Alcor A-2672

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-2672 was an 89-year-old member with whole-body cryopreservation arrangements that became a neuro-on-whole-body procedure. The member had surgery for a bowel obstruction and was not recovering well. The death certificate stated the cause of death as cardiac arrest subsequent to constipation, small bowl obstruction, and ischemic bowel disease.

Cardiac arrest was observed at 17:15 hrs on T-0 days and the member was pronounced legally deceased in California at 17:22 hrs on T-0 days in January of 2024.

After stabilization and field cryoprotectant perfusion (FCP), the patient was driven to Alcor for cryogenic cooldown. The patient arrived at Alcor on T+1 days. The cryogenic cooldown was initiated on T+2 days at 12:37hrs and terminated on T+7 days at 009:54 hrs. The patient was transferred to long-term care at liquid nitrogen temperature on T+7 days at 10:09 hrs.

2. Patient Assessment

T-1 days

Alcor was notified by the family that this member had undergone major surgery for a small bowel obstruction, and was not recovering well (this was the first notification of the member's condition; the family was not communicative). The surgeons had left the abdomen open and the member on ventilator. The member was at that time decompensating. The member was being given the maximum dose of levophed and vasopressin, both vasoconstrictors.

The member's vital signs were: blood pressure (BP) 65/50, heart rate (HR) 85, capillary oxygen saturation SpO_2 98%, respiratory rate (RR) 20. on assist control respiratory rate 20, title volume 450, peep of 5 on 100% FiO2, ABG showed pH 7.23, PaO_2 78%. Additionally, the member was receiving 10mg of propofol for sedation, was on a ventilator, and had minimal urine output.

3. Deployment

The Alcor Deployment Committee called a Level-1 deployment at 10:46 hrs, sending three members of the California based Suspended Animation (SA) team to respond immediately. The SA perfusionist and surgeons were also deployed. The Alcor Deployment and Recovery Team (DART) was also deployed with the Alcor Medical Response Vehicle (MSV) to facilitate the return transport of the patient. The estimated time of arrival of the DART team was 06:00 hrs the next day. Additionally, a California funeral director was notified to assist with the death certificate and transit paperwork.

At 11:15 hrs the SA team lead began loading the stabilization equipment into their Mobile Operating Vehicle (MOV) together with 280 lbs. of water ice. At 11:45 hrs the MOV was on its way to the member's location.

The SA team arrived at the California hospital at 12:47 hrs. The member's vital signs were: BP 80/52, HR 89. Medications being given were: levophed .5mcg/kg/min, Neo-synephrine 75 ml/hr., and a maximum dose of vasopressin .04mcg/kg/min. Note: studies concluded that by receiving three or more vasopressors at full dose, 30-day mortality reached 92.3 %. The propofol was discontinued at 21:00 hrs. Alcor documentation had been put on file with the nursing station. At this time the SA team was informed that the earliest possible arrival time on location for the surgeon and perfusionist would be 23:30 hrs the next day.

4. Standby

T-0 days

The nurse manager and attending physician would allow all stabilization procedures to be done in the member's room prior to extrication, and they allowed the staging of the Portable Ice Bath (PIB) just outside the members' room. The staff indicated that the family was looking at removal of care once the team was set up.

At 02:00 hrs all equipment was in place, including 180 lbs. of water ice at the member's bedside. The hospital staff was dealing with the member's family on code status. The SA team finished drawing up the medications protocol per the member's weight at 67.6 kg at 02:53 hrs. The MOV was relocated to the hospital loading bay in preparation for transport. The SA team then returned to the ICU to maintain proximity to the member's room to await cardiac arrest.

One of the member's family requested a Do Not Resuscitate (DNR) status for the member at 02:41 hrs. At 0:305 hrs a different family member called and revoked that decision, making the member a full code, to be resuscitated.

The member's vital signs at 04:13 hrs were: blood pressure (BP) 61/43, heart rate (HR) 99, capillary oxygen saturation (SpO_2) 49%. At 06:10 hrs the SpO_2 had fallen to 29%. At 06:51 hrs the vital signs were: BP 49/36, HR 61, and the SpO_2 was too low to register.

Due to thinking the surgeon and perfusionist would not arrive in time to provide a whole-body blood substitution, SA canceled their flights without consultation with Alcor or the MRD. Upon learning of this action, Alcor's MRD asked SA to re-deploy the full team to attempt a field blood washout, which is what the protocol and the SA contract state. After speaking with the family, who still wanted to provide full care for the member, SA and the MRD looked at flights for the surgeon and perfusionist to deploy. Unfortunately, no flights were available to get them there in a timely manner since their original flights had been canceled.

