Alcor A-1608

Case Report

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Alcor A-1608 Case Report Contents:

1. Member's Background

Paul Garfield (A-1608) was born December 30th, 1917 in Boston, MA. Paul enjoyed a life of long distance running and dancing. He was an Army veteran, having served in China during WWII. Paul retired from a career as a purchasing agent and became very interested in cryonics when Alcor was located in California. He became a member in 1990 and followed Alcor's move to Arizona where he volunteered every Friday for more than 10 years.

Due to a variety of medical issues and an inability to care for himself, Paul was moved from his home in Sun City, Arizona to live with family – first in California and then in Texas. At the age of 92, Paul entered into hospice care in Plano, TX. Alcor initiated a standby, and a little more than 30 hours after arriving, Paul was pronounced. The standby team immediately began performing stabilization & cool down procedures and a field washout was performed in the field prior to Paul's transport to Scottsdale, AZ.

Paul's clinical death occurred on May 12th, 2010, at 11:24 PM CDT. His wonderful personality and smile will be missed by all of his friends here at Alcor. He is our 95th patient.

2. Personnel

Standby, Stabilization and Transport: Aaron Drake, Transport Coordinator; members of Alcor's Texas Volunteer Response Team; Catherine Baldwin, General Manager; and members of Suspended Animation's response team. They were supported by Jennifer Chapman, Executive Director; and Steve Harris, M.D., Chief Medical Advisor.

Personnel at Alcor's surgery suite included Nancy McEachern, DVM, Surgeon; Aaron Drake, Surgical Assistant; Hugh Hixon, Cryoprotection Perfusionist; Steve Graber, Assistant Cryoprotection Perfusionist; Andrei Sobolev, Scribe; R. Michael Perry, Ph.D., Cooldown Coordinator. Surgical support staff: Richard Cremeens, and Bonnie Magee.

3. Pre-Deployment

In January of 2009, Alcor was alerted that Paul Garfield had been taken to a local Phoenix area hospital and treated for hyperglycemia. This was the first indication the family had that Paul was having difficulty managing his diabetes. Alcor's Transport Coordinator, Aaron Drake and Readiness Coordinator, Regina Pancake traveled to the member's home in Sun City, AZ to evaluate his condition and meet with the family. Paul appeared to be recovering but the family

said it was time to have him cared for where they could watch him and ensure a similar episode did not reoccur.

After briefly relocating Paul to California and then to Texas, Paul was eventually admitted to Baylor Regional Medical Center due to "declining mental status". This symptom was the culmination of his medical issues, having been diagnosed with acute renal failure, encephalopathy, non-ST elevation myocardial infarction, hypernatremia, controlled Type 2 diabetes mellitus, cerebrovascular disease, dysphagia, and hypertensive cardiovascular disease.

On the 11th of May, 2010, Alcor received an emergency text that Paul's health was rapidly declining. The deployment committee reviewed clinical data from his medical providers and determined that a standby should be initiated immediately. Less than 36 hours prior, Aaron had just returned from a week-long standby for another member in Cleveland, Ohio, therefore the committee decided to send a number of response personnel. In addition to Aaron, Alcor contacted members of the Texas Response team out of Austin, Texas as well as Suspended Animation's team out of Boynton Beach, Florida, to respond collectively.

While all of the teams were en route, Alcor was again contacted and informed that the patient was now being transferred from the medical center to a hospice-based assisted living facility in Plano. The teams were redirected to that facility.

4. Deployment

Paul arrived at the hospice at approximately 7:40pm, the evening of May 11th. Nurses reported the patient's O_2 saturation was 97%, blood pressure was 100/40 and his heart rate was in the mid-70's.

Four SA team members arrived at the Dallas airport at 7:45pm. A member of the Alcor Texas volunteer response team met and transported part of the SA team and gear to the hospice facility while other team members acquired another vehicle. Once on site at the hospice in Plano, other Alcor Texas team members provided coolers of ice and assisted with setting up equipment in the patient's room.

The SA Team Leader, Catherine Baldwin, met with the facility owner and the overnight licensed vocational nurse (LVN) to discuss the procedures in the event the patient declined or arrested. The LVN's opinion was the patient was stable and would live for several more days.

The LVN was not permitted to make a pronouncement of a patient's legal death per company policy. Alcor's Executive Director, Jennifer Chapman, arranged for a registered nurse (RN),

who lived nearby and was employed by the skilled nursing contractor who was caring for the patient, to be available to come to the facility to pronounce if he arrested during the night. Part of the pronouncement procedure would require the physician on-call, Medical Examiner (ME) on-call and next of kin be notified before pronouncement was considered official and legal. Different pronouncement arrangements would have to be made in the morning with the hospice's case manager when the RN was no longer available.

From Scottsdale, Jennifer called funeral homes in the Plano area to find one who would be willing to accommodate a washout, perfusion and an expedited transport.

At 9:00pm, a conference call was placed that included Jennifer, Catherine and a local funeral director, who agreed to provide a facility for washout and assist with expedited paperwork and air transport. Transport time from hospice to their facility in Dallas would be in excess of 45 minutes. Catherine and Jennifer agreed that this would have to be the facility used if the patient arrested overnight, but that it was less than ideal and something closer to the hospice facility would be preferred. Transport of the patient to Dallas would have to be improvised using one of the rental vehicles until a larger vehicle could be rented in the morning.

