arrests, we will generally not be using therapeutic hypothermia for trauma arrest victims.

101. What are other reasons for a patient to be hypothermic other than environmental factors?

Among the list of other possible reasons include patients who are taking beta blockers or phenothiazines as well as those at the extremes of age.

102. If the patient goes into ventricular fibrillation while we are cooling, do we limit the number of shocks as in “regular hypothermia” patients?

The extent of hypothermia we are inducing is mild (93-97 degrees F). Alteration of resuscitation attempts with regard to defibrillatory shocks or medications is not required. The chilled IV saline should be stopped until there is a return of spontaneous circulation (palpable pulse). The primary reason for doing this is because the available literature has the greatest support for therapeutic hypothermia in the patient with ROSC. Current research is underway to evaluate the effect of continued hypothermia during resuscitative efforts.

103. How do we take the patient’s temperature?

This is currently being addressed by the EMS Department. This discussion will be included in the Operations portion of the Hypothermia training (coming soon).

104. What do we do if the patient is waking up while intubated and reaching for the tube? Is this considered a “cognitive, purposeful” movement?

Therapeutic hypothermia should be initiated for patients who meet all criteria including the ability to follow a command as described in the question. Simply reaching for the tube is purposeful but it does not demonstrate adequate function of the brain. If this patient could also follow a specific command (generally this is the post-arrest patient who is also rapidly improving neurologically), then he/she would not meet the indications for hypothermia. In either case (hypothermia or not), this patient should be sedated.

105. Do we carry endotracheal tubes small enough for a five day old patient?

The Minimum Equipment List includes a 2.5 mm tube. The final decision on the lower age limit HAS NOT yet been finalized.

106. Why midazolam versus diazepam for therapeutic hypothermia?

There are two primary reasons for this decision. One reason is that this is consistent with our other COGs with regard to sedation. We currently use midazolam as our sedative for pacing and pharmacologic assisted intubation in the air medical setting. The second reason is that the use of midazolam is consistent with the therapeutic hypothermia practices implemented by other EMS systems.

107. What about transfers from a hospital that is NOT a Resuscitation Center of Excellence? As an example, what if the patient walked into such a hospital and then experienced sudden cardiac arrest and the hospital began hypothermia or did not begin hypothermia?

This is certainly a possibility. It will probably require some education with those hospitals that are not designated as Resuscitation Centers of Excellence. These hospitals will need to know that the EMS System has limited capabilities in terms of maintaining therapeutic hypothermia. Transporting a large piece of equipment with several additional components (e.g. several of the external and internal cooling devices fit into this category) in the ambulance would be a challenge.

108. If you know the patient has broken ribs due to the CPR, should you give narcotics?

Questions #18 and #89 address the topic of pain management for patients who are also receiving therapeutic hypothermia.

109. Can you give medications through the chilled saline line if that's all you have?

Ideally, medications should not be administered through the IV line along with the chilled saline. If possible, use a second IV line with room temperature normal saline. If a second line is NOT available, use the line with the chilled saline to administer the midazolam and vecuronium.

110. Since we are so concerned about rewarming patients, should I keep a 250 mL bag cool so if I need Dopamine I can piggyback it into my cooling line?

No. The very small effect of small volumes of chilled saline will not be enough to counter the effects of general rewarming. Plus, room temperature dopamine is unlikely to cause significant warming (i.e. 75° F dopamine infused into a patient with a temperature greater than 93° F). The best defense against rewarming is timing the infusion based upon the expected time of arrival at the ED (e.g. begin the infusion of chilled saline only when you are about 10-20 minutes from the receiving hospital).