Alcor A-3390

Case Report

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1. Summary

Information was derived from multiple sources and was all converted to Mountain Standard Time (MST). For de-identification, dates are not shown. T-0 represents the date of cardiac arrest, T-X represents occurrences before T-0, and T+X represents occurrences following T-0.

A-3390 was a 76-year-old member with neuro cryopreservation arrangements. The member had a history of renal cell carcinoma, current use of vasopressors, and recurrent pleural effusion (a condition that occurs when fluid builds up in the thin cavity between the layers of tissue lining the lungs and chest wall). The death certificate stated the cause of death as stage IV renal cell carcinoma. Cardiac arrest was observed at 14:10 hrs on T-0 days and the member was pronounced legally deceased in Arizona at 14:11 hrs on T-0 days in August of 2024.

After stabilization, the patient was driven to Alcor where cryoprotectant perfusion and cryogenic cooldown would be performed. The patient arrived at Alcor on T-0 days. The cryogenic cooldown was initiated on T-0 days at 21:33 hrs and terminated on T+4 days at 16:02 hrs. The patient was transferred to long-term care at liquid nitrogen temperature on T+12 days at 14:23 hrs.

2. Member Assessment

T-21 days

The member had been receiving chemotherapy every two weeks for renal cell carcinoma. Because the member was experiencing confusion and nausea with vomiting, the member went into the hospital. Blood tests showed the member's magnesium and sodium levels were critically low. The member was treated with electrolyte replacement and fluids.

Alcor's Medical Response Director (MRD) followed the member's hospitalization closely. A CT scan was negative, but a chest CTA showed metastasis of his renal cell carcinoma to the lungs. The member showed improvements in nausea and confusion, though occasional disorientation persisted. Lab results showed improvement in electrolytes, and the plan was to continue the current treatment until electrolytes stabilized enough for discharge, with a follow-up to be scheduled two weeks after discharge.

T-20 days

At 07:14 hrs, the MRD assured the family that Alcor was monitoring the situation. The MRD spoke with the member's nurse, and by the evening, the nurse reported the member was alert and oriented, and a thoracentesis (a procedure that removes fluid or air from the pleural space, which is the area between the lungs and the chest wall) was planned for the next day due to the diagnosis of pleural effusion. The member's vital signs remained stable, and the lab results showed slight improvements of electrolytes.

T-19 days

The MRD had called the nurse to check in on the member and found that they had not completed the thoracentesis on this day as planned, but the member remained stable. Thoracentesis was scheduled for the next day (the reasons why the procedure was rescheduled were unknown, but not related to the patient's status).

T-18 days

The thoracentesis was successfully completed at 10:43 hrs, removing 1,000 mL of fluid.

T-17 to T-15 days
Nothing of note was reported on these days. The member remained stable.

T-14/T-13 days

The member was cleared for discharge with placement in a skilled nursing facility (SNF). Despite the medical clearance, the member's transfer to the SNF was delayed pending insurance authorization.

T-12 days
It was confirmed that the member had been moved to a local skilled nursing facility.

T-11 days

The MRD attempted to reach the SNF but there was no nurse available. The MRD requested a call back. No call back was made, but the MRD stayed in communication with the member's family with assurance that the member's status remained stable.

T-10 days

The MRD called and spoke to a nurse. The nurse reported that the member was continuing to do well with stable vital signs and no discharge plans at that time.

T-9 days

The member remained stable. The MRD kept in close communication with family and the SNF.

T-8 days

The member's brother visited Alcor to ensure all necessary preparations, documentation, and directives were in place. The MRD stayed in communication with the member's nurse with reports of no changes.

T-7 days to T-2 days

The member remained stable. The MRD kept in close communication with family and the SNF.

3. Deployment

T-1 days

In the early hours, the MRD was informed that the member had become unresponsive and was being sent back to the hospital. The member was admitted but held in the ER (pending an open bed in the ICU) with a large pleural effusion. The member's blood pressure was unstable to the

extent that the use of norepinephrine (8mcg/min) to maintain a normal blood pressure was required. The member was on oxygen (4L/min by nasal cannula) with critical but stable vital signs (this is a term used to say that the member was stabilized but was still deemed critical because of the use of Norepinephrine or other life-sustaining medications and or treatments). With the history of renal cell carcinoma, the current use of vasopressors, and recurrent pleural effusion, the Alcor Deployment Committee decided to initiate a Level-2 standby at 07:35 hrs.

Sidebar:
The medical personnel on the Alcor Deployment Committee have established a list of medical indicators to assist in determining whether to call either a Level-1 standby, a high probability of death within seven days, or a Level-2 standby, a medium probability of death within seven days. The Deployment Committee voting members use these criteria when considering if a deployment is necessary.

Communication was maintained between Alcor, the medical team, and family members. Alcor made plans for an operating room (OR) perfusion. The OR was set up immediately in anticipation of the potentially rapid decline of the member. Throughout the day, various updates were provided on the member's condition, including another successful thoracentesis removing 1.7 liters of fluid, and ongoing discussions about transitioning to hospice care.

With this new information and assessment of the member, the Alcor Deployment Committee agreed to upgrade the deployment from a Level-2 to a Level-1 deployment at 13:40 hrs.

4. Standby

The Alcor Deployment and Recovery Team (DART), consisting of 2 team members, arrived at the hospital at 08:47 hrs, and received an update from the member’s primary nurse. The team then planned logistics regarding equipment staging, access into and out of the building, and the procedures to be used. The Arizona funeral director was informed of the situation.

The family had expressed wishes to remove care and let the member experience cardiac arrest naturally without intervention. The hospital ordered a hospice consult. The member was assessed by a hospice nurse, admitted to hospice care, and comfort care orders were placed as standing orders (standardized protocols that authorize healthcare providers to perform specific clinical tasks or administer treatments without the need for direct physician orders in every individual case) so that the RN could remove care when the family was ready without the direct supervision of the doctor. This was done at the request of the family, and the plan was to only remove care when the Alcor team was ready and in place.

The member would remain inpatient at the hospital since the anticipated cardiac arrest was within a 24-hour period after treatment was removed. The medical team and the family agreed a transfer to a hospice facility would be too risky considering the member’s wishes for cryopreservation. The member remained in the ER pending a bed in a private room.

The MRD arrived at the hospital at 16:00 hrs to assess the member and the situation, and to aid in the standby until a third DART member arrived from Florida. Upon the arrival of the MRD, it was noted that the norepinephrine being administered by the hospital had been increased to 30 mcg/min.