At 08:02 hrs the member was receiving 4 vasopressors: epinephrine at .5mcg/kg/min, neo-synephrine at 200mcg/min, norepinephrine at .5 mcg/kg/min. and vasopressin at .04 units/ min. A repeated arterial blood gas analysis (ABG) showed pH 7.23, PC02 38, PO2 143, HC03 15.9. At 09:03 hrs the member's family made the decision to change the member's status back to DNR.

There was a discussion between Alcor staff members and the teams onsite regarding how to maximize this patient's cryoprotectant perfusion (see the Discussion section). After discussion, it was decided that the best chance for effective cryopreservation for this member would be a neuro-on-whole-body, field cryoprotectant perfusion (FCP) procedure, with carotid artery cannulation, would be used. The nM22 vitrification solution was shipped from Alcor via airline cargo at 15:00 hrs, arriving to cargo in California at 19:39 hrs.

At 15:56 hrs, the member's family made the decision to change the member to comfort care only. At 16:24 hrs, the DART team secured 500 lbs. of dry ice. At 16:40 hrs the member was transitioned to comfort care. At 17:12 hrs the member's pulse dropped of the monitor. The nursing staff was notified, and the attending physician was called to check for lung sounds and make the pronouncement. The member experienced a witnessed cardiac arrest at 17:15 hrs and was pronounced legally deceased by hospital personnel at 17:22 hrs.

At 15:56 hrs, the member's family made the decision to change the member to comfort care only. Per the request of the member's wife, the vasopressors and all other medications were stopped, but the ventilator remained in place and running. At 16:24 hrs, the DART team secured 500 lbs. of dry ice. At 16:40 hrs the member was transitioned to comfort care. At 17:12 hrs no pulse could be seen on the monitor. The nursing staff was notified, and the attending physician was called to check for lung sounds and make the pronouncement. The member experienced a witnessed cardiac arrest at 17:15 hrs and was pronounced legally deceased by hospital personnel at 17:22 hrs.

5. Patient Recovery and Stabilization

As there were three team members assisting in the initial stabilization, many tasks were performed concurrently. Even though quick intervention by the team had been strongly conveyed to the family previously, the family lingered for a short period after the patient was pronounced. The stabilization team moved the PIB into the room and found that all the lines, leads, and tubes used for supportive care were still attached to the patient. The nursing staff was not present, so the team began disconnecting the lines. After freeing the patient of the unnecessary lines and monitors, the patient was transferred into the PIB, where water ice was immediately placed on and around the patient's head.

The AutoPulse mechanical chest compression device was initiated at 17:25 hrs, and the SAVE II ventilator was attached to the preexisting endotracheal tube with an impedance threshold device and ETCO2 detector at 17:26 hrs. No antacid was administered per a discussion and agreement by the attending physician, Alcor MRD, and SA team. An EZ-IO line was placed in the member's right tuberosity at 17:26 hrs and the full medications protocol was administered except for Hetastarch, which is only given if the patient is dehydrated. Additionally, the first of 4 syringes in the last round of Decaglycerol/THAM ruptured on the side of the shaft, which shot the medication out the side. Approximately 20cc was delivered out of the faulty syringe, and the following 3 syringes were administered without incident. See the below Table of Medications Administered for the names of the medications, the dosages, and the times of administration.

Two temperature probes were placed and secured in the patients right and left nasopharynx at17:27 hrs. An 8"x10" piece of Tegaderm was used to prevent ice and water from entering the mouth. The cooling mask, which is part of the surface conduction cooling device (SCCD), was

placed over the patient's face to improve external cooling. Additional ice was placed around the patient's head and body totaling approximately 180 lbs.

At 17:31 hrs, when all medications had been administered, the SA team covered the PIB with a fitted sheet for member privacy and awaited the required security escort needed to transport the patient out of the hospital. Once security arrived the team headed to the MOV at 17:45 hrs. During the transport through the hospital the release paperwork was placed on file with the hospital security office. At 17:48 hrs the patient was loaded into the MOV. The Autopulse device stopped and was restarted within 30 seconds. The SCCD pump was initiated, an additional 120 lbs. of ice and 3 gallons of water was added to the PIB. The team then departed to the funeral home at 17:53 hrs. Heavy traffic was experienced on the way to the funeral home.

At 18:11 hrs the MOV pulled off the road to change the battery in the Autopulse, which was indicating the battery was low. The battery was changed and the MOV was back on the road at 18:13 hrs. The patient arrived at the funeral home at 18:51 hrs.