Aaron flew into Dallas and arrived at the hospice around 10pm. He set up a capnograph/pulse oximeter (CO_2SMO) on the patient to alert overnight team members if the patient began declining suddenly. The patient's vitals were steady, BP 100/50, O_2 saturation 96%, heart rate 77, and respirations of 10.

One of the Texas team members joined an SA team member for overnight watch at the hospice facility. Another Texas team member volunteered to return to the Dallas airport to pick up the SA perfusionist who would arrive in another hour. The SA surgeon was scheduled to arrive the following morning.

Remaining team members began inquiring about rooms at nearby hotels but none could be found as the closest hotels were all completely booked. After midnight, Aaron was able to reserve rooms for the whole team at a hotel about a 20 minute drive from the hospice and proceeded to shuttle several team members to the hotel. A hotel nearer to the hospice would be searched for again in the morning.

The next morning, May 12 at 8am, Catherine and a second team member returned to the hospice to relieve the overnight crew and meet the new nurse at shift change.

Overnight the patient's temperature had spiked as high as 106° F. The nurse had placed cold packs in the groin and armpits to cool him. His temperature at shift change had dropped to 99°F.

He had overnight urine output of 500 ccs, heart rate 77, respiration 10, and his O_2 saturation was 96%.

At 9am, Catherine met with the patient's chaplain, hospice caseworker and the nurse manager for his hospice care, to explain the patient's wishes and the role of the SA team in caring for him.

During the conversation with the nurse manager, she explained that in the event of the patient's death, pronouncement could be delayed between 30 minutes to several hours because the nurse who could pronounce the patient would have to drive to hospice. Catherine explained that this length of delay could result in terrible damage to the patient prompting the nurse manager to consider other arrangements in an attempt to expedite the pronouncement.

At 10:10am, the patient's blood pressure was 92/40, heart rate 68, respiration 10, O_2 sat of 98% and a temperature of 99.1° F. The patient was turned in his bed however this activity caused the CO_2SMO monitor to discontinue registering vitals. By 10:40am the patient's temperature had returned to normal at 98.8° F.

Near 11am, Jennifer facilitated a conference call between Catherine and another funeral home she had located, closer to the hospice. After Catherine explained the team's needs and procedures, the funeral director's assistant indicated that he might be able to help, but would need to speak to his director. Shortly afterward, this assistant funeral director called back to Jennifer and informed her that he would be unable to assist in the case or provide facilities; he would not give a specific reason for declining to help.

The nurse manager continued to work with the patient's family and another hospice where the patient could get timely pronouncement. There were no beds available in any other hospice that had staff authorized to pronounce the patient. Ultimately, she made arrangements with her own company to have the LVN nurse on duty pronounce, however, whether for legal reasons or company policies, the patient could not be declared legally dead until the duty nurse had: 1) confirmed the patient's death herself; 2) made direct phone contact with the physician on-call to confirm time of death; 3) directly notified the next of kin; and 4) spoken with the Medical Examiner on-call, providing the time of death and physician confirmation. The nurse manager assured Catherine that, even after hours, both the physician and medical examiner answered their phones. This was not ideal, but would substantially reduce the delay of waiting for a nurse or physician to travel to the hospice. Legal counsel for Alcor was asked to investigate Texas law in this area.

The remaining SA team members had located a hotel ten minutes to the mortuary. While the team was moving, Aaron rented a larger vehicle to move the patient. Two additional SA team members arrived at the mortuary allowing Catherine to leave to pick up the surgeon at the Dallas

airport and bring her back to the mortuary. Afterwards, Catherine drove to the mortuary to consider pre-positioning perfusion equipment in their prep room.

With traffic and construction on the roads into Dallas, the drive time from the mortuary was more than an hour. The facility prep room at the mortuary turned out to be very small and narrow. The stabilization team with the ice bath would not be able to enter without removing equipment and prep tables from the room that the embalmers would need if a body arrived. Catherine explained to the assistant funeral director the need for a larger prep facility, as close as possible to the hospice. He suggested another funeral home, which he described as “huge and pristine” and around ten minutes from the hospice. He arranged a conference call between the team leader and the suggested facility’s funeral director. The new funeral director offered her facility and immediate response for filing paperwork and arranging air transport. They did not have a Ziegler case for airline transport but the original funeral director said they would deliver one.

Catherine returned to the hospice to find that Aaron had restored the CO_2SMO’s functions and the patient’s vitals were stable. At 7:30pm, the LVN for the overnight shift was briefed on the pronouncement procedures by the nursing case manager. Two SA team members were left on overnight watch and would assist the LVN in making calls to the son and medical examiner to facilitate pronouncement if the patient arrested. The remainder of the team returned to the hotel nearby.

At 11:26pm, a SA team member at the hospice called the team leader at the hotel to say the patient’s vital signs were declining very rapidly. The second SA team member called the duty nurse to request she come and check on the patient. The LVN confirmed that the patient was no longer breathing and had no heartbeat. She and the SA team members began calling one of the patient’s sons, the physician on-call and the ME on-call. The patient’s son and physician on-call answered their phone, however, the ME did not. The duty nurse continued to try to reach the ME.

