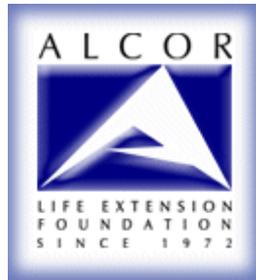


**Alcor A-2420**

**Case Report**



**Prepared by**

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## 1. Overview

### *Member information*

Member A-2420, age 82, was born on July 29<sup>th</sup>, 1926, in Burkesville, Illinois. She was a retired homemaker, living in St Louis, Missouri, who was approved for membership on July 22<sup>nd</sup>, 2009. Her husband completed his paperwork roughly in the same time period and her son has been an Alcor member since 1994.

### *Known medical history*

The patient suffered from Alzheimer's disease, congestive heart failure, chronic urinary tract infections, hypothyroidism, hypercholesterolemia, chronic renal insufficiency, morbid obesity, lower extremity cellulites and deep vein thrombosis.

### *Circumstances surrounding clinical death*

Clinical death occurred at 1:22 am on July 25<sup>th</sup>, 2009 at her hospice residence of McKnight Place Extended Care in St. Louis, MO. Witnesses included the member's son and daughter-in-law, along with the hospice nurse and members of Suspended Animation.

Although transport team members and nursing staff were present at the patient's side when she was pronounced, TeleMed was contacted regarding the patient's status to alert Alcor's notification network so they could prepare for their perspective roles in the case.

## 2. Personnel

### *Participants in this case*

Personnel from both Alcor and Suspended Animation participated jointly to support the cryopreservation wishes of Member A-2420.

### *Alcor*

Aaron Drake represented Alcor as Transport Coordinator at the patient's care facility and Surgical Support at the Alcor facility. He was supported by Jennifer Chapman, Executive Director; Steve Harris, M.D., Chief Medical Advisor; Hugh Hixon, Research Fellow; José Kanshepolsky, M.D., Neurosurgeon; Todd Huffman, Surgical Assistant; Steve Graber, Surgical Scribe; Richard Cremeens, Surgical Support.

### *Suspended Animation*

Suspended Animation was represented by Catherine Baldwin, Executive Director; Standby Team Members Mathew Sullivan, Kelly Kingston, EMT-B, Ken Schroeder, EMT-B, Piotr Ruc, EMT-B, Michael Quinn, EMT-P, Patrick Davis, CCP.

### 3. Pre-Deployment

#### *Initial medical communication*

In May of 2009, Aaron Drake called and spoke with Bernice Irwin, the Director of Nursing at Two McKnight Place in St. Louis, MO. The purpose of this call was to determine their level of comfort in participating with Alcor in administering post mortem medications to their patient - a member of Alcor. There was information in the patient's file that indicated the facility had been sent Alcor's instruction sheet for medical providers. Bernice confirmed the information had been placed into the patient's chart and they would be willing to help fulfill the patient's wishes. She had numerous questions about the process and she and Aaron discussed cryonics in general for about 15 minutes.

#### *Subsequent communication*

Aaron Drake was at Critical Care Research in Rancho Cucamonga, California, receiving surgical training from Dr. Steve Harris when he received a call from the facility's Director of Nursing on July 16<sup>th</sup>, 2009. She wanted to inform Alcor that their patient had taken a turn for the worse and that the family was considering changing her designation to hospice. Since this extended care facility also had hospice care, the patient would not need to be moved. She also had some questions about the specific medications that they were willing to administer in the event of the patient's death, as she was planning to order them from their in-house pharmacy, to have on hand. Her pharmacist had indicated that he might have trouble filling the order of Propofol and Streptokinase. Aaron told her that he would have those two medications sent by overnight delivery.

Aaron called Regina Pancake, Alcor's Readiness Coordinator, explaining the situation and requested that she ship the two medications the same day. Aaron and Dr. Harris called back to the extended care facility to confirm that the medications were shipped and that they could expect them in the morning. This also gave them the opportunity to speak directly with the patient's nurse to better understand the specifics of what prompted the call. They were told that her core body temperature was very low and she looked extremely ill. Her nurse had been caring for her for ten years and had never seen her in this poor condition.

Jennifer Chapman was contacted and apprised of the situation and the actions that Alcor was taking. Over the course of the next day, the deployment committee of Jennifer Chapman, Steve Harris, MD and Aaron Drake continued to call the patient's nurses to get updates. Suspended Animation was notified that Alcor had a potential member standby and inquired about their availability to respond if requested.

Aaron spoke to the son and inquired if the physician was aware of his mother's cryopreservation wishes and he confirmed that everyone involved was fully aware, supportive of her personal choice and willing to help in any way possible.

#### **4. Deployment**

On the morning of Saturday, July 18<sup>th</sup>, the Deployment Committee decided to send Aaron to St. Louis to better assess the patient's condition and when it would be appropriate to initiate a full deployment of a standby team. Through several conversations with a variety of the patient's nurses, Alcor was getting mixed messages of the medical condition of the patient. Firsthand knowledge would provide us with reliable information and a consistent perspective to make a more informed decision.

##### *Selection of stabilization equipment*

It was decided that although Aaron was not planning to handle the entire case by himself, it would be prudent to take a minimal cache of equipment and medications if the patient suffered an unexpected and immediate clinical death. Aaron had developed a single person standby kit that contained all of the medications and a non-redundant supply of stabilization and cool down equipment. This kit is small, lightweight and designed not to exceed the airline's weight restrictions or incur additional baggage costs yet maintain sufficient supplies for a single medical provider to establish stabilization and cool down procedures while additional support is enroute.

Based upon the location of the standby and considering that Alcor was in the process of revamping their Air Transportable Perfusion equipment, it was decided to make this a joint operation with assistance from Suspended Animation.

##### *Airline Travel*

At 9:00, Aaron drove from his home to Alcor to gather the medications, equipment and supplies. Jennifer met him with all of the completed member documents. By 10:00, Aaron departed for Phoenix Sky Harbor (PHX) airport and arrived 30 minutes later.

He was scheduled on Southwest Airlines, flight #2928 direct to St. Louis (STL) airport. While sitting on the plane prior to pulling back from the gate, the member's son called and said that his mother looked "bad". He reported that the nursing staff felt she could expire by Sunday evening. Her body was trembling, probably due to a body temperature of 94 degrees. Her O2 saturation was still high, however she was now being administered oxygen through a nasal cannula. They were now withholding all food.

The son was very glad that Alcor was sending someone and would plan on meeting Aaron at the facility later that evening. The plane departed at 11:55 am arriving at 5:00 pm, Central Daylight Time. (All subsequent times in this report, while in Saint Louis, will be reported as CDT.)

## 5. Standby

### *Arrival at facility*

At 6:15 pm, Aaron arrived at the member's care facility. He met with the nursing staff on duty to establish his role and to access the patient's medical information to better determine her condition. Although prior communication had occurred between Alcor and this facility, all of the appropriate documentation was presented to alleviate any concerns about the member's wishes and directives for Alcor to be an active participant in her post-mortem care.

### *Initial patient status*

Aaron was given permission to review the patient's charts and to be kept updated with all vital sign assessments and pertinent medical findings. Reading the charts, he determined that the member had been suffering from Alzheimer's disease for 10 years and had resided in extended care facilities during that time. In addition, her medical background included congestive heart failure, chronic urinary tract infections, hypothyroidism, hypercholesterolemia, chronic renal insufficiency, morbid obesity, lower extremity cellulites and deep vein thrombosis. She recently had become non-ambulatory.

Her Alzheimer's had advanced to the level where she was losing the ability to chew and swallow food. The patient had kept the previous day's food in her mouth all throughout the night and it had to be removed by the nursing staff in the morning. Therefore it was decided to discontinue all food as it was considered a choking hazard for the patient. She was provided water to drink, but her intake was minimal. All medications had been stopped with the exception of Gentamicin for UTI, Roxanol for pain and O2 via nasal cannula @ 2 lpm.

After reviewing the charts and discussing the patient's current condition with the nurse, she and Aaron went to the patient's room for a visual assessment of the patient and room configuration. This was a large private room adorned with personal effects as if it were a bedroom at home. There were comfortable chairs for visitors, dressers, a television, a single bed with a surrounding curtain for privacy, a bathroom, a small refrigerator and photographs of family and of earlier times. Aaron brought in the single person standby kit and staged the equipment in the room. The medications were placed in the refrigerator and freezer to maintain their efficacy.