Once at the funeral home, one of the SA team members left for the airport to obtain the cryoprotectant that had been shipped from Alcor for the field cryoprotectant perfusion (FCP) procedure. The rest of the team brought the patient inside the prep room where the DART team already had the gravity feed equipment ready to be unpacked and set up for use. The streptokinase had been added to the first bladder of MHP2 at 20:08 hrs. The attending funeral home manager had given authorization to set up and perform the gravity feed perfusion.

While the patient was cooling in the PIB, the DART team began setting up the Alcor gurney and perfusion equipment. The SA team lead began modifying the perfusion tubing to accommodate connecting to the MHP-2 15 L bladders for the initial blood substitution. While assembling the surgical setup the team was notified by the funeral director that they did not have authorization to perform the procedure in the prep room as there was a viewing taking place and no authorized member of the funeral home would be present to monitor the use of the prep room (see the Discussion section).

6. Field Surgery and Blood Substitution

The member was rapidly transferred from the PIB to a body bag on the Alcor gurney with approximately 100 lbs. of bagged water ice. The prep room was quickly cleaned and restored to its original condition. The patient was then transported outside to the Alcor Medical Response Vehicle (MRV) and the vehicle was strategically parked in an inconspicuous area of the funeral home parking lot, with permission. The perfusion equipment was brought out to the MSV, and preparations were made for surgery.

Upon arriving at the airport cargo department, the SA team member found that the shipment of perfusate from Alcor would not be available for pickup for at least 2 hours, which then turned into 1 hour. Once the shipment of perfusate was secured, it was transported to the funeral home. The SA and DART team had already begun the carotid cut down and blood substitution with MHP-2 when the perfusate arrived around 21:20 hrs. The surgical procedure to access the patient's carotids had started at 20:30 hrs with the first cut on the right side of the patient's neck. The DART team members were taking the lead on the surgery with assistance by the SA team lead.

The right jugular vein was partially cut, leading to some difficulty visualizing the carotid artery. The right carotid was identified at 20:38 hrs. At 20:41 hrs the carotid was isolated and then cannulated with a 18 fr. curve tipped cannula. At this time the perfusion tubing was primed with MHP-2 carrier solution while the left carotid artery was dissected. At 20:59 hrs the left carotid artery was identified. The left carotid artery was cannulated prior to occluding proximal to the body, but that was remedied once the cannula was secured. The 18 fr. curve tip canulae was secured at 21:04 hrs.

The heat exchanger was connected to the patient circuit. The Hobo datalogger was connected to the patient circuit to record temperatures and pressure. The circuit was primed with MHP-2 and bubbles were removed from the tubing. At 21:08 hrs the carotid cannulae were connected to the tubing and open circuit blood substitution was started. The jugular veins were severed, and effluent was allowed to flow to the table. The left jugular vein was cannulated to retrieve effluent samples for refractometry readings.

Because this had become a neuro-on-whole-body procedure, at 21:15 hrs approximately 200 lbs. of dry ice was placed around the patient's body (excluding the cephalon, which was being perfused) to start cooldown of the body. At 21:40 hrs the Alcor cryoprotectant was delivered and ready for use. At approximately 21:35 hrs the MHP-2 blood substitution was discontinued with 4 liters being introduced.

7. Field Cryoprotectant Perfusion (FCP)

The procedure was rapidly transitioned from field blood substitution by the SA team to field cryoprotectant perfusion by the DART team. Once the FCP cryoprotectant perfusion was started, the SA team members cleaned up and departed the funeral home. This indicated the hand-off of the patient from the SA team to Alcor's DART team.

The gravity induced FCP was initiated at 21:38 hrs with bladder #4 (bladders #1 through #3 were not used because an initial neuro blood substitution was done using 4 liters of MHP2) containing nM22 cryoprotectant with a concentration of 0.05 concentration needed to vitrify (CNV) and a molarity of 1.29 (see the Table of Concentrations (Brix) of nM22 Solution, for the times the bladders were started, the precalculated concentrations of each bladder, and the refractive index of effluent samples taken).

By hanging two bladders with different cryoprotectant concentrations on a teeter-totter atop an elevated tripod, a smoother transition of increasing concentrations of cryoprotectant can be achieved.

The gravity feed system for FCP uses a tripod that can be adjusted for height to control the arterial pressure. The pre-mixed cryoprotectant was in a series of bladders with graduated concentrations [measured by the refractive index (RI) in Brix units]. The height of the bladders on the teeter totter for this case was 39 inches which is (39" x 2.054 mmHg per inch of height) a maximum arterial pressure of 80 mmHg at the infusion site. The goal is to have the pressure between 70 and 80 mmHg and the bladders can be raised or lowered as needed to optimize flow and protection of the vasculature.