At 11:41pm the full SA team assembled in the patient’s room, moved him to the ice bath and began packing him in ice. At 11:45pm the Medical Examiner was finally reached and the duty nurse told the team they could proceed. Catherine then called Aaron at the hotel to let him know of the events that had transpired.

5. Field Stabilization & Cooling

Immediately after official pronouncement, team members set the FAST1 intraosseous infusion line up and started the AutoPulse cardiopulmonary support device. A Combitube was inserted

and the ventilator started with air only. In the first five minutes following pronouncement, Heparin (100,000 IU), Streptokinase (250,000 IU), Epinephrine (1 mg), and Vasopressin (100 IU) were pushed through the FAST1 and Mannitol (500 ml 20%) was piggybacked onto the line. Water was added to the icebath and Maalox was delivered through the gastric access lumen of the Combitube.

Within 10 minutes, S-methylthiourea (SMT, 400 mg), two additional doses of Epinephrine (1 mg every 3 min), Keterolac (15 mg), Gentamicin (80 mg), Aspegic (200 mg) and Niacinimide (500 mg) were infused. A second intraosseous line was set using the EZ IO. The rectal and nasopharyngeal probes were inserted and DuaLogR temperature logger was started.

The patient's head was shaved and a cooling mask was applied. More water was added to the ice bath and the ice water recirculating device ("squid") applied to the patient. A blood sample was drawn from the EZ IO port and run on the I-STAT blood analyzer.

Within twenty-five minutes following pronouncement Propofol (200 mg), L-kynurenine (1.5 g), Vital-Oxy (70 mL), Saline (1 L, 0.9%) with Tromethamine (THAM, 100 mL 1 M), Hetastarch (250 mL, 6%) were infused. An additional dose of Vasopressin (100 IU) was given and additional 1 mg doses of Epinephrine continued every three minutes over the first hour post-pronouncement. One additional blood sample was drawn and processed. More ice was added to cover the patient.

The patient was then covered for privacy and rolled to the front of the facility. Along a dark portion of the path to the vehicle, a 6-inch drop-off from a curb snapped a center-stabilizing wheel from the portable ice bath. Still functional, the ice bath was wheeled and lifted into the transport vehicle and strapped down.

The transport vehicle departed for the funeral home with the patient and arrived approximately one hour post-pronouncement.

6. Field Washout & Transport

After arriving at the mortuary, the excess ice water was suctioned from the ice bath and the patient's nasopharyngeal temperature was 25.3° C.

The surgeon prepped the patient's left groin for surgery by swabbing with ChloroPrep and draped the area with sterile surgical towels. A 5cm incision was made and rough dissection was used to expose the femoral vessels.

The AutoPulse was shut off at 1:57am for cannulation. (Patient's nasopharyngeal temp was approximately 21.6° C) The femoral vein was cannulated first and then the artery with 19 Fr cannulae. After the cannulae were secured with suture and primed, the patient was connected to the circuit and slow forward flow was initiated but no drainage observed from the venous side. After attempting several adjustments to the venous cannula and applying suction without obtaining drainage, the left venous cannula was clamped.*

* Note: After arrival at Alcor, the left femoral venous cannula was removed. Alcor staff reported they found hard, calcified particulates blocking the end of the cannula that probably prevented the drainage mentioned above.

The patient's right groin was prepped and swabbed; an incision was made and rough dissection exposed the femoral vein. After cannulating the vein, forward flow was initiated and smooth venous drainage began.

After seven minutes on open circuit, the patient's nasopharyngeal temperature was 14.1° C.

After approximately 25 minutes on open circuit, the circuit was closed. The remaining 30 ml Vital-Oxy was added to the circuit during closed circulation. Perfusion was stopped at 4:04am. The patient's nasopharyngeal temperature was 1.4° C. No edema was observed.

The patient's cannulae were clamped, incisions were closed and he was quickly cleaned. He was then placed in a body bag and packed in roughly 250 lbs of bagged water ice inside the Ziegler case that had been delivered and later insulated by the SA team.

Before the patient's death certificate could be filed with the Health Department for a transit permit, it had to be electronically signed online by the physician on-call who confirmed the patient's time of death with the duty nurse. Until the certificate was signed, the funeral director could not make transport arrangements with the airlines.

Jennifer worked directly with the funeral director and hospice to try to expedite the death certificate signing and arrangements for transport of the patient. Although the Health Department opened its office at 9am, the physician was not available to sign until after 10:30am. Since the airlines must receive human remains shipments no less than two to three hours before the scheduled flight, the delay in signing and filing created a significant delay in transport.

Once the documents had been approved - a little after 12:00 noon - the funeral director transported Aaron and the patient to the airport. The drive was approximately an hour across town to the cargo drop off area of the airport. After the airline paperwork was completed and

accepted, the Ziegler case was off-loaded from the mortuary vehicle onto a forklift, where it was then stored prior to departure. Aaron was then taken to the passenger side of the terminal so he could travel on the same flight.