### *Meeting with family*

Approximately 8:00 pm, the patient's son and daughter-in-law arrived to meet Aaron. Although they had spoken numerous times by phone, they had never met in person. After introductions, they spoke about his mother's situation and the events and decisions that led them to enroll her into hospice. Cryonics was a personal choice that had been made by many members of this family and this quiet time provided an opportunity for the two of them to discuss these decisions and the subsequent actions that would be taken when clinical death occurred. Aaron felt this was an important discussion as the family members would probably be witness to the extraordinary measures that would be performed by the standby team. The visual impact of these measures occurs at a very emotional time and they should be prepared for what they may witness. Without previous medical experience or training, the events that unfold may be overwhelming and difficult for some to comprehend, even by someone who had personally made the decision to be cryonically preserved.

By this time, Aaron had developed a comprehensive understanding of the situation and called Dr. Harris with the details. At 10:00 pm, Aaron called Jennifer with an update. After ensuring that the nursing staff had both Alcor's emergency 800-phone number and his cellular phone with instructions to call 24/7, he then secured a hotel that was approximately one mile from the facility, so he could rest for the evening.

At 8:00 am on Sunday, July 19<sup>th</sup> - the next morning, Aaron met with the relief nursing staff. The patient had no changes during the night and appeared stable. She would respond to voice commands; however she would not open her eyes. She occasionally mumbled with no discernable words. As of this morning, the providers now decided to withhold all fluids, in addition to withholding food. One of the nursing staff mentioned that the patient typically had copious amounts of urine output during the night. Now they were seeing very little. The patient was previously taking a diuretic for her congestive heart failure. As this medication was discontinued, it might account for some of the reduction in her output - however it was difficult to determine. Since they were still changing the patient's diaper throughout the day, Aaron asked if they could report the amount of fluid output so we could better determine the level of dehydration.

### *Logistical Planning*

To start on the logistical planning, Aaron contacted the funeral home that the family had requested Alcor use. He needed to find their location, the inventory and availability of their shipping supplies, and determine their TSA "Known Shipper" status. Given the recent

Federal security changes at airports, this could affect their ability to ship. The weekend staff was not able to answer many questions. They indicated they would have someone call him back with more information. Over the course of the day, no one returned the call.

The County Coroner's office was contacted and Aaron spoke with the on-call investigator. Aaron explained the anticipated situation and inquired about the local protocols for death pronouncement and subsequent paperwork. He was told that in the case of a hospice death, the medical facility only needed to fax the documents to their office; there was no need for the Coroner to visit. The facility's medical director would determine who had the authority to pronounce death. He also inquired about which funeral home Alcor intended to use. Aaron mentioned the business that the family had requested and the investigator said they were not very close to the nursing facility in which our patient resided. He suggested a closer one, Lupton Mortuary, and provided a contact number. He had previously worked with the director, Eric Huesemann, a former police detective with an outstanding reputation. The investigator was thanked for the information and the funeral home suggestion.

Since little progress had been made with the initial mortuary, Lupton Mortuary was then contacted. The Director was not in but they said they would have him return the call. A short while later the Director, Mr. Huesemann, called from home. The two discussed the situation and Alcor's needs. Lupton was two miles from the nursing home as opposed to 25 miles from the original choice. It was also near the airport allowing for convenient departure. For references, they urged us to speak with the McKnight Place nursing facility where our member was located. They handle the majority of their patients and are quite familiar with the facility. The Director further said they would be very interested in assisting Alcor and made their staff, facility, equipment and prep room at our disposal. Aaron indicated that he would speak with the family and schedule a tour of their facility the following day.

When the patient's family returned to McKnight Place in the afternoon, they discussed the reasons why the mortuary was selected. The primary reason was based upon proximity to the family's home. It was explained that the additional travel time could add up to an extra hour of drive time each way, depending on traffic. In cryonics, minutes are critical, and it may be worth exploring an alternative. They family was comfortable in considering other options for transportation as long as they could continue to use the original facility for the memorial services.

*Monday, July 20th*

On Monday morning, Aaron met with the Director of Nursing for the facility, Bernice Irwin. They discussed cryonics and the patient's wishes. They were supportive of all of their patient's requests and were willing to help in anyway.

Aaron was given an extensive tour of the facility and was introduced to each department's director, with instructions to accommodate Alcor and their representatives with every courtesy. An appointment with the Nurse Practitioner was scheduled for the afternoon, as she represented the medical director's office. She could offer more definitive diagnosis of the patient's condition and clarify any protocol questions or concerns that we may have.

In the early afternoon, Aaron met with the Nurse Practitioner. She anticipated the progression of medical events for Alcor's member should she follow a path from reduced responsiveness eventually leading to unconsciousness; then labored breathing leading to respiratory distress and finally respiratory failure. Of course, in Hospice, there are numerous patients who surprised healthcare providers with greatly extended or immediate deaths. The staff was watching for the first of the patient's vital signs to dramatically change.

Aaron traveled to Lupton Mortuary and they provided him with a tour of their funeral home. They staff the facility 24 hours a day and promised they would be available around the clock. They had a Ziegler case and a combo unit in stock and reserved it for Alcor. There were two exam tables in their prep room for a perfusion if we needed them. A large cooler set at 40 degrees with a strong fan can accommodate four patients at once, if needed. Basically, all of the components needed were in place and Aaron decided to go ahead and have them handle Alcor's member.

Lupton's funeral director stated that a licensed funeral director in the state of Missouri is the one who issues the transfer permit, not the health department. The transfer permit is the legal document that allows Alcor to transport a patient across state lines. Without this all important document, no airline would accept the shipment. The funeral director only needs to sign and fax the form to the state and we are able to transport. This can save Alcor valuable time, especially if the case occurs over the weekend or during the night, when the health department is typically closed.

The original mortuary called Aaron on Monday afternoon. They had a very large facility with an equally large staff who were also willing to assist under these special circumstances. Although their proximity was not ideal, they would work as an alternate facility.

The Deployment Committee had a phone conference regarding the medical status of the patient. They reviewed the progression of vital signs and Aaron's description of how the patient looked visually. Catherine Baldwin from Suspended Animation was subsequently contacted to provide her with current information on the patient's status. She indicated she would be shipping their full field kit to our location on Tuesday so it would be pre-positioned and ready for use. She would send it by airline cargo; however Aaron would need to pick it up and deliver it to the patient's bedside.

*Tuesday, July 21st*

It had been 96 hours since the patient had consumed any food and 84 hours for any water. Her vitals remained virtually unchanged and visibly she looked the same as she did a week ago, per the nursing staff.

Two rolling ice chests had been purchased and filled with bagged ice. These were stored in a walk-in cooler next to the facility's cafeteria. Aaron was provided a key to allow him 24 hour access to the cooler. Additional bagged ice was also being stored in an ice machine near the patient's room.

Aaron had obtained a vital statistics information sheet from Lupton Mortuary the preceding day for the family members to complete. This information would then be entered in to the funeral home's database and a death certificate would be pre-printed, absent a physician's signature, to expedite the paperwork process.

Another logistical issue that can slow the process of initiating immediate treatment is determining who has the legal authority to pronounce death. Aaron found numerous sources that said a law was passed four years prior in the State of Missouri that allowed a hospice nurse to pronounce death in place of a physician. This law matched the protocol of the medical facility of Alcor's member. Once a hospice nurse pronounces death, she only needs to call the Medical Director and inform him of the event.

Aaron began to download the airline's schedules to start planning available flights; depending on the time of the day that patient was ready to be shipped. US Airways had three non-stop flights per day from STL to PHX. He contacted the TLC desk that handles human remains shipments; the category of cargo Alcor patients fall under. They confirmed they will allow a Ziegler case, packed with wet ice, to be shipped. They also reiterated that a shipment must be at their cargo desk greater than two hours prior to departure. When it came to the



new TSA regulations, US Airways responded that the TSA had delayed the start of the “Known Shipper” program due to an overwhelming influx of submissions of which they were unable to process. Although both of the mortuaries that Alcor was considering using had applied to meet this new regulation, it would not have any impact on this particular case.

The Deployment Committee spoke again regarding the current developments in the planning progress. Catherine Baldwin was now being consulted on a daily basis. Catherine said she would rather have the Suspended Animation Response Vehicle as a preferred surgical suite over that of the funeral home’s prep room. This is due to team members being more familiar with where all the tools and equipment are located - having trained and responded with that unit; it is a more controlled and sterile environment than a prep room of a mortuary; and, it is designed specifically for the purpose of performing a field perfusion and cool down.