Bladder #5 was started at 21:58 hrs, which bladders represent the pause for the patient to come to equilibrium. Ethylene glycol antifreeze was added to the water in the heat exchanger at 21:58 hrs to bring the perfusate below 0°C.

Sidebar:
Per the cryoprotection protocol, the ramp is to be paused at 30 Brix (50% of the desired terminal concentration) to allow the patient to come to osmotic equilibrium. When the bladder system is used, bladders 5 & 6 represent the pause. The cephalic/patient enclosure and the chiller are switched from +3°C to -3°C operation. 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 (52.5 Brix) and held between 102% and 105% concentration until the terminal concentration is obtained.

T+1 days

Cryoprotectant perfusion was terminated at 00:25 hrs. The final RI reading was 51.5 Brix, and the molarity was 9.91.The patient was moved to the dry ice shipper and covered with approximately 200 lbs. of dry ice at 00:25 hrs.

8. Patient Transport to Alcor

Alcor's DART team began transporting the patient to the Arizona border at 00:32 hrs to await the approval of transit permit. They arrived at the border at 03:09 hrs and continued to monitor the patient's temperature while waiting. The funeral home submitted the causes of death to the health department for review and approval. Because the patient had an operation in the hospital just prior to passing, a discussion between the hospital and coroner was required, for the coroner to electronically sign off on the death certificate. The decedent coordinator and attending physician contacted the coroner's office for approval.

At 16:27 hrs the funeral director was able to speak with a supervisor at the health department office and get the causes of death accepted. The attending physician was able to sign off on the attestation and the transit permit was filed for approval. Unfortunately, the approval would not be made until the following morning.

At 22:37 hours, DART checked patient temperatures which were: right NPT -39.7°C, left NPT -46.6°C, burr hole -44.9°C. DART continued to monitor the patient temperatures, adding dry ice as needed to keep the patient in cooldown.

T+2 days

At 08:47 hrs the DART team received notice that the transit permit had been approved and at 08:59 hrs the team began transporting the member to Alcor.

9. Cooling to Liquid Nitrogen Temperature

The DART team arrived at Alcor at 12:20 hrs. The patient's NPT was -43°C.

Computer-controlled cryogenic cooldown was initiated at 12:37 hrs on T+1 days, plunging to -80°C and descending thereafter at -1°C/hour to liquid nitrogen temperature. On T+7 day at 09:54 hrs, an uneventful cooldown was terminated. On T+7 days at 10:09 hrs, the patient was transferred to long-term care at liquid nitrogen temperature.

The cryogenic cooldown was difficult due to an undesirable configuration of the patient's arms prior to dry ice transport (see the Discussion section). The team discovered during the mid-cooldown transfer that the patient would not fit into the standard TallBoy cooldown dewar. The patient was quickly returned to the horizontal cooldown chamber and the TallBoy dewar was switched for a BigFoot dewar at 11:34 hrs. The remainder of the cooldown was then conducted in the BigFoot dewar.

An alternative to the standard whole-body cooldown scheme was used due to personal circumstances (see the Discussion section) preventing the cooldown team from transferring the patient within 24 hours after the start of the cooldown plunge. Typically, the initial cooldown chamber is held at -110°C until the patient can equilibrate to this temperature. The patient is then transferred to a vertical cooldown dewar to continue cooling to LN2 at -1°C /hour. Instead, the team set the cooldown system to ramp down from the plunge temperature of -110°C to a holding temperature of -145°C. This was done to avoid extended storage at -110°C, a temperature at which ice growth can occur. Cooldown then continued normally to -196°C and the patient was transferred to the BigFoot dewar for long term care.

10. Timeline and Time Summaries

Timeline

T-0	17:15	Estimated time of cardiac arrest
T-0	17:22	Time of legal pronouncement
T-0	17:25	Start ice bath cooling
T-0	17:26	Start of mechanical chest compressions
T-0	17:26	Placed King airway, ventilator, and EZ-IO
T-0	17:27	Administration of first medication (propofol)
T-0	17:31	Administration of last medication (decaglycerol/THAM)
T-0	17:53	Start transport of patient to funeral home
T-0	18:51	Patient arrived at funeral home
T-0	20:20	Stopped of cardiopulmonary support (estimated)
T-0	20:30	Start of field surgery
T-0	21:06	Cannulation complete (estimate) (end of surgery)
T-0	21:08	Start of open circuit blood substitution
T-0	21:41	End of open circuit blood substitution
T-0	21:41	Start of field cryoprotectant perfusion (FCP)
T+1	00:25	Completion of field cryoprotectant perfusion (FCP)
T+1	00:26	Start of dry ice cooling
T+1	21:50	Arrival of patient at AZ border awaiting transit permit
T+2	08:59	DART left CA to transport patient to Alcor
T+2	12:20	Arrival of patient at Alcor (NPT -43°C)
T+2	12:37	Start of cryogenic cooldown
T+7	09:54	End cryogenic cooldown
T+7	10:09	Transfer of patient to long term care at LN2