At 18:44 hrs, the norepinephrine was discontinued, and all other medications were stopped at the family's request to proceed with comfort care only. The member was left on 4L/min of oxygen via nasal cannula for comfort. The member was transferred to the medical/surgical unit to receive comfort care in a private room out of the ER.

The MRD was replaced by the DART member from Florida at 23:30 hrs.

T-0 days

At 07:45 hrs the member was heavily sedated with Ativan due to severe agitation. Morphine, for pain management, was also administered. The member was cyanotic around the lips and fingertips. The nurse made positioning adjustments to improve capillary oxygen saturation (SPO2). The member's condition deteriorated, with agonal breathing and skin mottling noted. Preparations were made for an imminent decline, and the team was on standby.

5. Patient Recovery, Stabilization, and Transport to Alcor

Cardiac arrest was observed at 14:10 hrs by the attending nurse, and at 14:11 hrs, the member was declared legally deceased. The DART team promptly began the stabilization process.

Manual chest compressions were initiated at 14:14 hrs. The patient was moved into the portable ice bath (PIB) at 14:17 hrs and surrounded with 120 lbs. of water ice. The surface conduction cooling device with facemask was not used because of a battery malfunction (see the Discussion section).

An intraosseous device was not used to access the patient's vasculature because hospital staff had earlier placed an I.V. in the patient's left antecubital vein in the inner elbow. The first stabilization medication (see the below Table of Medication Administration for the names of the medications, the dosages, and the times of administration) was administered at 14:21 hrs and mechanical chest compressions were initiated at 14:22 hrs.

A King airway was placed at 14:22 hrs and ventilation to improve external cooling was started at the same time, using a SAVe ventilator. Concurrently, a CO2 colorimeter detector was placed. The CO2 detector changes from purple to orange in the presence of CO2, affirming that the airway is in the lungs and not the esophagus.

Thermistors were placed in the patient's nares at 14:37 hrs. The initial temperature readings were 26.7°C for the right nasopharyngeal temperature (RNPT) on port-1 of the datalogger, and 32.2°C for the left nasopharyngeal temperature (LNPT) on port-2 of the datalogger.

The member departed the hospital at 14:56 hrs and was transported to Alcor for surgery and cryoprotectant perfusion.

6. Cryoprotectant Surgery and Perfusion at Alcor

As part of the setup of the OR circuit, at 15:30 hrs, 25,000 IU Streptokinase was added to the mixing reservoir to break up blood clots when perfusion is initiated.

At 15:43 hrs the patient arrived at the back door to Alcor. The patient, who was still in the portable ice bath (PIB) was moved into the OR, with the Amoul mechanical chest compression device still running at 15:44 hrs. The initial nasopharyngeal temperatures (NPT) from data logger #9 were (RNPT = 17.6 °C, LNPT = 22.8°C).

While still in the PIB, a Styrofoam block was placed under patient's shoulders at 15:51 hrs to raise the cephalon out of the ice for cannulation. Bags of cubed ice were placed on the patient's torso and around the head at 15:52 hrs. A burr hole was started at 15:54 hrs using a Codman perforator while saline was poured over the perforator to cool it and the patient's skull. The burr hole was completed at 15:56 hrs, and a thermocouple was placed in the burr hole to measure burr hole temperature (BT) at 15:59 hrs and sutured to forehead. The patient temperatures were: T-3/Burr hole = 21.4°C, T-1/LNPT= 24.9°C, T-2/RNPT = not connected.

The Amoul chest compression device was turned off at 15:57 hrs in order to start surgery. At 16:08 hrs the first cut was made for the carotid isolation and cephalic isolation procedures. At 16:16 hrs baseline refractive index (RI) measurements were made: R RI = 0.13 Brix and L RI = 0.53 Brix. The arterial pressure was 10 mmHg.

At 16:15 hrs the surgeons were still removing a lot of adipose tissue to isolate the vessels. The left carotid artery was identified and isolated at 16:16 hrs. The right carotid artery was identified and isolated at 16:22 hrs. Using a surgical blade, the cephalic isolation was started at 16:23 hrs. Using the spinal separation device, the cephalic isolation was completed at 16:30 hrs. The cephalon weighed 5.61 kg at 16:31 hrs, prior to cryoprotectant perfusion. The patient was placed in the cephalic halo in cephalic cooling enclosure at 16:32 hrs.

The right carotid artery was cannulated at 16:35 hrs with a red Robinson cannula. The left carotid artery was cannulated at 16:37 hrs with a red Robinson cannula. Perfusion flow with B1 carrier solution was opened to the carotid arteries at 16:39 hrs. The arterial pressure was increased to 40 mmHg.

The perfusion circuit was placed on computer control at 16:41 hrs, but there was no flow to the patient. The tubing circuit was checked and adjusted. Flow started but was extremely slow at about 64 ml/min which is only about 25% of normal. Efforts continued to isolate the problem, and the cause was finally determined to be due to blood clots in the effluent coming from the patient. To overcome the slow flow rate, a steep ramp to approximately 30 Brix in 15 minutes, to open the vessels, was initiated. This was successful. The arterial pressure was increased to 90 mmHg at 16:45 hrs.

The left vertebral artery was canulated at 16:49 hrs with a straight, 10 gauge vertebral cannula, and secured with sutures. The right vertebral artery was canulated at 16:59 hrs with a straight, 10 gauge vertebral cannula, secured with sutures. The circuit was placed in recirculation mode at 17:09 hrs, but not yet on computer control.

The right jugular vein was cannulated with a standard size venous cannula at 17:02 hrs. The left jugular vein could not be found (the surgeon said this would not affect the flow).

The lid was placed on the cephalic enclosure at 17:14 hrs. An effluent sample was taken from the right jugular vein to measure the RI of the effluent. The initial RI was 9.96 Brix.

The cryoprotectant ramp was started with nM22 perfusate at 17:18 hrs. Large blood clots were observed in the jugular effluent at 17:34 hrs, but the flow rate was still significantly improved. The volume of the main reservoir was lowered at 17:40 hrs from 1.5 liters to 1 liter. Facial tanning from contact with the nM22 perfusate was becoming noticeable at 18:03 hrs, but it was not yet uniform. The eyes had not collapsed yet from contact with the nM22. These are both normal results of contact with the perfusate. By 18:19 hrs, the facial tanning was increasing and becoming more uniform on the head and face, and the right eye showed slight retraction.