#### *Suspended Animation Field Kits*

In preparation to receive the Suspended Animation equipment being shipped via airline cargo, the car was upgraded to an SUV to accommodate all of the Pelican containers. There were no mini-vans available at any car rental facility in the city. The shipment from Suspended Animation was initially split between two flights due to size and weight; however the first flight was weight-restricted due to weather and the first of two loads was shifted to the second flight. The second flight could not accommodate both loads, again due to weather, so it now was shifted to a third flight. Since the US Airways cargo office was not able to determine if the shipment actually departed based solely upon the manifest, Aaron had to travel to the airport each time to physically check the off loaded cargo only to be turned away twice. Six hours later than expected, the equipment finally arrived. Since the SUV could only carry nine of the twelve items, it took a fourth trip to the airport to finally retrieve all of the containers. All the items were placed in the patient’s room and inspected for damage. The MHP2 was located and stored in the walk-in cooler at 38 degrees.

#### *Wednesday, July 22<sup>nd</sup>*

The following morning brought the first sign of a change in the patient’s condition. She began to exhibit mottling on the bottom of her feet; which is an indication there are blood vessel changes occurring. The nurse mentioned that she had poor skin turgor as her skin would tent upon squeezing; this finding usually indicates moderate dehydration. Her level of consciousness (LOC) was decreasing overall, however she still had periods of nonsensical language.



These new changes were communicated to Catherine Baldwin and the decision to deploy the SA rescue vehicle, along with two SA team members, was made. Based upon an estimated 20 hour drive time, they should arrive sometime on Thursday morning.

Although the son and other family members were at her bedside regularly, we asked that the patient be checked on every hour by the medical staff. The patient also had a Groshong style PICC line that had been centrally inserted prior to Alcor's arrival. This line is normally flushed once per week to maintain patency. Since it was approaching a week and there was the great likelihood that we would be using it for immediate vascular access in the near future, we had requested that it be flushed again tomorrow.

In consulting with Steve Rude, the local funeral director who coordinates the receiving of Alcor's patients, he confirmed that the State of Missouri allows for a deferred death certificate. This permits a funeral director to complete the death certificate, absent a physician's or coroner's signature, to facilitate transferring the body on an expedited basis. The death certificate will still be signed and completed, only at a later date.

The member's family completed the vital statistics information sheet and Aaron took the paperwork to the mortuary. He waited for them to complete an unsigned death certificate in case the opportunity arose to have the document signed by a physician.

*Thursday, July 23<sup>rd</sup>*

On Thursday morning, the patient's vital signs continued to deteriorate slowly and steadily. She was less alert and her pain tolerance had dropped significantly as she easily displayed discomfort by any tactile stimulus. The hospice nurse had increased the order for Roxanol to be given every 4 hours or as needed for pain.

*Suspended Animation  
Rescue Vehicle*

Two SA team members arrived on Thursday, July 23<sup>rd</sup>. Initially, Aaron met with them to discuss the patient's current medical status and to introduce them to the nursing staff and administration. They toured the facility and determined the best place to position the response vehicle and received approval from the building's management.

The SA staff then brought their equipment from the vehicle and assembled the portable ice bath. All of the equipment that had previously been shipped was double checked and set up in the patient's room, per their preferences. Since the team was only pre-positioning equipment and had not been officially deployed for the



stand-by, when the set-up was complete, both team members retired to their hotel rooms to rest in anticipation of the work ahead.

The Deployment Committee discussed the situation and although the patient was not exhibiting severe clinical signs or symptoms indicating she would experience clinical death any time soon, due to the extended period of time the patient had gone without food and water, it was decided to request that the SA team deploy on Friday morning. Although there were currently three people on location, with the equipment, who were capable of providing initial stabilization and cool down of the patient, they would be prone to fatigue and would need rest while waiting. It would be preferable to have a full complement of team members coupled with the surgical and perfusion capabilities to assist on the standby.

It appeared that all of the logistical planning was complete. There were plans, along with contingencies, with respect to: immediate declaration of clinical death; obtainment of ice; preparation of the portable ice bath and associated equipment; the perfusate and response vehicle were positioned; the mortuary was ready with all of the proper legal documentation and supplies to ship human remains; awareness of all available commercial flights, times and cargo shipping compliance.

#### *Friday, July 24<sup>th</sup>*

A significant decline in the patient's condition was observed on Friday morning. She now experienced longer periods of apnea; her blood pressure was beginning to drop; and her overall appearance had significantly deteriorated. Suspended Animation was contacted and Alcor requested they deploy a full team to standby. SA deployed five additional standby team members to St. Louis: three staff; a contract perfusionist; and a contract surgeon.

#### *Arrival of Response Team members*

By noon, the first team members began to arrive and become acquainted with the situation. As the afternoon progressed, all of the people who were deployed for the standby had arrived. Procedures were reviewed, equipment was double-checked, work positions were assigned and an overall plan was established. All of the new and familiar faces created a buzz in the air which Catherine knew would wear people down over time. She decided to break up the team members to cover different shifts. Some members went and checked in to the nearby hotel to rest-up, while others stayed for observation.

One logistical concern that developed due to the length of the standby was with the airline cargo office. They were closed over the weekend and any shipments not checked by 10:00 pm would not be processed until Monday morning. This could potentially be disastrous the longer

the standby was delayed. Aaron discussed this issue with the patient's son and suggested the possibility of chartering a private jet to facilitate the transport. The alternative would be a time consuming drive of the patient back to Scottsdale in Suspended Animation's rescue vehicle. The family was willing to fund the additional money to accomplish this.

Aaron began to call chartered aircraft brokers to find an available plane. Air ambulances are usually available with short notice however they are priced at a premium since you pay for advanced medical providers to accompany the patient. In Alcor's situation, that type of care is not necessary, and the space taken up by the medical personnel is needed to bring along additional ice, supplies and personnel back to Scottsdale along with the patient. After speaking with four different companies, one was identified that was in the process of repositioning to St. Louis airport and would be willing to standby until needed. A favorable price was negotiated since the company was based out of the Scottsdale Airport, three blocks from Alcor central. A deal was struck and an alliance was forged.

#### *Saturday, July 25th*

The patient's health continued to decline over the evening and by 12:10 am on Saturday, the patient began exhibiting whole body tremors every minute with agonal gasping. At 1:20am the patient appeared to stop breathing. The patient's daughter-in-law summoned a hospice nurse. An SA standby team member recalled the rest of the team to the facility.

A hospice nurse pronounced the patient legally dead at 1:22am.

#### **Remote Stabilization and Cooling**

#### *Initial procedures after pronouncement*

Immediately after pronouncement, team members infused Propofol (200mg), Streptokinase (250,000IU) and Heparin (30,000IU) through the patient's existing peripherally inserted central catheter (PICC) line. Several nurses then assisted team members in moving the patient from her bed into the ice bath.

#### *Cardiopulmonary Support*

Team members packed the patient in ice, intubated her, and started up the AutoPulse CPS device and the automated ventilator with oxygen (10 lpm). The stack of the impedance threshold valve and the CO2 detector on top of the CombiTube was not stable and had to be taped to an ink pen laid along the side of the stack for support. Maalox was not administered through the CombiTube.

When the patient was repositioned to insert the rectal probe, team members noted blood and black tissue-like fragments discharging from the rectum and a powerful chemical odor.

Both the nasopharyngeal and rectal probes were put in place and connected to the Dual Logger temperature recorder.

Water was added to the ice bath and the “squid” started to re-circulate ice water over the patient.

In the twenty minutes following pronouncement, the following medications were administered via the patient’s PICC line: Epinephrine (1mg x 3), Vasopressin (100 IU), S-methylthiourea (SMT, 400mg), Aspegic (200mg), Niacinamide (500mg), and L-kynurenine (1.0mg of 1.5mg, approximately 37cc’s of L-kynurenine were not administered because of repeated .2um filter clogging.) Additional 1mg doses of Epinephrine were administered about every three minutes over the first hour post-pronouncement.

The AutoPulse stopped briefly when chunks of ice interfered with the compression band. Ice was removed and the AutoPulse restarted.

Team members noted that infusion into the PICC line slowed considerably after the first low volume medications were administered.

A FAST1 intraosseous infusion (IO) line was set and flushed. High volume medications Saline (1 L, .9%) with Tromethamine (THAM, 100mL 1M), Dextran 40 (500mL, 10%) and Mannitol (500mL 20%), were piggybacked onto an IV line to the FAST1 port. All remaining medications were administered using this line instead of the PICC.

Three blood samples were also drawn from the IO over the next hour. The samples were processed two hours post pronouncement using the I-STAT analyzer with an EC8+ cartridge. (Sample results are in the data section of this report)

Approximately 30 minutes post-pronouncement, Ketoralac (7.5mg), Gentamicin (80mg), Vital-Oxy (70mL), and a second dose of Vasopressin (100 IU) were pushed via syringe into the IV line.

The balloon inflators on the CombiTube were checked and additional air added to compensate for cooling. The balloon inflator on the rectal plug was being checked when the inflator detached from the tube. It was reattached and the balloon re-inflated.