Time Summaries

Event Duration hr:min		days	time	
00:07	From: Till:	T-0 T-0	17:15 17:22	Estimated time of cardiac arrest Time of legal pronouncement
00:10	From: Till:	T-0 T-0	17:15 17:25	Estimated time of cardiac arrest Start ice bath cooling
00:12	From: Till:	T-0 T-0	17:15 17:27	Estimated time of cardiac arrest Administration of first medication (propofol)
00:04	From: Till:	T-0 T-0	17:27 17:31	Administration of first medication (propofol) Administration of last med (decaglycerol/THAM)
03:15	From: Till:	T-0 T-0	17:15 20:30	Estimated time of cardiac arrest Start of field surgery
00:36	From: Till:	T-0 T-0	20:30 21:06	Start of field surgery Cannulation complete (estimate) (end of surgery)
03:53	From: Till:	T-0 T-0	17:15 21:08	Estimated time of cardiac arrest Start of open circuit blood substitution
00:33	From: Till:	T-0 T-0	21:08 21:41	Start of open circuit blood substitution End of open circuit blood substitution
04:26	From: Till:	T-0 T-0	17:15 21:41	Estimated time of cardiac arrest End of open circuit blood substitution
04:26	From: Till:	T-0 T-0	17:15 21:41	Estimated time of cardiac arrest End of open circuit blood substitution
00:00	From: Till:	T-0 T-0	21:41 21:41	End of open circuit blood substitution Start of field cryoprotectant perfusion (FCP)
07:10	From: Till:	T-0 T+1	17:15 00:25	Estimated time of cardiac arrest Completion of field cryoprotectant perfusion (FCP)
01:11	From: Till:	T-0 T-0	20:30 21:41	Start of field surgery End of open circuit blood substitution
03:55	From: Till:	T-0 T+1	20:30 00:25	Start of field surgery Completion of field cryoprotectant perfusion (FCP)
00:01	From: Till:	T+1 T+1	00:25 00:26	Completion of field cryoprotectant perfusion (FCP) Start of dry ice cooling
07:11	From: Till:	T-0 T+1	17:15 00:26	Estimated time of cardiac arrest Start of dry ice cooling
43:05	From: Till:	T-0 T+2	17:15 12:20	Estimated time of cardiac arrest Arrival of patient at Alcor (NPT -43°C)
00:17	From: Till:	T+2 T+2	12:20 12:37	Arrival of patient at Alcor (NPT -43°C) Start of cryogenic cooldown

11. Table of Medications Administered

T-0 days

TIME	MEDICATION	DOSE	PURPOSE
17:27 hrs	Propofol	200 mg	Anesthetic; reduces cerebral metabolic demand; reduces the theoretic possibility of increased awareness during aggressive CPS.
17:27 hrs	Sodium citrate	20 g Note 1	Anticoagulant; prevents blood clot formation.
17:28 hrs	Heparin	50,000 IU	Anticoagulant; prevents blood clot formation.
17:28 hrs	Vasopressin (1st dose)	40 IU Note 2	Vasopressor; increases blood pressure during CPS.
17:29 hrs	Minocycline	200 mg	Antibiotic and neuroprotectant
17:29 hrs	SMT (S-methyl-isothiourea)	400 mg Note 3	Neuroprotectant (iNOS inhibitor); protects the brain from ischemic injury; raises blood pressure.
17:29hrs	Decaglycerol/THAM	380 ml Note 4	Decaglycerol inhibits cerebral edema.
17:30 hrs	Vital Oxy (w/ saline)	47 mL Note 5	Antioxidants: melatonin, vitamin E (D-alpha tocopherol), PBN (alpha Phenyl t-Butyl Nitrone) and anti-inflammatory carprofen.
17:30 hrs	Vasopressin (2nd dose)	40 IU Note 2	Vasopressor; increases blood pressure during CPS.
20:08 hrs	Streptokinase	25,000 IU Note 7	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.

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. During administration of the second dose, the syringe failed and only 180 ml could be given, for the total dosage of 380 ml.

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 of the blood substitution). 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.