The 30-minute pause for equilibration was started at 18:39 hrs. The cephalic enclosure temperature was lowered to -3°C. The 30-minute pause was terminated at 19:09 hrs. The main pump was started at 68ml/min, not full speed, in order not to overflow the reservoir.

Sidebar:
Per the cryoprotection protocol, the ramp is to be paused at 30 Brix (approximately 50% of the desired terminal concentration of 52.5 Brix) to allow the patient to come to osmotic equilibrium. At the end of the 30-minute pause, the ramp is resumed at the maximum addition rate (maximum without losing total volume in the circuit) to go to 105% of the desired end concentration (49.9 Brix x 105% = 52.5 Brix) and held between 102% and 105% concentration until the terminal concentration is obtained.

The left eye was starting to collapse at 19:43 hrs. At 20:09 hrs, both eyes were collapsing, and skin tanning was uniform.

At 20:51 hrs, the venous RI was 49.9 Brix, and the arterial RI was 53.25 Brix. The 30-minute countdown to the end of perfusion was started. At 21:20 hrs the venous RI was 51.56 Brix, and the arterial RI was 53.16 Brix. The ramp was terminated.

Sidebar:
Per the cryoprotection protocol, a 30-minute countdown to the termination of cryoprotection is initiated, after which the final sub-zero terminal concentration ramp is resumed. The normal endpoint criterion for whole body patients is over 100% for over 30 minutes from the venous return and for neuro patients, it is over 100% target cryoprotectant concentration for over 30 minutes from both jugular veins. The addition pump speed is minimized, with frequent corrections, to compensate for latency.

The cephalon was weighed post-perfusion at 21:25 hrs. It weighed 4.89 kg (5.61 – 4.89 = 0.72 kg loss = 12.8% loss). Lines and equipment were removed from the cephalon, and the patient was moved into Patient Care Bay at 21:27 hrs for cryogenic cooldown.

7. Cooling to Liquid Nitrogen Temperature

Computer-controlled cryogenic cooldown was initiated at 21:33 hrs on T-0 days, plunging to -110°C and descending thereafter at -1°C/hour to liquid nitrogen temperature. On T+4 days at 16:02 hrs, an uneventful cooldown was terminated. On T+12 days at 14:23 hrs the patient was transferred to long-term care at liquid nitrogen temperature.

8. Timeline and Time Summaries

Timeline

T-0	14:10	Time of cardiac arrest
T-0	14:11	Time of legal pronouncement
T-0	14:14	Start of mechanical chest compressions
T-0	14:17	Start of ice bath cooling
T-0	14:21	Administered first medication (propofol)
T-0	14:22	Place airway and start ventilation
T-0	14:47	Administered last medication (Decaglycerol-THAM)
T-0	14:56	Start transport of patient to Alcor
T-0	15:44	Arrival of patient at Alcor OR (RNPT 17.6°C, LNPT 22.8°C)
T-0	15:57	Termination of cardiopulmonary support
T-0	16:08	Start surgery (cannulation and cephalic isolation)
T-0	17:06	Surgery completed
T-0	17:18	Start of cryoprotectant perfusion ramp
T-0	18:39	Start 30-min pause for equilibration
T-0	19:09	End 30-min pause
T-0	20:51	Start 30-min countdown to terminate ramp
T-0	21:20	Termination of cryoprotectant ramp
T-0	21:33	Start cryogenic cooldown
T+4	16:02	Terminate cryogenic cooldown
T+12	14:23	Transfer patient to long-term care at LN2

Time Summaries

Event Duration hr:min		days	time	
00:01	From: Till:	T-0 T-0	14:10 14:11	Time of cardiac arrest Time of legal pronouncement
00:07	From: Till:	T-0 T-0	14:10 14:17	Time of cardiac arrest Start of ice bath cooling
00:04	From: Till:	T-0 T-0	14:10 14:14	Time of cardiac arrest Start of mechanical chest compressions
00:11	From: Till:	T-0 T-0	14:10 14:21	Time of cardiac arrest Administered first medication (propofol)
00:26	From: Till:	T-0 T-0	14:21 14:47	Administered first medication (propofol) Administered last medication (Decaglycerol-THAM)
01:34	From: Till:	T-0 T-0	14:10 15:44	Time of cardiac arrest Arrival of patient at Alcor OR (RNPT 17.6°C, LNPT 22.8°C)
01:58	From: Till:	T-0 T-0	14:10 16:08	Time of cardiac arrest Start surgery (cannulation and cephalic isolation)
00:24	From: Till:	T-0 T-0	15:44 16:08	Arrival of patient at Alcor OR (RNPT 17.6°C, LNPT 22.8°C) Start surgery (cannulation and cephalic isolation)
00:58	From: Till:	T-0 T-0	16:08 17:06	Start surgery (cannulation and cephalic isolation) Surgery completed
01:10	From: Till:	T-0 T-0	16:08 17:18	Start surgery (cannulation and cephalic isolation) Start of cryoprotectant perfusion ramp
05:12	From: Till:	T-0 T-0	16:08 21:20	Start surgery (cannulation and cephalic isolation) Termination of cryoprotectant ramp
04:02	From: Till:	T-0 T-0	17:18 21:20	Start of cryoprotectant perfusion ramp Termination of cryoprotectant ramp
00:13	From: Till:	T-0 T-0	21:20 21:33	Termination of cryoprotectant ramp Start cryogenic cooldown
07:23	From: Till:	T-0 T-0	14:10 21:33	Time of cardiac arrest Start cryogenic cooldown
05:49	From: Till:	T-0 T-0	15:44 21:33	Arrival of patient at Alcor OR (RNPT 17.6°C, LNPT 22.8°C) Start cryogenic cooldown

9. Table of Medications Administered

T-0 days

TIME	MEDICATION	DOSE	PURPOSE
14:21 hrs	Propofol	200 mg	Anesthetic; reduces cerebral metabolic demand; reduces the theoretic possibility of increased awareness during aggressive CPS.
14:23 hrs	Antacid	250 ml Note 6	A buffer used to neutralize stomach acid.
14:40 hrs	Sodium citrate	20 g Note 1	Anticoagulant; prevents blood clot formation.
14:41 hrs	Heparin	50,000 IU	Anticoagulant; prevents blood clot formation.
14:41 hrs	Vasopressin (1st dose)	40 IU Note 2	Vasopressor; increases blood pressure during CPS.
14:42 hrs	Minocycline	200 mg	Antibiotic and neuroprotectant
14:43 hrs	SMT (S-methyl-isothiourea)	400 mg Note 3	Neuroprotectant (iNOS inhibitor); protects the brain from ischemic injury; raises blood pressure.
14:44 hrs	Decaglycerol/THAM (1st dose)	200 ml Note 4	Decaglycerol inhibits cerebral edema.
14:44 hrs	Vasopressin (2nd dose)	40 IU Note 2	Vasopressor; increases blood pressure during CPS.
14:45 hrs	Vital Oxy (w/ saline)	40 mL Note 5	Antioxidants: melatonin, vitamin E (D-alpha tocopherol), PBN (alpha Phenyl t-Butyl Nitrone) and anti-inflammatory carprofen.
14:47 hrs	Decaglycerol/THAM (2nd dose)	200 ml Note 4	Decaglycerol inhibits cerebral edema.
15:30 hrs	Streptokinase	250,000 IU Note 6	A thrombolytic used to break up existing blood clots.