Upon arrival at Phoenix's Sky Harbor airport, Funeral Director Steve Rude accepted the shipment from cargo on behalf of Alcor and transported the patient to the Alcor facility. A-1608 arrived at Alcor at about 16:53, 13 May, over 19 hours post-arrest. Cryoprotection began at 18:58, and was routine. Terminal concentration, using M22, was achieved at 23:02. The brain started out retracted, probably due to the use of hyperosmolar washout solution, and then swelled to the burr holes during the cryoprotection, indicating the blood-brain barrier had been broken down due to the length of the transport. At the end of the cryoprotection, the brain appeared to have retracted a bit. The eyes shrunk and then swelled again. The skin was lightly and evenly colored (tan).

7. Timelines

Stabilization

An approximate timeline of events compiled from multiple sources is below.
Times are Central Daylight Time (CDT)

May 12th, 2010
23:27 Phone calls to patient's son, physician on-call and medical examiner begin
23:29 Son and physician respond to calls, Medical Examiner does not
23:30 SA team at hotel en route to Mortuary
23:41 Full team in room with patient
23:41 Patient is covered in ice
23:45 Medical Examiner responds, patient is officially pronounced
23:46 FAST1 intraosseous access is in
23:46 Autopulse started
23:47 Combitube in
23:48 Ventilator started
23:48 Heparin in
23:48 Mannitol started
23:48 Streptase in
23:48 Rectal probe in
23:50 Water to ice bath
23:50 5 ml Vassopressin in
23:50 1 ml Epinephrine in
23:51 250 ml Maalox in

23:51 Cooldown mask on
23:52 SMT in
23:52 Ketoralac in
23:52 Gentamicin in
23:53 1 ml Epinephrine in
23:53 Niacinimide in
23:53 More water added to ice bath
23:53 DuaLogR started - nasal T1 and rectal T2
23:54 EZIO is in
23:54 More water added to ice bath
23:55 Icewater recirculating
23:55 Blood sample pulled
23:56 1 ml Epinephrine in
23:56 DuaLogR logging
24:00 1 ml Epinephrine in

May 13th, 2010

00:01 50 ml L Kynurenine in
00:03 1 ml Epinephrine in
00:05 50 ml L Kynurenine in
00:05 Mannitol in
00:06 Vital Oxy running
00:07 1 ml Epinephrine in
00:08 Hetastarch running
00:09 5 ml Vasopressin in
00:10 1 ml Epinephrine in
00:11 THAM plus saline in
00:12 Large transport vehicle is cleared out and ice check done
00:13 1 ml Epinephrine in
00:13 Second blood sample pulled
00:16 1 ml Epinephrine in
00:19 Propofol in
00:19 1 ml Epinephrine in
00:23 1 ml Epinephrine in
00:26 1 ml Epinephrine in
00:29 1 ml Epinephrine in
00:31 En route to mortuary
00:32 1 ml Epinephrine in
00:35 1 ml Epinephrine in
00:49 Arrived at mortuary
00:51 Moving patient into prep room

00:55 Setting up SCPC
01:00 Scrub in, gown up
01:10 Suctioning water out of surgical area
01:34 Isolated vein and artery
01:57 AutoPulse turned off
02:01 Adjusting patient
02:03 Ventilator shut off
02:03 Suturing cannulae
02:23 Flowing in, no drainage
02:26 No drainage…readjusting cannulae
02:30 Flowing in, light suction
02:32 No drainage
02:35 Prepping surgical site right side femorals
02:43 Flowing in, light suction
02:44 Patient draining successfully
02:51 Temp on the circuit is arterial 3.2° C and venous 11.5° C
02:51 Patient temp is nasopharyngeal 14.1° C
02:55 Temp on circuit is arterial 3.3° C and venous 9.4° C
03:10 On recirculation
03:18 Nasopharyngeal temp 5.2° C rectal 15.4° C
03:21 Adding Vital-Oxy to recirculation
03:37 Nasopharyngeal temp is 0.5° C
04:03 Nasopharyngeal temp is 1.4° C and rectal is 8.6° C
04:03 Arterial temp is 0.1° C venous is 2.2° C
04:04 Perfusion stopped

Surgical

Times are Arizona Time (PDT)

May 13th, 2010

16:53 Arrived at Alcor (19:29 post-arrest)
17:05 Moved onto table, placed new icebags around head and body
17:38 Temperature sensors were put in burr holes and wires stapled to skin
18:36 Head is separated
18:51 Clamped off the bypass line to begin perfusion 110 mmHg
18:58 Started Ramp
19:03 Brain retracted to 8-10 mm both sides
19:19 Observation by Hugh: water was pulled out patient's eyeballs
19:40 Hugh's observation: Brain has shifted on the left side. Eyes were collapsing

20:35 Richard's observation: Brain was swelling
Hugh's observation: Brain blood barrier must have been bad
20:49 Ramp was switched off
21:15 Hugh's observation: No skin discoloration
21:30 Mixer volume was being drained into waste bucket
Switched over to the 2nd filter
21:45 Hugh's observation: Brain retracted
22:30 Hugh's observation: Facial discoloration is light and even
22:32 Ramp turned off
22:58 Hugh's observation: Brain retraction was approximately 2 mm
23:02 System stopped (25.38 post-arrest)
23:27 Cooling program up and running (26.03 post-arrest)

Cooldown was started at 23:27, 13 May 2010 and ended 17 May, 2010.
A-1608 was transferred to a neurocan on 4 Jun, 2010.