Additional ice was packed on the patient.

Temperature readings were 39.2C rectal, 33.3C nasopharyngeal.

Team members noted although the gravity fed tromethamine was complete, the flow from the other piggybacked high volume IV bags had stopped. For rapid infusion, the remaining Dextran 40 (367mL) and Mannitol (382mL) were pulled from the IV bags using 60cc syringes and pushed directly. The saline IV bag flowed freely.

The AutoPulse battery was replaced after 45 minutes.

All stabilization medication administration was complete within one hour following pronouncement.

*Patient moved to  
Rescue Vehicle*

The patient was covered for privacy and rolled out to the front of the facility where the SA Transport Vehicle was waiting with the surgeon and perfusionist inside.

The patient's nasopharyngeal temperature had dropped 8 degrees C from the time of placement of the probe.

### **Remote Perfusion**

*Cannulation*

The surgeon prepped the patient's left groin for surgery by swabbing with ChloroPrep and draping the area with sterile surgical towels. The surgeon requested assistance retracting large folds of skin from the abdomen that covered the surgical site. Using a number 10 scalpel blade, a 5cm incision was made and rough dissection was used to clear 3cm layer of adipose tissue to expose the muscle and femoral capsule. Large quantities of blood from the surrounding tissue immediately filled the surgical field.

The surgeon asked how much heparin the patient had been given and was informed 30,000 IUs had been administered.

The surgeon packed the area with surgical sponges with little effect on the blood pooling. After about five minutes of dissection with the AutoPulse running, the surgeon asked that the CPS device be shut off.

The patient's nasopharyngeal temperature was 30.1C.

The remaining 30mL Vital-Oxy was added to the perfusate reservoir used for closed circuit cooling.

No femoral capsule was visible. The femoral artery was located and isolated. As the surgeon ran a 2-0 silk tie under the distal end of the

artery this section of the artery broke into several pieces. Bright red blood flowed freely from the artery. A tie on the proximal end was quickly placed and the distal tie replaced. The surgeon handed the broken pieces of the artery to the Team Leader. They were thick with plaque and extremely brittle. A 17 French arterial cannula could not be immediately located so a 17 French venous cannula was used and advanced with some difficulty to the heart.

The surgeon requested the AutoPulse be turned on briefly to aid in the location of a large vein.

Additional dissection around the cannulated artery revealed a large vein. The surgeon isolated this vessel, secured the distal and superior ends and attempted, unsuccessfully, to insert a 16 French venous cannula. A 15 French cannula was inserted and slow venous return was observed.

#### *Venous drainage*

The cannula in the artery was primed and connected to the perfusion circuit. The cannula in the vein was left open and the pump started slowly. Venous drainage was minimal. A team member noted that the cannula in the vein was coming out of the vessel. The surgeon re-secured the cannula, primed it and connected it to the venous return of the circuit.

The arterial and venous lines were unclamped. No venous return was visible. No line kinks or air bubbles were visible. The perfusionist started the pump again and applied mild suction. Attempts to get venous drainage continued for several minutes, but no additional flow was observed. A team member noted some abdominal distension. The pump was shut off.

Dark effluent began flowing from the patient's esophageal tube.

#### *Alternate access sites*

The surgeon made an additional transverse incision near the inguinal crease to locate another vein. Another vein was located, isolated and tied off. This vessel was cannulated, primed and attached to the venous return of the perfusion circuit. After unclamping, unassisted drainage was attempted. With no return, the pump was started again and slow venous return was noted, but additional distension was also obvious in the patient's abdomen. The pump was shut off.

Moving up to the patient's neck, the surgeon made a 3cm incision along the right side. He isolated the external jugular, tied off and inserted a 17 F arterial cannula. Dark blood backed up into the cannula and receded.

The venous return of the perfusion circuit was moved from the cannulated vein in the femoral location to the external jugular vein cannula. Saline added to prime the jugular cannula immediately disappeared down the cannula. A one-liter bottle of saline was used and poured continuously while the connection was made between the cannula and the venous return line of the circuit.

The lines were unclamped and the AutoPulse was started to aid flow. The perfusionist started the pump and applied mild suction. Slow venous return was noted, but the perfusionist was unable to get good venous return. The pump was stopped. The AutoPulse was shut off.

The patient's abdomen was visibly distended. Approximately 8 liters of perfusate had been pumped. Less than a liter of venous waste was returned.

The patient's nasopharyngeal temperature was 20C.

#### *Termination of perfusion*

After more than one hour of attempting washout and being unable to get venous drainage from the patient, the surgeon clamped the cannulae, disconnected the patient from the circuit and began preparing the patient for transport via air ambulance.

#### **Transportation**

Alcor's Transport Coordinator had made arrangements with a private air charter to fly the patient directly to Alcor from the charter area of the St. Louis Airport. The plane would not accommodate an insulated Ziegler case with the patient, so the patient would be packed in two body bags with as much ice as possible

The patient was quickly cleaned and incisions closed.

Clean ice was packed in one-gallon zip top bags for placement around the patient during transport.

#### *Patient transferred to airport*

The SA Transport vehicle was driven to the St. Louis Airport. Once through security, the vehicle was driven onto the tarmac a short distance from the plane.

The patient was moved from the ice bath into the body bags. Team members carried the patient to the plane and maneuvered through the plane's narrow entry, around a corner and into the plane's cabin.



Several passenger seats had been folded down and covered with plastic. The patient was placed on top of the folded seats and bagged ice packed over and around the patient. To replace ice melting during the flight, an additional cooler of ice was also loaded into the plane.

*Personnel traveling  
with patient*

Alcor's Transport Coordinator and one SA team member accompanied the patient. Within 10 minutes, the jet was taxiing down the runway and departed for Scottsdale. During the flight, there was a significant amount of heat emanating from the floor of the passenger cabin. Although the patient was positioned well above the floor, Aaron directed the pilots to turn the temperature as low as possible. While this was uncomfortable for the two passengers, there were blankets to cover up for warmth and patient care took precedence over personal comfort.

*Procedure changed to  
Neuropreservation*

During the flight, discussions began to determine the best possible preservations to perform, given the limited field washout success. The two choices were between a whole body straight freeze and a neuropreservation. Although the original plan had been for a whole body preservation, after discussing the situation with the patient's son and the probable outcomes, he made the decision to proceed with a neuropreservation.

*Arrival to  
Alcor*

The jet landed at the Scottsdale airport at approximately 08:30 am (PDT). They were met immediately by Alcor staff and contractors in the Alcor Suburban. The patient was offloaded directly into the rear of the vehicle and traveled the few blocks to the Alcor facility. The patient was transferred to the whole body tray and moved into the surgical suite with the awaiting surgical staff. It was now 08:50 am.

## **Procedures at Alcor**

*Surgical Procedure*

The surgical team, lead by José Kanshepolosky, commenced at 08:54 am. Initially, two cranial burr holes were established to determine cerebral edema and place temperature probes. At 09:14 the first incisions into the neck were made and the various anatomical landmarks were identified and clipped. By 09:30, an osteotome was used and cephalic isolation occurred within four minutes. Hugh started the perfusion circuit.

The cranium was moved to the cephalic isolation chamber and secured. The right side was cannulated within 20 minutes of separation and the left side was completed in another five minutes. The pumps were started and the lines were monitored for the next 15 minutes to ensure patency. Satisfied that all connections were secure, Hugh called out

that the “ramp was on”. With that, the surgical procedure was complete and the process of perfusion began.

#### *Cryoprotective Perfusion*

Over the following two and a half hours, Hugh continued to monitor and adjust the process of cryoprotectant perfusion. At 12:56 PM, Hugh stopped the ramp pump and process of clean-up began. Hugh re-measured the base cryoprotectant levels and determined they were greater than 50.35 for more than 30 minutes and so he shut down the cryo-perfusion process. Within another 30 minutes the patient had been moved to intermediate storage.

#### *Cool Down*

On Wednesday, July 29<sup>th</sup>, the cool down process ended.

#### *Permanent Storage*

On Tuesday, August 18<sup>th</sup>, A-2420 was moved to permanent storage and became Alcor’s 88<sup>th</sup> patient.

### **Discussions and Recommendations**

#### *Field Perfusion*

The most serious issue of this case, affecting perfusion, and therefore cooling, of the patient, was the inability to drain any significant volume of blood from the patient and perfuse with any return. The patient received CPS, medications and surface cooling but without extracorporeal cooling, her temperature was reduced only 17 degrees C prior to transport.

Perfusion pressures below 200mm Hg, indicated no blockages when the pump was started slowly for washout. Minimal venous drainage and the patient’s significant abdominal distension suggest that blood and perfusate were flowing out of the vasculature and into the ventral cavity through some breach of a vessel wall.