Notes:

1. The standard formulation for sodium citrate is 20% w/v, in sterile packaging provided by the manufacturer. 10 grams of sodium citrate are given to patients who weigh less than 40 kg, and 20 grams are given to patients who weigh over 40 kg. This patient weighed 104 kg and therefore received 20 grams of sodium citrate.

2. Vasopressin is a fixed dosage of 40 IU, per dose for two doses. The second 40 IU dose is to be administered concurrently with Vital-Oxy, I.V. Vasopressin is to be administered only if the patient's temperature is above 20°C as it is ineffective at cold temperatures.

3. SMT (S-methyl isothiourea) is a powder, (1 vial = 400 mg) dissolved in 10 mL of saline and injected through a 0.2 µ filter. SMT is unstable in solution with a use life of approximately six hours.

4. Decaglycerol/THAM is administered as a custom formulation of 20% w/v decaglycerol and 4.5% w/v THAM (tromethamine) in water (pH = 10.4 and pKa = 8.3). It is a fixed dose of 400 ml to be given in two separate doses.

5. The medications protocol dilutes 70 mL or less, based on body weight, of Vital-Oxy into 150 mL of saline for a total of 220 cc of diluted Vital-Oxy saline. Each mL of Vital-Oxy contains 194 mg Sigma Cremophor EL (or Sigma Kolliphor EL), 155 mg ethanol, 19.4 mg PBN, 3.24 mg carprofen, 1.55 mg melatonin, and 198 IU vitamin E.

6. The standard administration of streptokinase is 250,000 IU fixed dose, dissolved in 5 mL of 9% sodium chloride, to be added to the blood washout solution prior to remote blood washout, or to the first cryoprotection flush in the OR. The dosage is reduced to 25,000 IU in field neuro (FCP) cases and added to the first bladder). This medication previously needed to be infused through a 0.2 µ filter. The medication now in use is already sterile-filtered and can be reconstituted in the vial.

10. Discussion

Stabilization

The digital audio recorder did not turn on to record the stabilization process. This was the result of lack of familiarity with the device. The recorder on/off button needs to be pressed for at least 10 seconds for those functions to be used. The DART team will be re-trained in the use of this equipment.

The surface conduction cooling device (SCCD) did not function. It is assumed that it was due to battery failure after sitting in the hot mobile response vehicle (MRV) during standby. The DART team had brought the equipment inside the hospital, plugged the devices in, and tested them the day prior to stabilization, but placed them back in the MRV until the member began to decline. In the future, battery operated equipment will not be left in the MRV in hot weather.

Some medications leaked in the bag in which they were stored after being drawn up for use. DART members will be reminded to make sure that all syringes are tightened before traveling or transporting them.

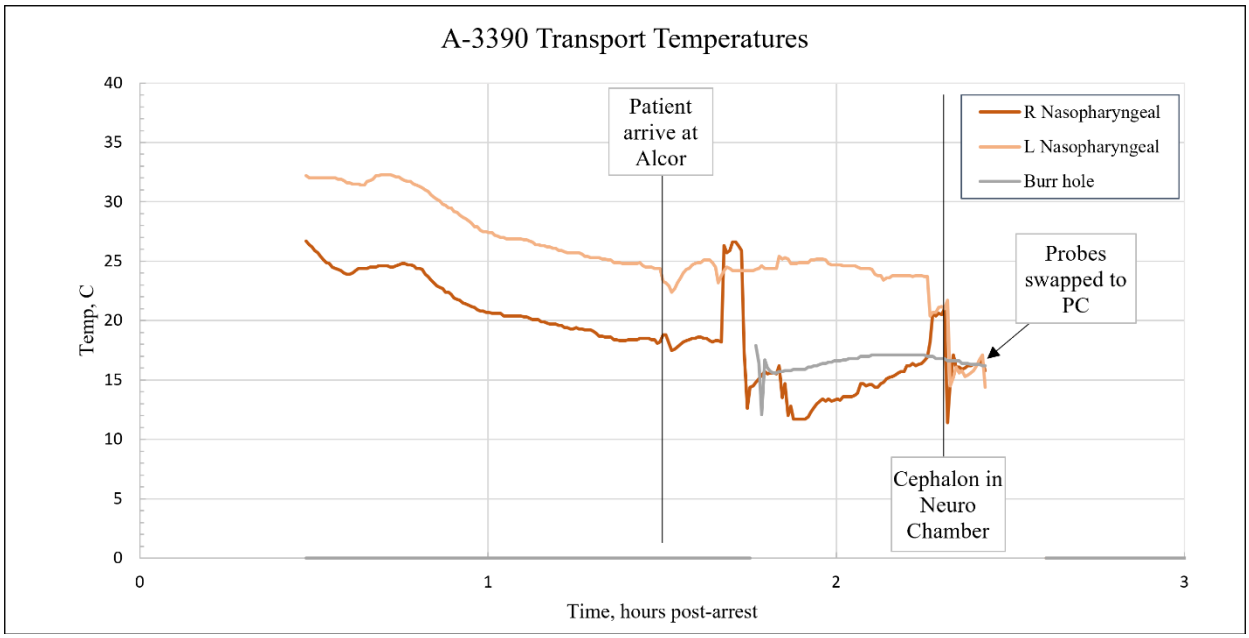
There was good communication between all parties on this case, which resulted in improved outcomes. Teamwork and open communication will continue to be fostered.