12. Table of Concentrations (Brix) of nM22 Solution

A-2672 step-ramp, nM22									
Preferred endpoint is over 49.9 Brix from both jugulars for 1/2hr									
2L Bag label number	**[nM22], CNV**	**Molarity of penetrating CPAs***	**Brix (calc)**	**Bag start hh:mm, MST**	**hrs post pronounc-ement**	**Bag avg. flow rate, mL/min**		**Sample time hh:mm, MST**	**Effluent Conc., Brix**
1	0.00	0.00	9.80	21:08	3.77	66.7		21:59	13.1
4	0.14	1.29	15.35	21:38	4.27	100.0		22:28	24.55
5	0.23	2.15	19.03	21:58	4.60	69.0		23:02	31.45
6	0.50	4.67	29.85	22:27	5.08	58.8		23:24	46
7	1.06	9.91	52.31	23:01	5.65	87.0		23:57	50.5
8	1.06	9.91	52.31	23:24	6.03	62.5		0:25	51.5
9	1.06	9.91	52.31	23:56	6.57	69.0			
END				0:25	7.05				
* does not account for concentration of non-penetrating CPAs									

13. Discussion

Standby and Stabilization

The power outlet box in the Alcor Mobile Recovery Vehicle (MRV) dies after a couple of hours of use. Utilizing electronic coolers is very limited and powering the perfusion system for 3 hours is nearly impossible. Having another method of plugging standard duplex electrical cords is required. Alcor has purchased a cigarette lighter port to duplex with the receptacle outlet converter. However, installing a solar charging device for the power box would be helpful.

Upon arrival at the funeral home the DART team was given authorization to set up in the prep room by one of the managers at the facility. It was quickly discovered that the funeral director was unaware of this authorization and the request was made to vacate the prep room and perform the neuro gravity feed in the Alcor MOV outside in a discreet area of the parking lot.

This added a substantial delay in initiating the carotid cutdown and created a need to transfer the patient to a body bag on the Alcor gurney earlier than desired.

Funeral home employees do not always have the authority to allow Alcor access to their spaces. Alcor should not allow third-party contractors or past "friendly" contacts that have no authority to establish communications and access to facilities. This should always be done by Alcor personnel to prevent miscommunication.

Field Surgery and Washout

The contractor used for this case could not perform the whole-body wash out because they did not have a contract surgeon or perfusionist. This whole-body member, therefore, received a neuro-on-whole-body cryoprotectant perfusion (FCP) with whole body straight freeze. This has happened before. It is important that Alcor, together with the DART team, create the capability to perform whole body field cryoprotection (WBFCP) as soon as possible to prevent further occurrences of this kind.

There was a discussion between Alcor staff members and the teams onsite regarding how to maximize this patient's cryoprotectant perfusion. Alcor staff pointed out that this case was reaching 15+ hours post cardiac arrest of insufficient oxygen to support the brain, greatly decreasing the chances of successful perfusion. There had likely been significant ischemic brain damage by this point.

In the past few years, Alcor had seen several cases involving extended ventilation and medication-assisted life support which resulted in hours of insufficient blood perfusion of the brain. Attempting cryoprotection in these cases, even when washout appeared successful, regularly resulted in aborted perfusion, several hours of unnecessary ischemia, and in many cases observed extrusion of brain tissue through the burr holes. A straight freeze without cryoprotectant perfusion was considered but the MRD felt strongly that every effort should be made to give this whole-body member cryoprotection. It was decided that the neuro-on-whole-body, field cryoprotection using the carotid arteries, procedure would be used.

The temperature data gathered by the logger became nonsensical approximately an hour after the start of perfusion. Unfortunately, this renders the majority of the transport data unusable, both for graphs and for the S-MIX comparisons. This case was performed with a new type of data logger, but it took place prior to the inclusion of a waterproof insulating case for the logger. The team believed that the logger was exposed to water during the perfusion, and this caused damage to the device. It is uncertain how the logger continued to report temperatures via the onboard screen, but it is possible that water within the SD card slot corrupted data as it was being recorded.

Patient Transport to Alcor

Transit permits are a continuing problem due to such things as weekends, holidays, and various and changing laws within differing counties. For California cases, the patient is often driven to the CA-AZ border while waiting for the transit permit to be issued. This can often cause the team to wait over night with the patient in the vehicle but does ultimately save transit hours. This is a continual learning curve.