8. i-STAT

Two blood samples were collected post-mortem for i-STAT analysis, however, data from the second sample were not recorded due to an i-STAT cassette problem.

Data from the first blood sample, taken roughly 30 minutes post-mortem and 10 minutes post-pronouncement.

Na mmol/L 164
K mmol/L 7.2
CI mmol/L >140
TCO_2 mmol/L 25
BUN mg/dL 91
Glu mg/dL 152
Hct %PCV 38
pH 6.859
PCO_2 mmHg 121.6
HCO_3 mmol/L 21.7
BEecf mmol/L -12
AnGap mmol/L <>
HB* g/dL 12.9

<> indicates out of analytical range

9. Discussions and Recommendations

Problem: Several portable ice bath locking pins and extension arms were bent and chipped during air transport.

Solution: Reduce pin exposure by reducing clearance; use stainless where possible; add canvas/nylon cover.

Problem: A great deal of time and effort was expended by Alcor's Executive Director in trying to locate, via telephone from Arizona, a local funeral home in Plano willing to assist and with proper facilities. However, being unfamiliar with the exact requirements that needed to be met to accommodate the stabilization team complicated communications and limited the Executive Director's ability to assist.

Solution: SA has a standard letter to fax or otherwise provide to funeral directors that outlines requirements and what the funeral director can expect if he/she chooses to assist with a cryonics case. SA can provide this document to Alcor for future use. Alcor may also wish simply identify funeral homes locally but allocate the task of communicating with funeral directors and selecting a funeral home to SA and Alcor team members on location.

Problem: Most medications were administered while still in the hospice, rather than en route to the funeral home. Although administration is more complicated in a non-specialized transport vehicle, in general, once lines are established, every effort should be made to begin transport of the patient to save time.

Solution: Whenever possible, and only when it does not compromise the safety of the patient or team members, begin moving the patient while meds are being administered.

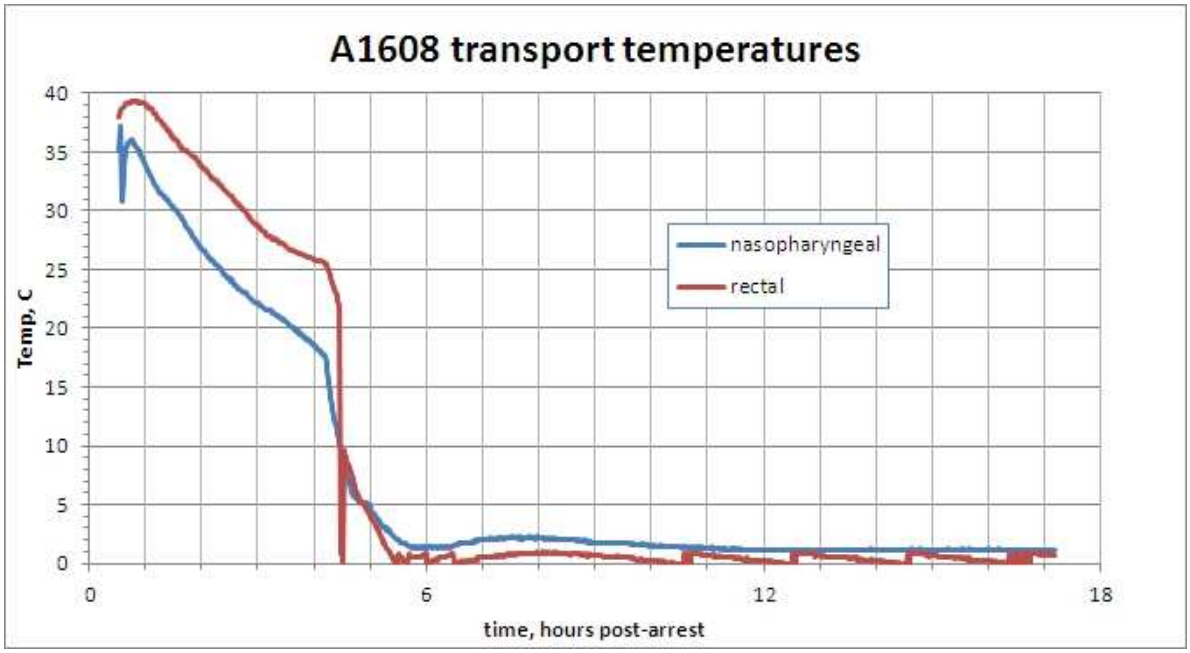
Problem: A six-inch drop off a curb, in the dark, broke a center-stabilizing wheel on the portable ice bath.