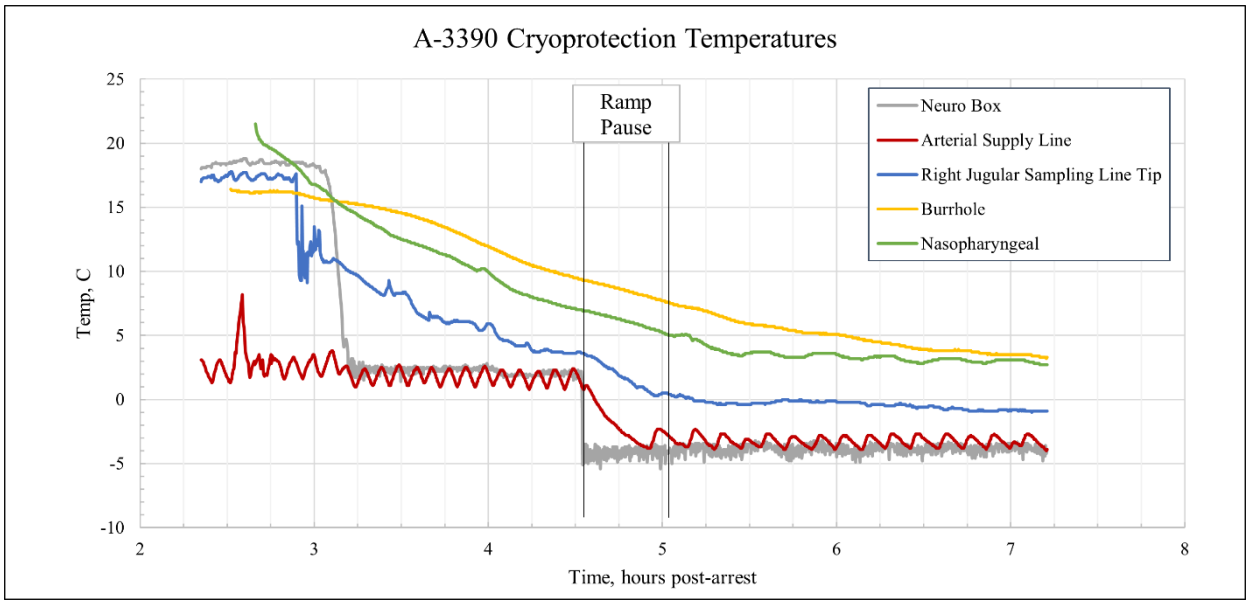
The family and the hospital were well prepared because the family was proactive. Members will continue to be encouraged to engage their family to support their wishes to be cryopreserved by Alcor.

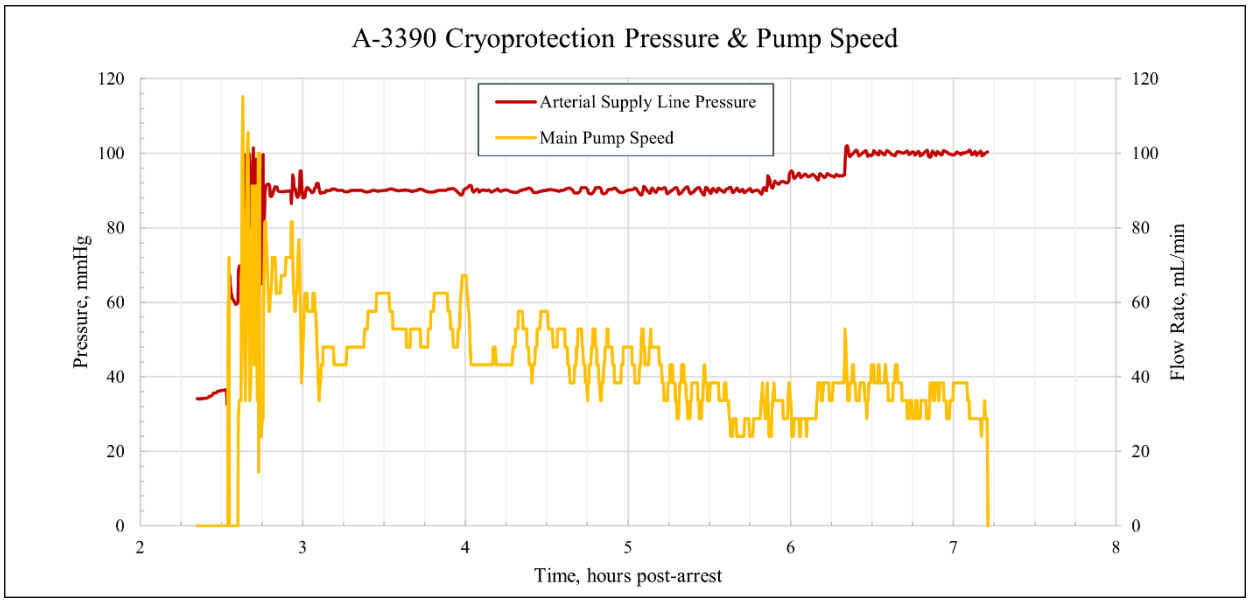
Cryoprotectant Perfusion

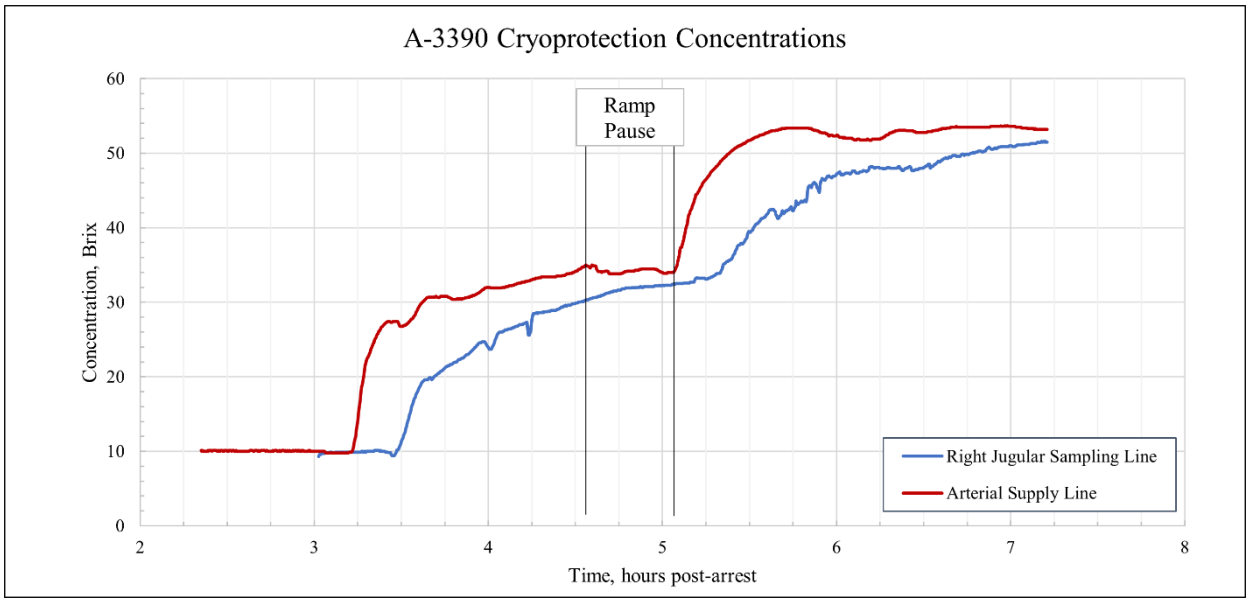
The OR team observed significantly lower flow rates than expected in a case with such a short ischemic time. Despite this, visual indicators of perfusion were observed uniformly about the cephalon, and a significant amount of water was extracted by the perfusate. Several hours into the perfusion, the team increased the arterial supply line pressure to 100mmHg, intending to increase flow rates during the latter portion of the procedure. This was only marginally successful, as seen on the Pressure & Pump Speed graph. The cryoprotection was uneventful and the team did not have to handle any emergent situations.