The perfusionist’s opinion was that the patient’s age, sclerotic vascular condition and abdominal distension indicated that an abdominal aortic aneurysm (rupturing as a result of cardiopulmonary support) was the mostly likely cause. The surgeon did not disagree with this possibility but also suggested that the cannulated artery’s fragility made perforation of this vessel during cannulation a possibility, also. Unfortunately, without an examination of the patient’s ventral cavity, the real source of the issue remains unknown.

*Pre-deployment  
and logistics*

**ISSUE:** The stabilization kits that were shipped via US Airways cargo were delayed by bad weather that affected weight accommodations for cargo on the plane. Alcor's Transport Coordinator made several unnecessary trips to the airport to retrieve the cargo that had not actually arrived.

**CORRECTIVE ACTION:** Both the airlines and cargo operators with whom SA has accounts offer priority cargo delivery and tracking information. While SA has had good experiences shipping with US Airways cargo, other operators offering better tracking and guaranteed delivery will be used for future, unaccompanied shipments.

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*Stabilization*

**ISSUE:** About eight minutes were required to round up nurses, position the patient carrying sling and move the patient. During this time, several medications were administered but no manual chest compressions were given. The AmbuCardio Pump was available.

**CORRECTIVE ACTION:** Cardiopulmonary support after pronouncement is a priority. If the patient cannot be moved to the icebath with the AutoPulse immediately, manual chest compressions with the AmbuCardio Pump should be administered until the patient can be moved to the icebath.

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**ISSUE:** The combination of the impedance threshold valve (ITV) and CO2 detector stacked on top of the CombiTube is unstable and topples over. This stack had to be taped in place with a pen.

**CORRECTIVE ACTION:** A modification has been made to the top of the CombiTube to hold and stabilize the stack.

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**ISSUE:** No Maalox was administered

**CORRECTIVE ACTION:** Once the CombiTube has been placed and verified (using a stethoscope, CO2 monitor, chest movement), the team member verifying the correct placement should administer Maalox.

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**ISSUE:** L-kynurenine was extremely difficult to get into solution, even with hot water available to heat the citrate-L-kynurenine mixture. .2um filters clogged twice on second 60cc syringe of mixture and 37ccs (~.5mg) were not administered.

**CORRECTIVE ACTION:** Tests indicate that the solubility problem was not batch-specific and the most soluble form is being used. The most effective dissolution technique requires hot water in the 105-110F range (heated in microwave) and the citrate-L-kynurenine mixture bottle must be submerged for 5 minutes at a time followed by vigorous shaking until the L-kynurenine is completely dissolved. L-kynurenine mixtures prepared this way do not cause filter clogging.

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**ISSUE:** Rectal probe inflator detached from inflator line.

**CORRECTIVE ACTION:** Check inflators of rectal probes in all kits and glue or otherwise secure inflators in place.

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**ISSUE:**

- Three blood samples were collected during the hour of initial stabilization but they were not analyzed for more than an hour after collection.
- Cartridge expiration date not recorded.

**CORRECTIVE ACTION:** Blood samples should be collected before medications administration, during medications administration, following the administration and circulation of all medications, and at the initiation of washout. Manufacturer guidelines recommend I-STAT sample testing occur within 30 minutes of collection for the most accurate results. Longer times between collection and analysis can skew results. Samples drawn should be analyzed as rapidly as possible. Cartridge expiration dates should be noted in the I-STAT record. Greater emphasis will be placed on blood sampling and analysis in training and evaluation.

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*Surgical and  
Cannulation*

**ISSUE:**

- A great deal of blood pooling in the surgical field.
- Surgical suction available in vehicle was not used.

**CORRECTIVE ACTION:** Investigate additional options/techniques for controlling blood in the surgical field. Team members need to be reminded that suction is now available for both surgery and perfusion in the vehicle. Sterile suction tips will be added to surgical tray rather than being stored separately.

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**ISSUE:** Audio analysis of surgery, cannulation, washout, and perfusion procedures could be simplified if clear call-outs of procedures are made as they are during the initial stabilization procedures.

**CORRECTIVE ACTION:** Protocol and training will be modified to make deliberate, audible call outs of procedures during surgery and perfusion standard as it is for stabilization procedures.

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**ISSUE:** Surgeon suggested lengths of 2-0 silk that are longer than those in suture packs be available.

**CORRECTIVE ACTION:** Spools of sterile 2-0 silk will be added to kits.

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**ISSUE:** Time-consuming and difficult to immediately identify the cannula size and type desired from a pile or drawer full of Steri-Paks with small writing in various places.

**CORRECTIVE ACTION:** Cannula packages will be color coded and identified with large lettering on the exterior of each Steri-Pak.

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**ISSUE:** A/C blows directly over surgical field and onto surgeon.

**CORRECTIVE ACTION:** Add A/C filter and redirect output well away from surgical area.

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**ISSUE:** Inconsistent use of eye and face shields in vehicle.

**CORRECTIVE ACTION:** All personnel within three feet of surgical field must have scrubs or gowns, caps, masks and eye shields, even if not directly involved in surgery. All team members with any patient contact are required to wear gloves, eye protection and masks for their safety and the safety of the patient.

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## Timeline

*\*Times are collected from multiple sources and are approximate.*

*St Louis  
Field Procedures*

1:22 AM	Patient pronounced
1:26 AM	Propofol and streptokinase administered
1:27 AM	Heparin administered
1:28 AM	Patient moved to ice bath and packed in ice
1:29 AM	Temperature probes in
1:30 AM	AutoPulse on
1:32 AM	CombiTube in and Aspegic administered
1:34 AM	Ventilator on, first administration of epinephrine, additional every 3 min
1:35 AM	Vasopressin in
1:37 AM	SMT in
1:40 AM	Squid started
1:42 AM	Dextran 40, Mannitol bags spiked and running
1:45 AM	L-Kynurenine filter clogged and replaced, PICC line slowing
1:47 AM	FAST1 set
1:51 AM	Keterolac and Gentamicin in
1:55 AM	Second dose Vasopressin in
1:57 AM	VitalOxy pushed
2:01 AM	THAM running
2:04 AM	Bags not running, begin IV push of Dextran and Mannitol

*St Louis  
Surgical Procedures*

2:15 AM	AutoPulse battery replaced
2:24 AM	Saline spiked and running
2:31 AM	Move patient to transport vehicle
2:34 AM	Icebath locked down for surgery
2:40 AM	Incision left thigh
2:45 AM	AutoPulse off
3:09 AM	Femoral artery section breaks in pieces
3:13 AM	Femoral artery cannulated
3:40 AM	Vein cannulated
4:02 AM	On washout, no drainage
4:06 AM	Swelling of patient's abdomen noted
4:20 AM	Different leg vein cannulated
4:27 AM	Very slow drainage
4:34 AM	No drainage
4:41 AM	External jugular cannulated
4:56 AM	Minimal drainage with AutoPulse, suction and pump
5:03 AM	Washout attempts stopped
5:10 AM	Closing incisions
5:20 AM	Additional coolers of ice brought in
5:24 AM	Bagging of ice
5:54 AM	Departed for airport

*Scottsdale  
Surgical Procedures*

6:10 AM	Arrive at security at airport
6:17 AM	Vehicle moved near plane
6:33 AM	Moved patient into body bags
6:43 AM	Transferred patient to plane
6:59 AM	Plane ready for takeoff.
8:54 AM	Waiting for drill hose. Hose for craniotome missing.
8:56 AM	Hugh switches regulator assembly drill working
8:59 AM	Procedure starts. José; Todd assisting
9:01 AM	Drilling completed
9:05 AM	Removing left dura, Right dura completed Left brain hemisphere appears slightly more shrunken that the right side
9:08 AM	Left cranial temperature probe inserted
9:10 AM	Cranial openings sutured
9:12 AM	Starting on neck – betadine wash
9:14 AM	First neck incisions
9:16 AM	Cut jugular
9:20 AM	Found carotid artery
	Note: No tie bands on refractometer for section B1. Mathew found in several minutes.
9:22 AM	Right carotid clipped
9:22 AM	Switched to search for left carotid.
9:25 AM	Left carotid clipped. Trachea clipped

9:26 AM Aaron notices bodily fluids dripping from tube. Notice that table is tilting toward head.

9:28 AM 4 x 4 gauze into trachea

9:29 AM Hugh is starting perfusion circuit

9:30 AM José using osteotome to separate vertebrae

9:31 AM Todd requests more #10 scalpel blades. Aaron brings 2 of them

9:32 AM Osteotome work continued by José

9:33 AM José notes cephalic isolation coming soon  
Mathew activates voice recorder

9:34 AM Todd notes head is separated.  
José preparing to move head to isolation chamber

9:35 AM Head being held on table.  
Todd looking at vertebrae.  
Aaron notes cut was made at C6

9:37 AM Vertebrae clamped

9:38 AM Hugh and Mathew still preparing isolation chamber.  
José looking for suture needle.