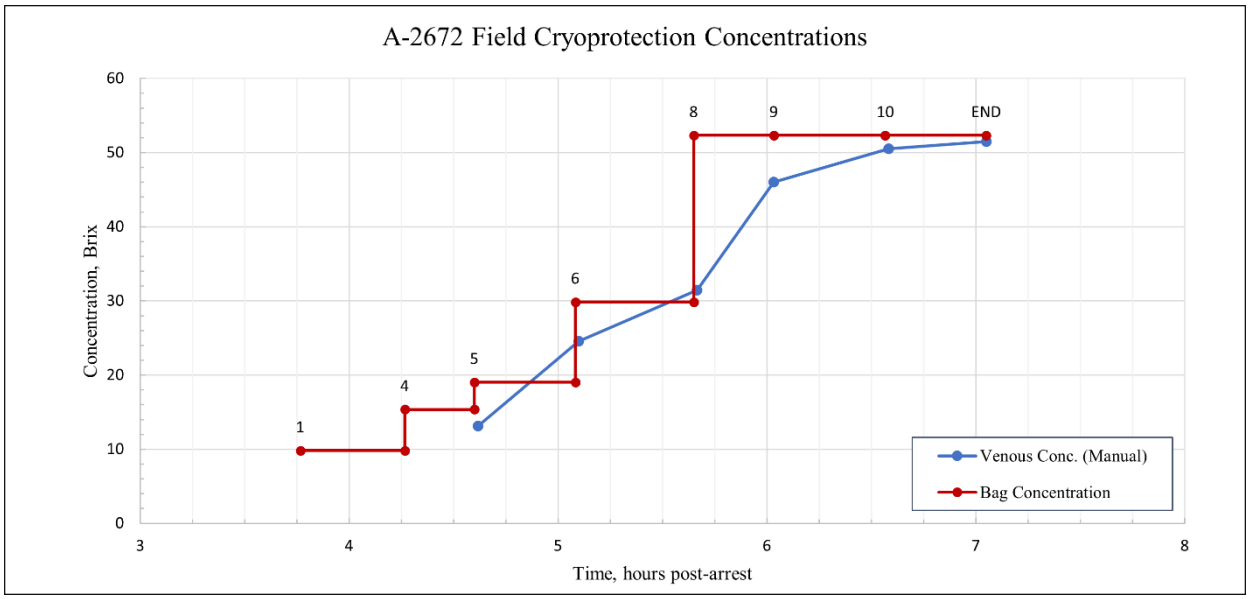
Cryogenic Cooldown

The cryogenic cooldown was difficult due to an undesirable configuration of the patient's arms prior to dry ice transport. The patient's elbows were not placed tightly by the body. The team has reviewed this, and after consultation with Alcor engineers, a new standard has been set for positioning the patient properly.

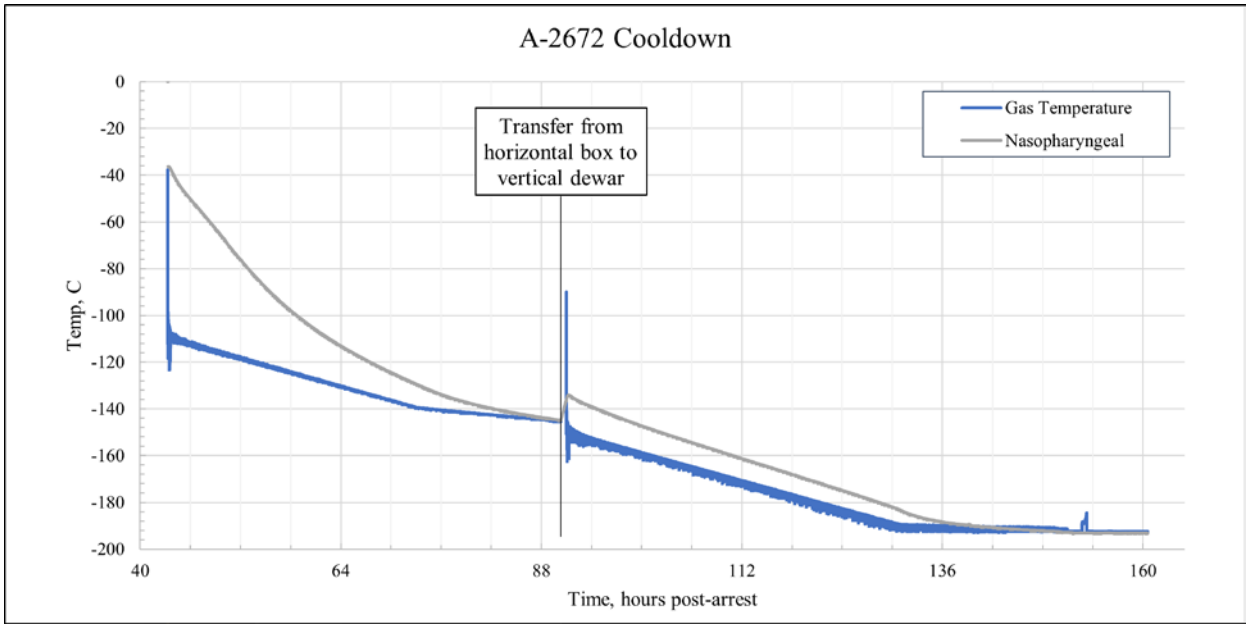
An alternative to the standard whole-body cooldown procedure was used due to personal circumstances that prevented the cooldown team from transferring the patient within 24 hours after the start of the cooldown plunge. The personal circumstances were medical in nature; there was no way to reasonably reschedule. It would have just been one member of staff alone doing the transfer, so the system needed to be configured so it would be ready to transfer the patient the day after.