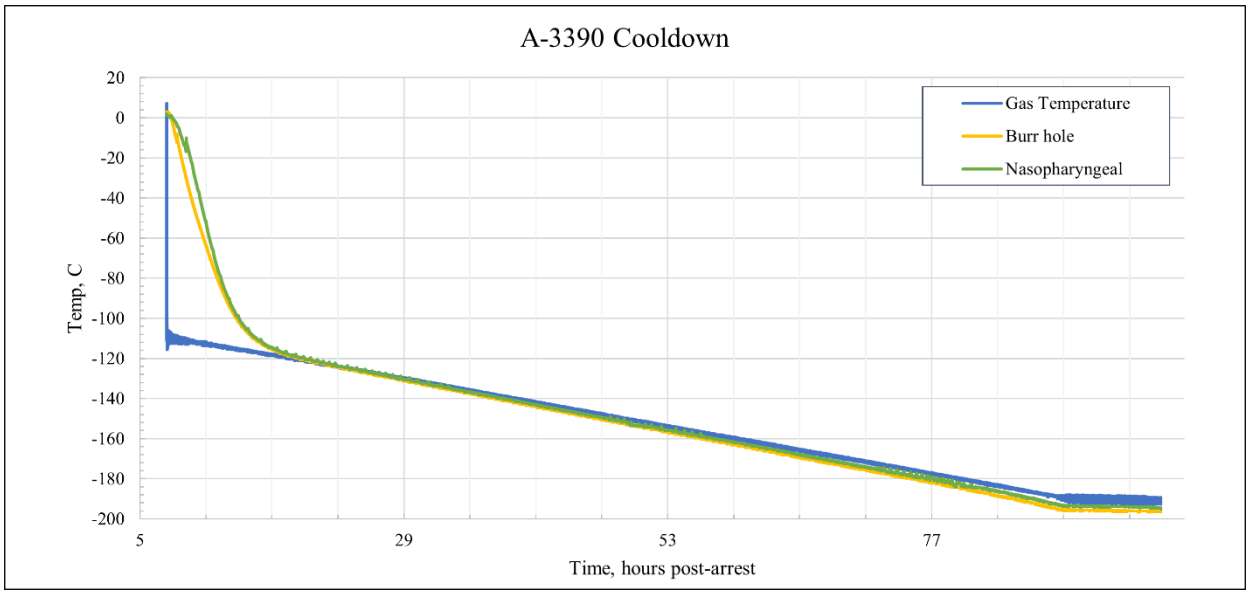
11. Cryoprotection and Temperature Graphs

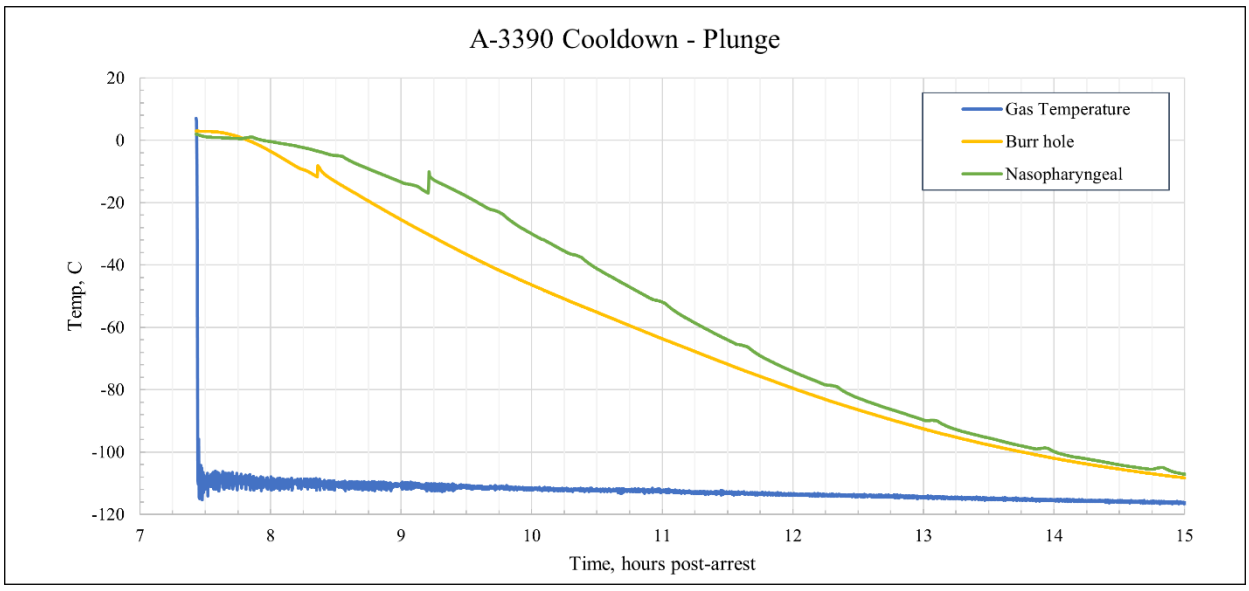





A-3390 Cryoprotection Pressure & Pump Speed
Arterial Supply Line Pressure
Main Pump Speed
Pressure, mmHg
Flow Rate, mL/min
Time, hours post-arrest
0
20
40
60
80
100
120
2
3
4
5
6
7
8