9:40 AM Aaron brings one suture needle pack

9:44 AM José moving neuro to cephalon enclosure  
Todd locking head into brace

9:45 AM José call for step stool

9:46 AM Mathew plugs brain/dura temp probe into labview

9:48 AM Hugh controlling perfusion pressure. Richard call out pressures

9:50 AM José cannulating right side. Volume in mixing res. 1.45

9:51 AM Vessel pressure 29 cm

9:52 AM Vessel pressure rising to 60

9:53 AM Hugh comments “arterials flowing nicely”

9:55 AM Hugh calls out good jugular flow  
Left side cannulation complete  
Right side jugular not full secured

9:57 AM Mathew called out pressure at .75

9:58 AM Hugh notes fluids are being pulled from bladder

9:59 AM Vessel pressure at 80  
Hugh notes volume building in res.

10:01 AM Hugh notes completely clamped off on bypass  
Back pressure on .22 micron filter arterial 4 psi

10:05 AM Arterial line pressure 1004

10:06 AM Head rotated and looking at Burr holes  
Hugh calls for retractors. Todd delivers

10:07 AM Hugh states surface of brain retracted 1/8” or actually 1  
cm

10:08 AM Hugh comments return looks good, not seeing any clots  
Hugh notes both sides of brain retracted close to 1 cm

10:09 AM Vessel pressure 94, Hugh-good venous return  
José does physical measurement 7mm brain retracted

10:10 AM Hugh calls out “ramp is on”

10:11 AM Surgical procedure complete – now completely on  
profusion

10:13 AM José and Todd remove gloves and exit OR

10:14 AM Hugh “on recirculation and on ramp”  
set the box going

10:15 AM Hugh places lid on box

10:18 AM Box temp 12

10:20 AM Box temp 4 – Hugh clamps ramp  
Mixing reservoir 1.1

10:22 AM Hugh needs someone to monitor refractometer. Leaves  
OR. Mathew monitoring equipment

10:25 AM Back pressure - .22 micron filter 6 psi

10:27 AM Mathew noted air in the inline refractometer and  
cleaned it out

10:30 AM Mix reservoir 1.4  
Todd teaching Richard to use refractometer.  
Mathew removes clam from ramp

10:46 AM Todd states that Richard understands how to use the  
refractometer

10:48 AM Hugh makes a visual observation of brain through burr  
holes

10:51 AM .22 micron filter at 9 psi back pressure, per Mathew

10:52 AM Hugh and Aaron inspecting previous cut downs on  
cadaver

11:00 AM Richard measuring concentration with refractometer

11:03 AM Mathew clamps off cryoprotectant

11:03 AM Mathew unclamps cryo-line and Hugh dumps 270 ml  
into waste bucket. Mixing res now a1.32

11:06 AM Hugh note skin tone changing (brown) as cryo-  
protectant perfuses into skin

11:10 AM Hugh, Aaron and Mathew continue inspection of  
cadaver

11:11 AM .22 micron filter 12 psi

11:13 AM Richard measuring refractive index

11:30 AM Luer connection at filter pressure gauge slight leak to  
floor. Mathew notices and tightens. Leak stopped.  
Richard measure refraction

11:32 AM Hugh stops box controller and removes lid to measure brain. 1.5 cm right side / 1.2 left side

11:36 M Richard measuring refractive index. Richard tells Hugh index is at 32.4. Hugh dropping temp 6 degrees

11:38 AM Hugh stops ramp

11:44 AM .22 micron B.P filter is 19 psi

12:00 PM Richard measuring refractive index .22 micron filter pressure 22 psi

12:08 PM Hugh switching ramp back on at 'high rate' speed 84 on ramp

12:10 PM Hugh inserting 2<sup>nd</sup> micron filter into circuit. Filter pressure 6 p

12:22 PM Richard notices a bracket inside cryo box has slipped. Vertebral clamp has slipped – per Hugh. Mathew notices leak and Hugh stops it with a clamp

12:30 PM Mathew lowers temperature (8/10<sup>th</sup> degree) and pressure (160 to 104 psi)

12:56 PM Refractive index at 54.6  
Hugh stops ramp pump

1:25 PM Hugh begins clean up of cadaver. Removal of clamps, temp probes, etc.  
Disposal of gauze, rags, dressings, etc

1:40 PM Mathew suggests Hugh use bio-hazard bags for disposal. Mathew finds bio-hazard cart with yellow lid and wheels into OR

1:43 PM Base cryoprotectant levels both terminal greater than 50.35 for more than 30 minutes.  
Hugh shuts down cryo-perfusion process

1:45 PM Hugh measures brain retraction: RT. =1.1 cm / LFT=.9 cm

1:46 PM Hugh staples burr holes shut

1:47 PM	Mathew shuts down Labview PC system Hugh removes probes, instruments and cannula from stump
1:55 PM	Hugh inserts pharyngeal probe
1:57 PM	Hugh takes patient to cool down bay
2:00 PM	Hugh pre-cools LR – 40 dewar
2:03 PM	Hugh places patient in dewar for cooldown
2:07 PM	Hugh wires in temperature probes Hugh installs cool down lid with duct tape
2:08 PM	Patient transfer to intermediate storage complete

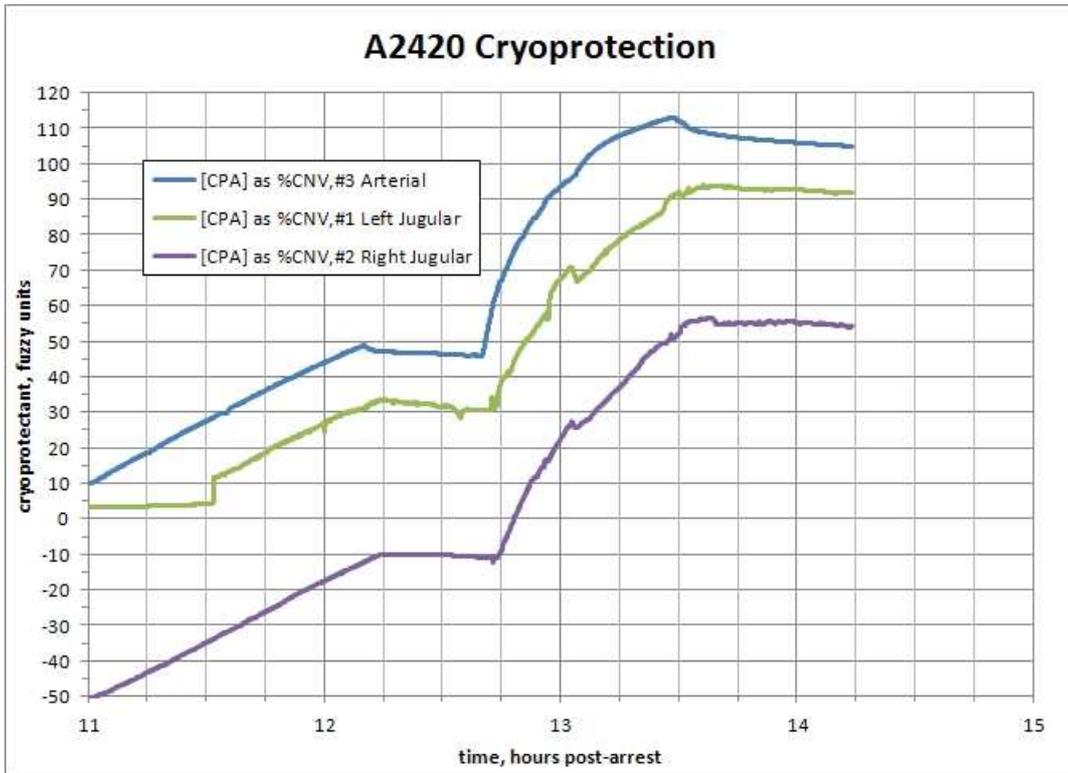
## Charts & Graphs:

### I-Stat Results

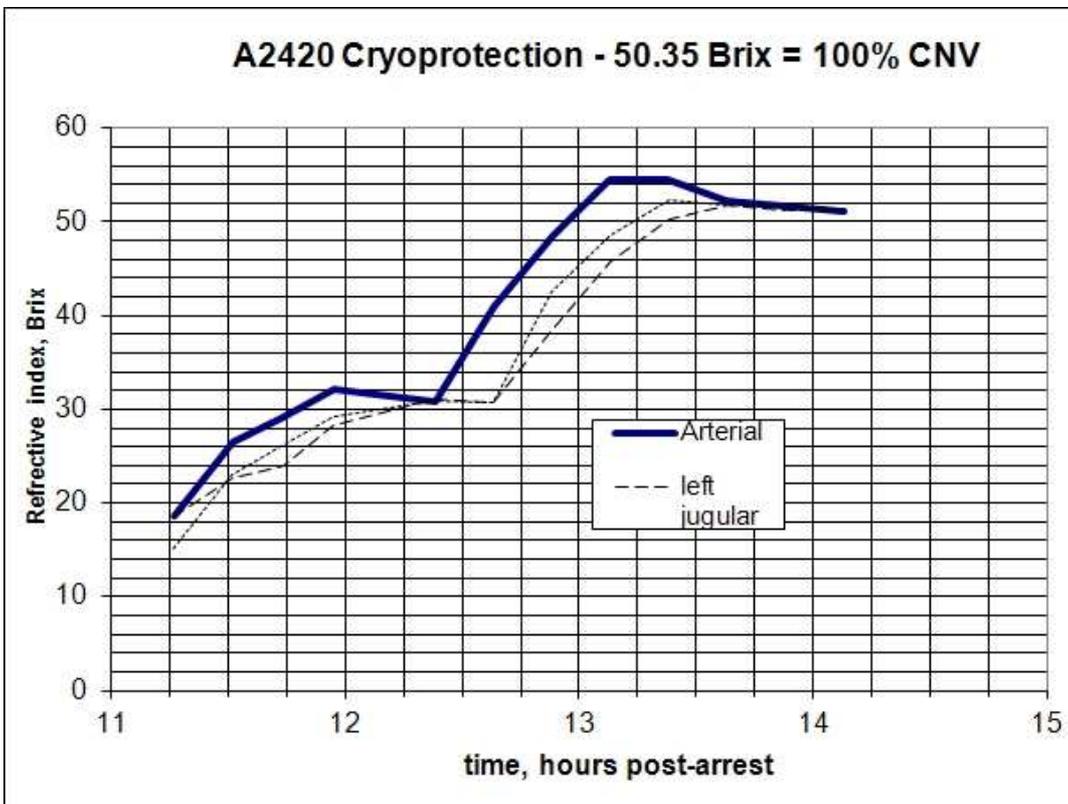
I-STAT EC8+	24MIN POST-PRONOUNCEMENT	33MIN POST-PRONOUNCEMENT	68MIN POST-PRONOUNCEMENT
Na mmol/L	Error returned ***	119	114
K mmol/L	Error returned ***	4.8	6.4
Cl mmol/L	Error returned ***	124	103
TCO2 mm/L	Error returned ***	<>	<>
BUN mg/dL	Error returned ***	108	85
Glu mg/dL	298	297	23
Hct %PCV	Error returned ***	28	11
pH	Error returned ***	<6.5	<6.5
PCO2 mmHg	Error returned ***	115.1	82.8
HCO3 mmol/L	Error returned ***	<>	<>
BEecf mmol/L	Error returned ***	<>	<>
AnGap mmol/L	Error returned ***	<>	<>
Hb* g/dL	Error returned ***	9.5	3.7