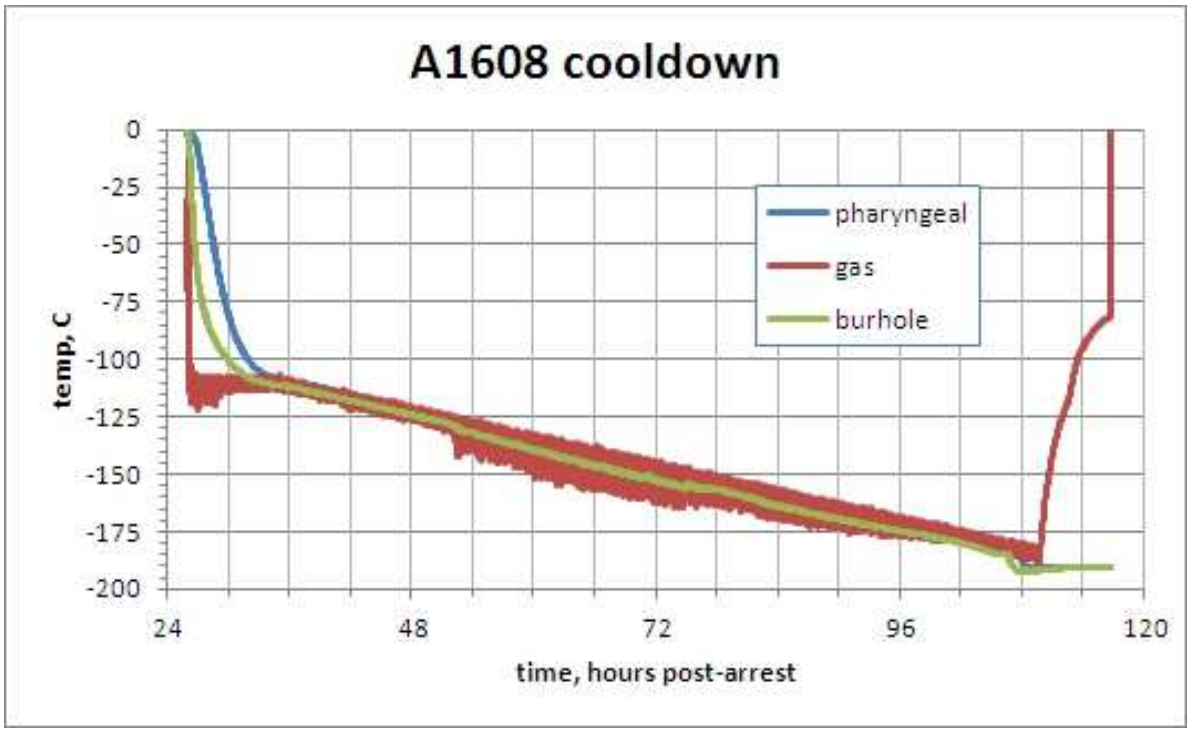
Solution: Re-evaluate center-stabilizing wheel design for reinforcement or replacement.

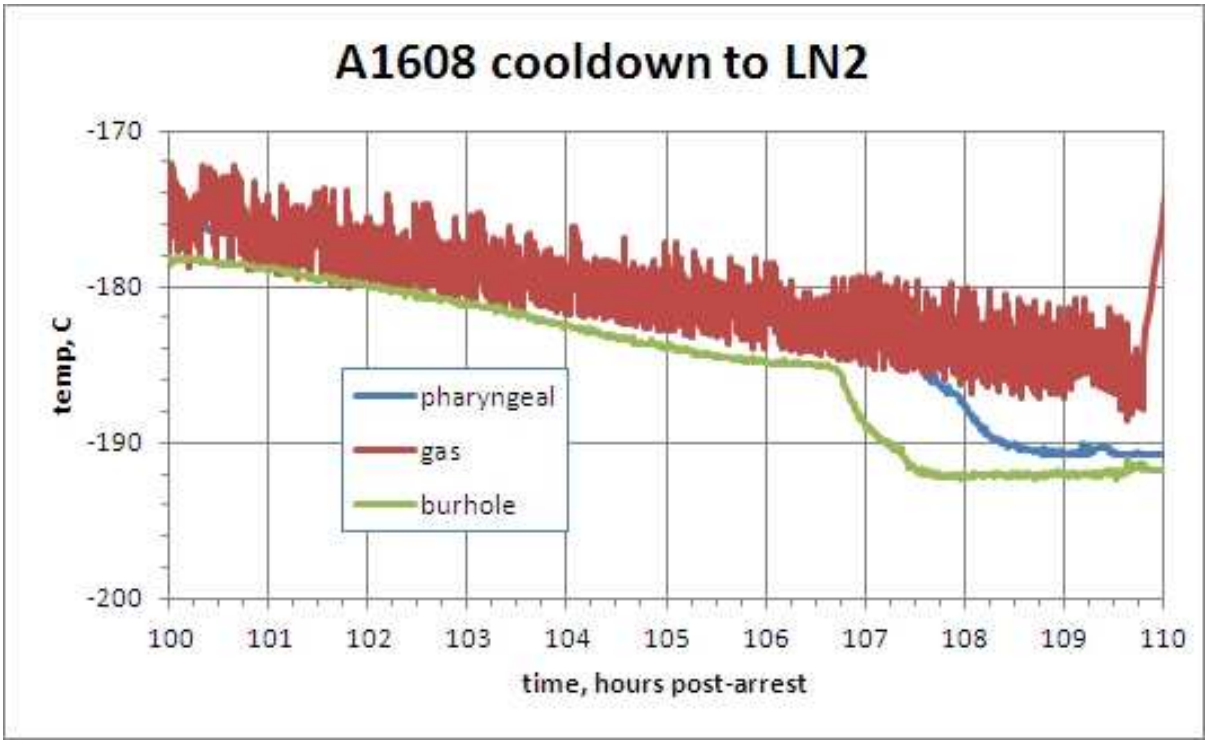
Problem: Sterile cloth disposable surgical towels and drapes became saturated and moved too much even when secured with clips. In the clinical environment, cloth drapes have been replaced with sterile disposable spun-bonded paper drapes and 3M Steri-Drape, a sterile adhesive plastic cover for the surgical site.