A-3390 Cryoprotection Concentrations
Ramp
Pause
Right Jugular Sampling Line
Arterial Supply Line
Concentration, Brix
Time, hours post-arrest
0
10
20
30
40
50
60
2
3
4
5
6
7
8


A-3390 Cooldown
Gas Temperature
Burr hole
Nasopharyngeal
Temp, C
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
5
29
53
77
Time, hours post-arrest

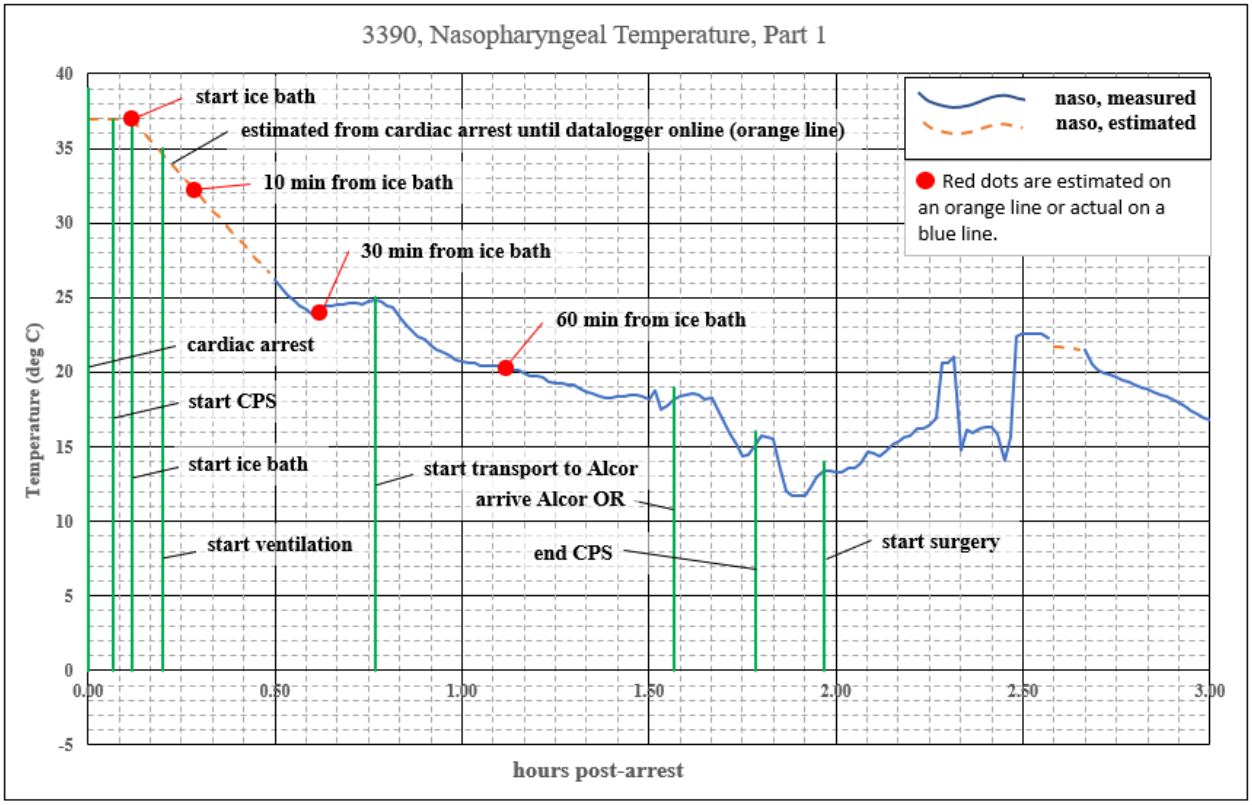

A-3390 Cooldown - Plunge
Gas Temperature
Burr hole
Nasopharyngeal
Temp, C
20
0
-20
-40
-60
-80
-100
-120
7
8
9
10
11
12
13
14
15
Time, hours post-arrest