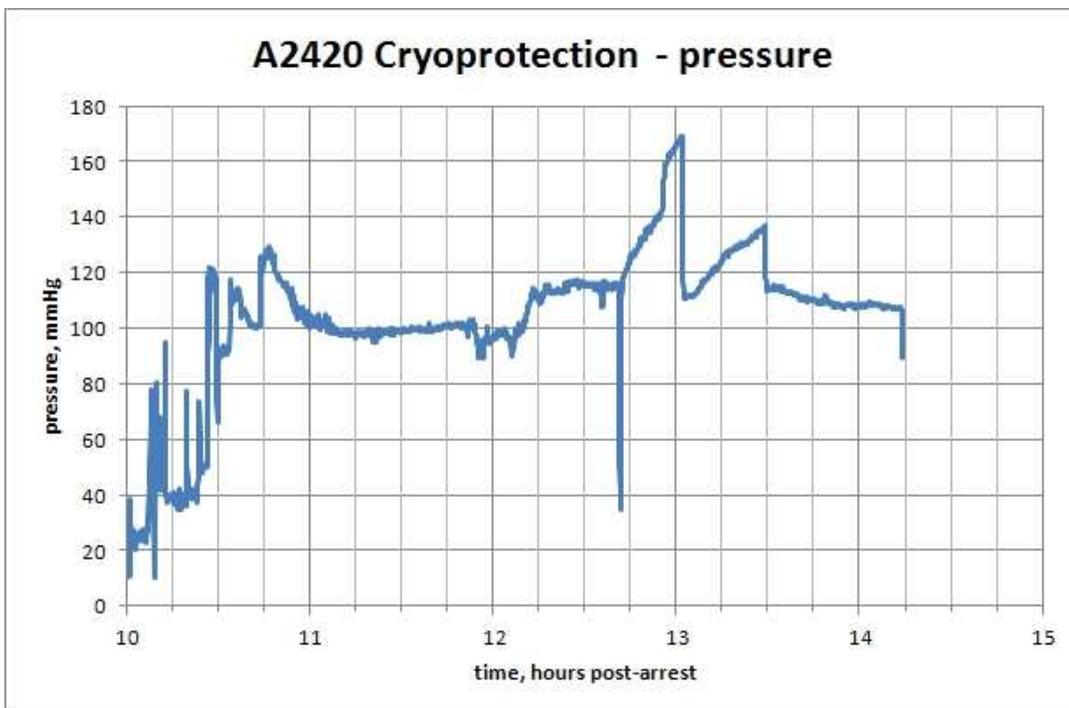
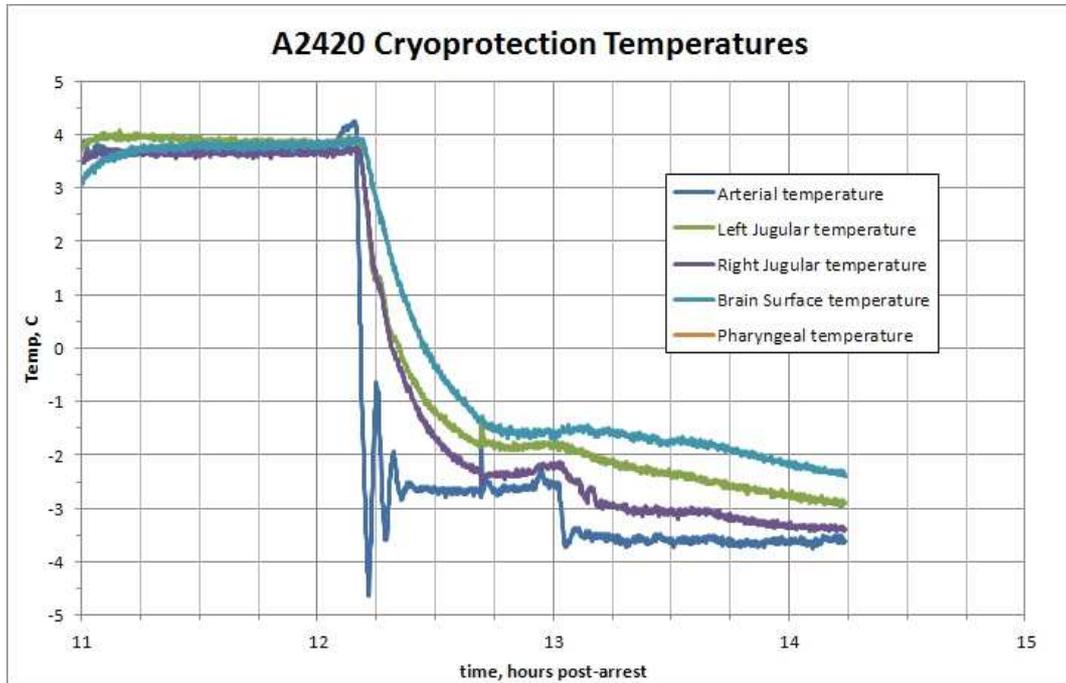
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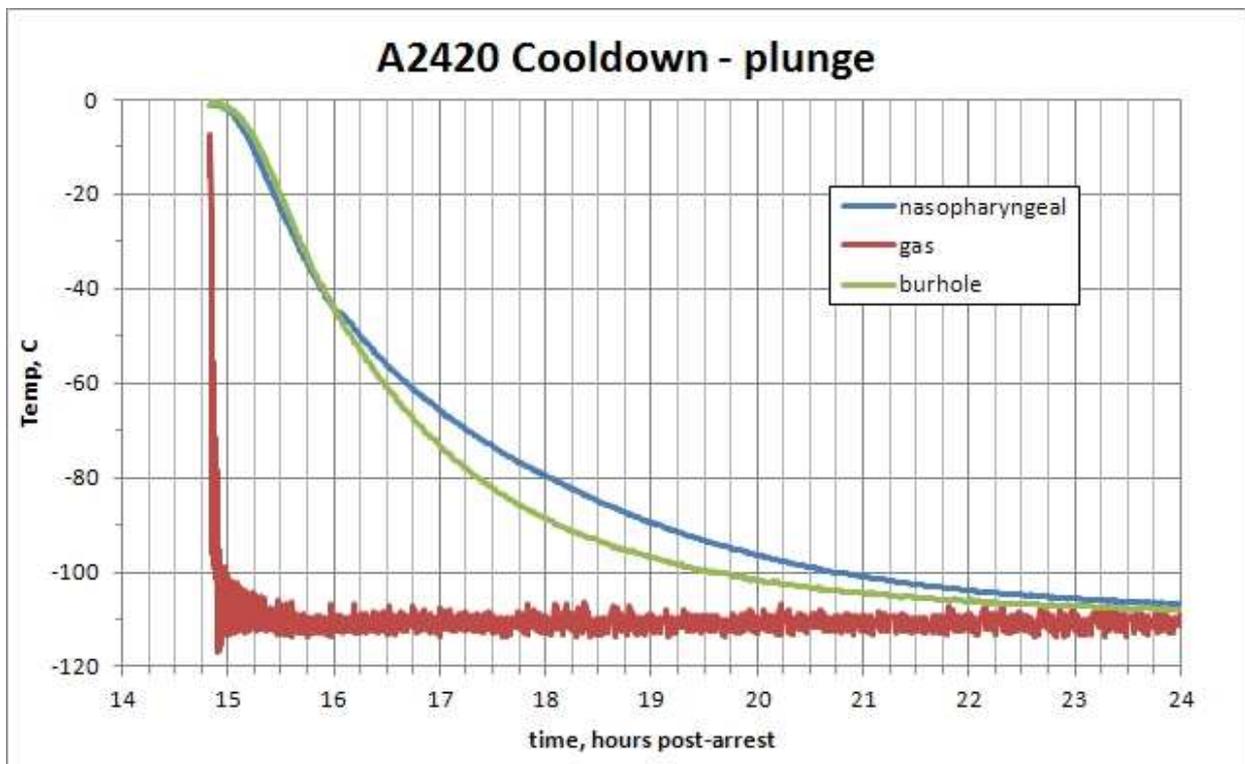
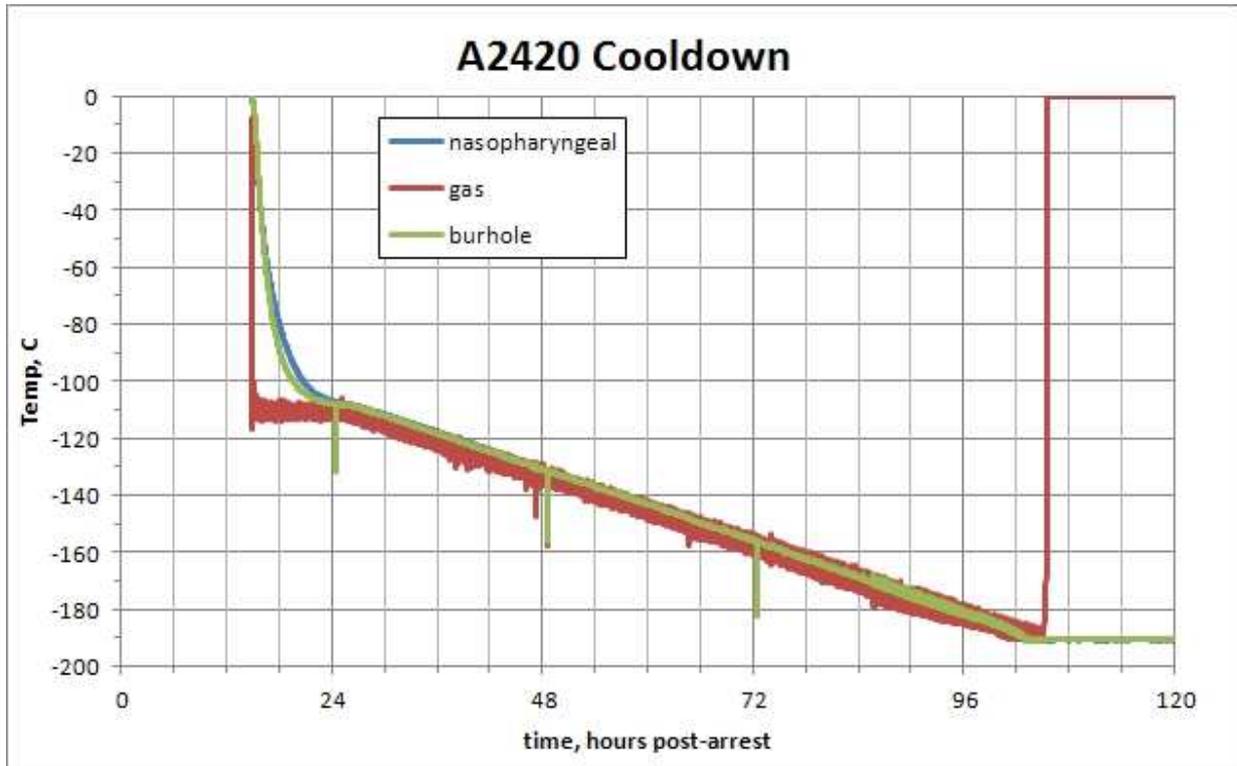
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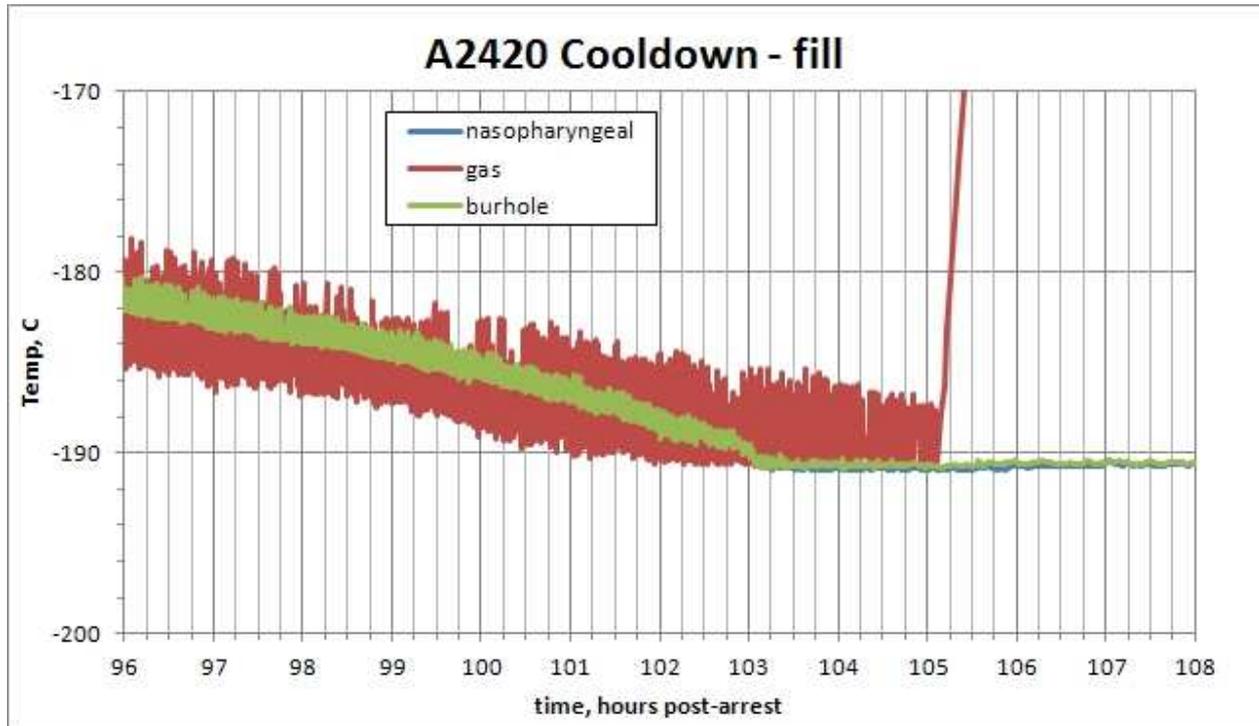


\*Note: Refractometers were not zeroed









**-END-**