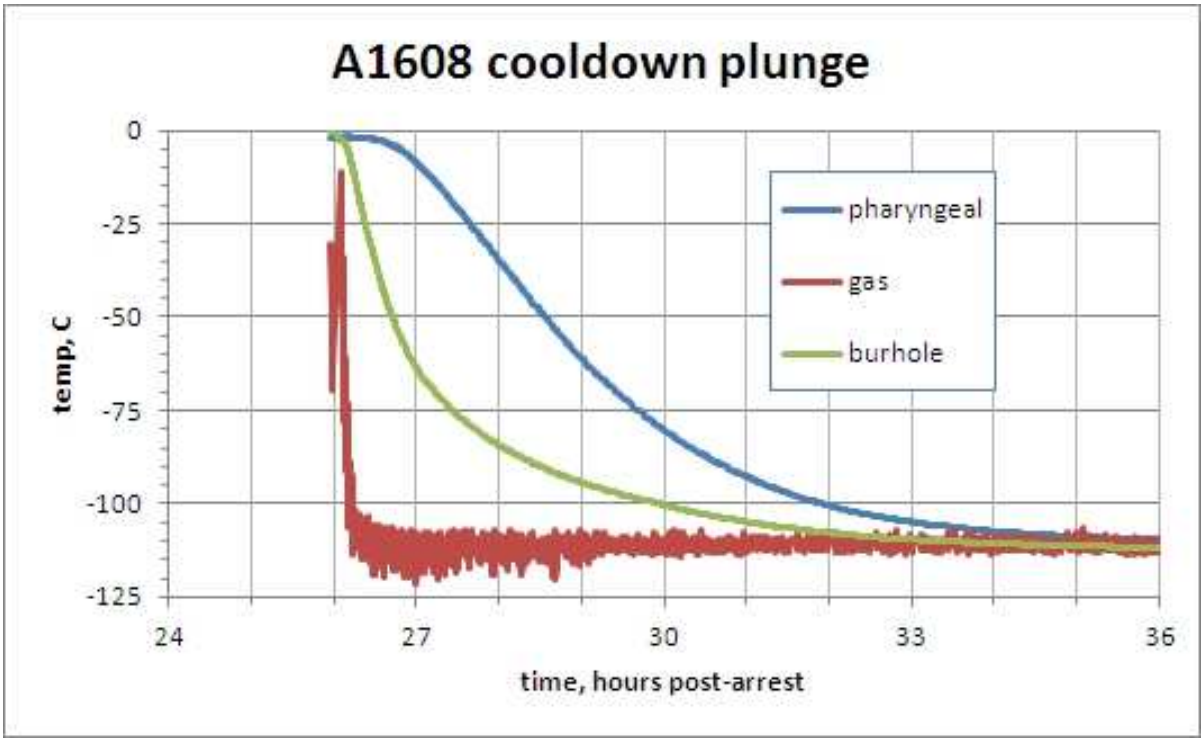
Solution: Replace current cloth drapes with paper drapes and appropriate 3M Steri-Drape in SA kits.