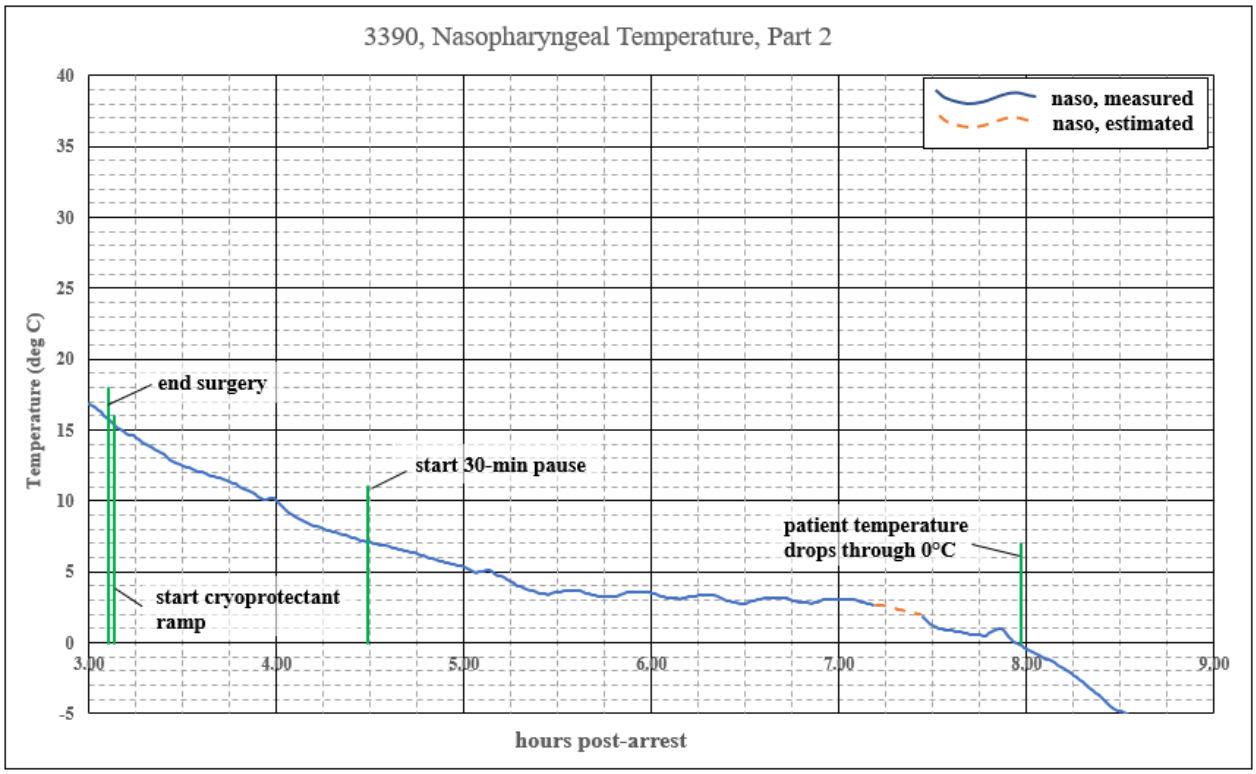
12. S-MIX

The Standardized Measure of Ischemic Exposure (S-MIX) expresses the total ischemic exposure prior to the start of cryogenic cooling as the equivalent duration of normothermic ischemia. An S-MIX of 00:00 (hh:mm) is the ideal case of no ischemic damage. The higher the S-MIX time, the more damage. Factors that improve the S-MIX, and that are quantitatively accounted for in the below table are: shorter times at higher temperatures, ventilation during cardiopulmonary support (CPS), and oxygenation during blood washout. The duration from cardiac arrest to 0°C is 07:58. As shown below, and due to lowering of the body temperature, S-MIX duration is shorter, at 01:25.

event	segment #	days (T+X)	time (MST) duration	post-arrest	Tnaso (deg C)	CPS w/ ventil.	washout oxygen.	S-MIX (hh:mm)
Time of cardiac arrest		T-0	14:10	00:00	37.0			
	seg 1		00:04	00:04	0.0	no	no	00:04
Start of mechanical chest compressions		T-0	14:14	00:04	37.0			
	seg 2		00:03	00:03	0.0	no	no	00:03
Start of ice bath cooling		T-0	14:17	00:07	37.0			
	seg 3		00:05	00:05	-2.4	no	no	00:05
Place airway and start ventilation		T-0	14:22	00:12	34.6			
	seg 4		00:34	00:34	-9.8	yes	no	00:09
Start transport of patient to Alcor		T-0	14:56	00:46	24.8			
	seg 5		00:48	00:48	-6.6	yes	no	00:08
Arrival of patient at Alcor OR		T-0	15:44	01:34	18.2			
	seg 6		00:13	00:13	-3.1	yes	no	00:02
Termination of cardiopulmonary support		T-0	15:57	01:47	15.1			
	seg 7		00:11	00:11	-1.7	no	no	00:02
Start surgery (cannulation & cephalic isolation)		T-0	16:08	01:58	13.4			
	seg 8		01:08	01:08	2.4	no	no	00:18
Surgery complete		T-0	17:16	03:06	15.8			
	seg 9		00:02	00:02	-0.4	no	no	00:00
Start cryoprotectant perfusion ramp		T-0	17:18	03:08	15.4			
	seg 10		01:21	01:21	-8.3	no	no	00:13
Start 30-min pause for equilibration		T-0	18:39	04:29	7.1			
	seg 11		03:29	03:29	-7.3	no	no	00:20
Patient temperature thru 0°C		T-0	22:08	07:58	-0.2			
totals:			07:58	07:58	-37.2			01:25

The below plots show events related to the S-MIX calculation. The red dots can be used to construct a metric for how fast the patient is initially cooled (see the Patient Cooling Rate table below). This is a critical period since body temperature is highest and ischemic damage most rapid.

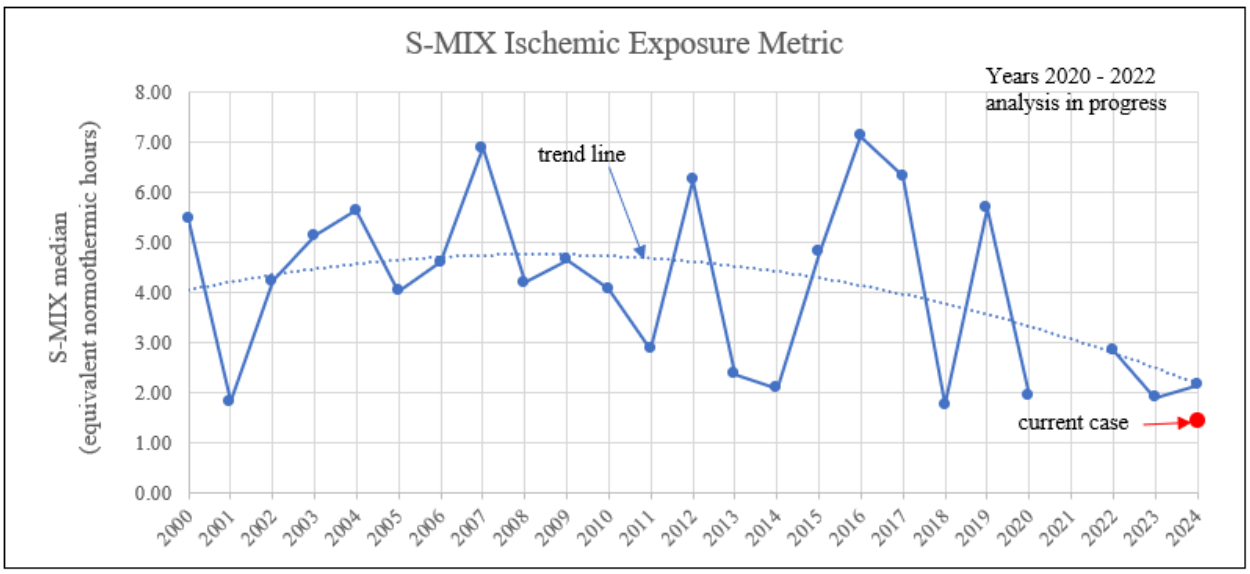




The below table provides cooling data for 10, 30, and 60 minutes after the team first applies water ice.

Patient Cooling Rate			(patient weight 229 kg; xxx lb)	
Note: time = 0 at start of ice bath	0 min elapsed	10 min elapsed	30 min elapsed	60 min elapsed
Naso temperature (°C)	37.0	32.3	24.0	20.3
Temperature drop (°C) from t = 0	0.0	-4.7	-13.0	-16.7
Cooling rate (°C/min) from t = 0	N/A	-0.47	-0.43	-0.28

The following plot shows the trend of S-MIX achieved since 2000.



13. CT Scans

Cryoprotectant Distribution (Post-cryopreservation CT scan)

When the in-house scanner is functional and whole-body patients are being scanned, additional information will be added to this report.