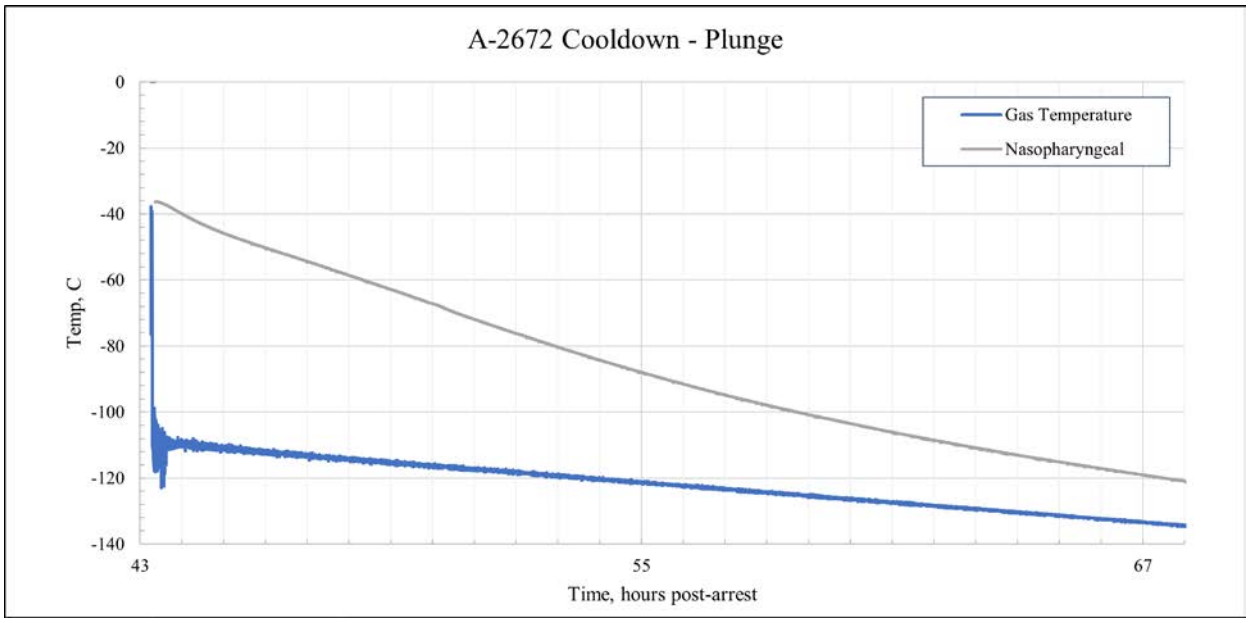
Rather than let the patient "age" (in the metallurgical sense) at a temperature that is ideal for crystal growth (-110°C), it was decided that it would be more favorable to cool past the glass transition temperature and halt ice growth instead.

14. Cryoprotection and Temperature Graphs



FCP Temperature graph comment: The temperature data gathered by the logger became nonsensical approximately an hour after the start of perfusion. Unfortunately, this renders the majority of the transport data unusable, both for graphs and for the S-MIX comparisons. This case was performed with a new type of data logger, but it took place prior to the inclusion of a waterproof insulating case for the logger. The team believed that the logger was exposed to water during the perfusion, and this caused damage to the device. It is uncertain how the logger continued to report temperatures via the onboard screen, but it is possible that water within the SD card slot corrupted data as it was being recorded.





15. S-MIX

The loss of transport temperature data prevented the S-MIX comparison data from being created for this report.

16. CT Scans

Cryoprotectant Distribution (Post-cryopreservation CT scan)

Because this was a neuro-on-whole-body cryopreservation, no post-cryopreservation CT scans were obtained. When the in-house scanner is functional and whole-body patients are being scanned, additional information will be added to this report.