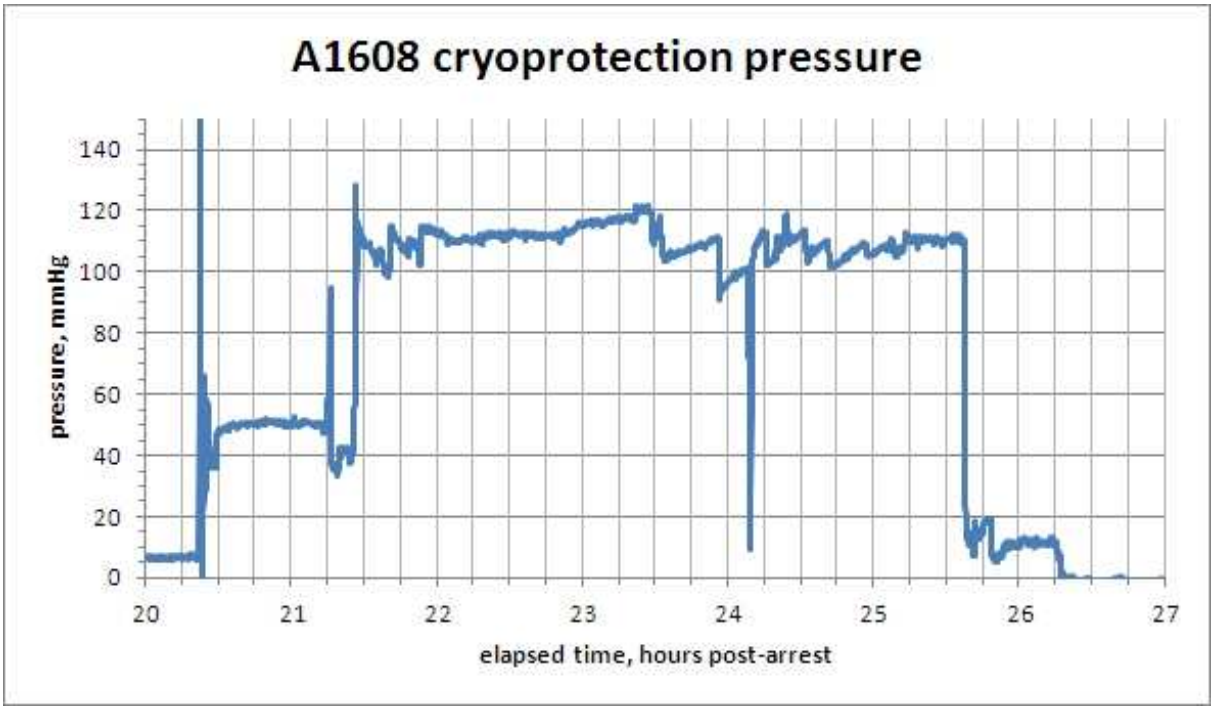
10. Graphs

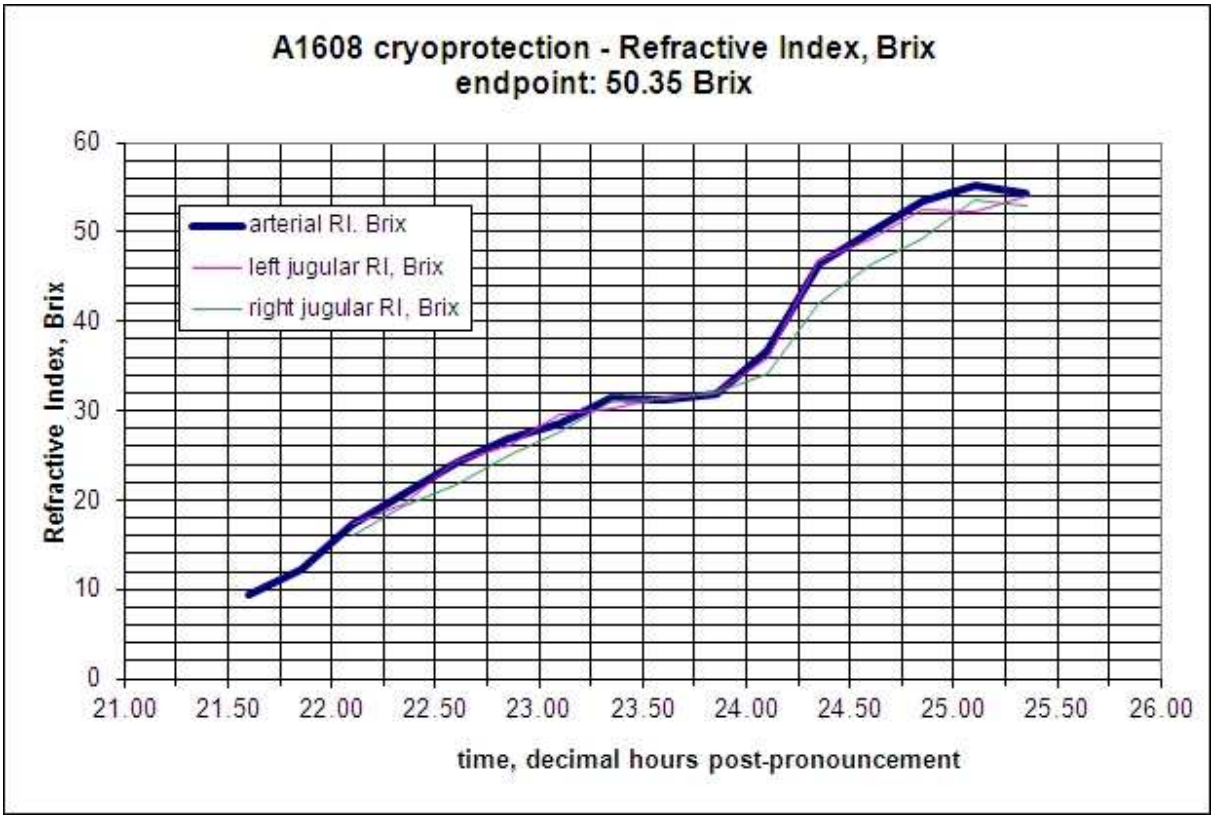

A1608 transport temperatures
Temp, C
40
35
30
25
20
15
10
5
0
0
6
12
18
time, hours post-arrest
nasopharyngeal
rectal


A1608 cooldown
temp, C
0
-25
-50
-75
-100
-125
-150
-175
-200
24
48
72
96
120
time, hours post-arrest
pharyngeal
gas
burhole


A1608 cooldown to LN2
-170
-180
-190
-200
temp, C
100
101
102
103
104
105
106
107
108
109
110
time, hours post-arrest
pharyngeal
gas
burhole


A1608 cooldown plunge
0
-25
-50
-75
-100
-125
temp, C
24
27
30
33
36
time, hours post-arrest
pharyngeal
gas
burhole





- End of report -