Center Of Veterinary Expertise | 24/7 ER + Specialty Care

the cove connection

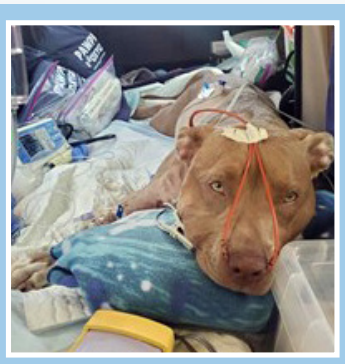
# Emergency and Critical Care Case Study: Hypovolemic Shock in the Polytrauma Canine

By Christine Reid, DVM, and Meg Carrasco, LVT

**Patient:** Smoke, an approximately 8-month-old female intact Pit Bull

**Referred by:** Portsmouth EMS/BAC

**History:** Smoke was found by a good Samaritan after sustaining several stab wounds to her ventral neck and face. The good Samaritan applied QuickClot in the field, and Smoke was immediately transported to The COVE. No medical history could be provided.



*Smoke en route to NC State University College of Veterinary Medicine, where a CT was performed.*

**Presentation and diagnosis:** Within minutes of presentation, Smoke went into cardiac arrest from severe hypovolemic shock secondary to exsanguination.

**Diagnostics and lab work:** Firm manual pressure was immediately applied to the wound in the area of Smoke's right jugular furrow. Efforts began immediately to place two large-bore IV catheters in each cephalic vessel. Blood and fluids were both prepped, EKG leads were placed, and sterile instrument packs were prepped and opened. When Smoke went into cardiac arrest, external chest compressions were immediately initiated, an ET tube was placed, and oxygen therapy was started. Epinephrine 0.4 ml was given IV in conjunction with a 1-liter plasmalyte bolus and a double unit of DEA 1.1 pRBC push. Return of spontaneous circulation (ROSC) was achieved in less than 3 minutes. During initial stabilization and resuscitation, Smoke received an additional single unit of pRBC, totaling 325 mL infused as a bolus.

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## Case Study: Smoke (continued)

During immediate stabilization, the main wound to the right jugular furrow was blindly clamped until the flow of blood was staunched. It was assumed the jugular and carotid were both included within the clamp. Once the aggressive hemorrhage was controlled, sterile gloves and instruments were obtained while the patient was roughly and quickly prepped for wound repair. Wound exploration allowed for dissection to the jugular vein, which was ligated with 0 PDS. With the main source of hemorrhage controlled, the remaining wounds were clipped and aseptically prepped with betadine. Wound exploration and closure included the placement of Penrose drains, sutures, and staples as indicated based on the wounds.

A norepinephrine CRI at 2mcg/kg/min was started to help maintain blood pressure and tissue perfusion during stabilization. Post-transfusion and post-ROSC lab work identified hyperphosphatemia and a mild panhypoproteinemia. Smoke's hematocrit at that time was 31.7%.

Smoke was admitted to the ICU for close monitoring and care. Orders included methadone 0.2mg/kg IV q 4hrs, Unasyn 30mg/kg IV q 8hrs, maropitant 1mg/kg IV q 24hrs. Blood gasses were ordered every 12 hours, PCV/TS q 8, and daily chemistries. Toward shift end, a nasal cannula was placed, and Smoke was started on oxygen @ 5L/min due to a brief episode of dyspnea that resulted in a radiographic diagnosis of a pneumomediastinum.

Over the next 24 hours, Smoke had intermittent periods of tachypnea and coughing, most notably when she became excited. She developed appreciable SQ emphysema in addition to her pneumomediastinum. An episode of vomiting resulted in acute cyanosis that required sedation and intubation. Smoke was able to recover with a butorphanol CRI of 1mg/kg/hr. Due to ongoing concern for tracheal damage and Smoke's continued instability, a tertiary referral was recommended for CT and possible repair. Smoke was transported to the North Carolina State University College of Veterinary Medicine, where a CT was performed. A tracheal laceration was identified and debrided of necrotic tissue but left to heal by second intention and granulation. Ultimately, Smoke made a full recovery and was adopted by the good Samaritan who helped save her life.

**Discussion:** Smoke's case highlights several important aspects of stabilization and monitoring of the polytrauma and post-ROSC patient.

*Smoke's injuries upon presentation included stab wounds to her neck and face.*

*A close-up of Smoke's neck, where the major wounds to her trachea, jugular vein, and carotid artery occurred.*

*After being stabilized, Smoke was admitted to the ICU for close monitoring.*

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## Case Study Discussion (continued)

On presentation, Smoke was identified as unstable, and all efforts to stabilize her began. At one point, three staff members were attempting IVC placement at three different sites, IV access being of extreme importance.

Do not forget or be afraid to perform a cut down in a hypovolemic/hypotensive patient – the skin will heal. When all else fails, or if you are dealing with a small or neonatal animal, an IO catheter in the femur or a jugular catheter can be placed within a minute.

Aggressive fluid resuscitation was initiated with both crystalloids and colloids. You will note that the only colloids used were in the pRBC transfusion, which was only indicated in this hypovolemic patient due to blood loss. While hypertonic saline can have its place in these patients, you will notice that synthetic colloids (hetastarch/VetStarch) were not used. Ongoing research continues to show they are detrimental to patients in shock situations, and their use here could have had a significant negative impact on Smoke's outcome. You will also note that steroids were not administered – a patient with normal adrenal function is capable of stimulating their own cortisol response in times of stress and illness, and parental glucocorticoids in these patients will only risk further damage to a GIT and renal system that is already suffering from decreased blood flow.

A polytrauma patient requires close monitoring following stabilization, as numerous sequela can take days to develop. Coagulopathies, pulmonary contusions, SIRS, sepsis, ARDS, vasculitis, etc., are all concerning consequences of trauma that can cause fast decompensation.

ROSC patients are also at increased risk for not only additional cardiac arrests; the poor cardiac output and tissue perfusion during the arrest incident is particularly risky for SIRS/sepsis secondary to bacterial translocation, hypoxic brain injury, increased intracranial pressures, thromboembolism, ARDS, and numerous other secondary conditions. Careful monitoring of body temperature, blood pressure, blood glucose, and WBC numbers, in particular, can be early indicators that SIRS and/or sepsis is developing and aggressive intervention is necessary. In addition to this, careful monitoring of respiratory rate and effort should be performed to watch for the development of pulmonary edema secondary to chest compressions.

And of course, please remember that the only patient who does not benefit from oxygen therapy is a patient who is on fire. After you put out the fire, we all know they will appreciate that O2.

Smoke's case could present anywhere. Having a team that can work efficiently, communicate strongly and effectively, and coordinate efforts with referral clinics is sometimes all that is necessary to save a life.

# Tech Tip: Blood Typing

By Tawny Humphrey, LVT, and Meg Carrasco, LVT

Determining a canine or feline blood type is an important factor when starting a blood transfusion. An incompatible transfusion can result in both clumping and destruction of the red cells, leading to a potentially fatal anaphylactic reaction.

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## Tech Tip (continued)


### Dogs

- There are approximately a dozen recognized Dog Erythrocyte Antigen (DEA) systems in canines.
- The most common and most important canine type is DEA 1.1.
- The majority of canines are DEA 1.1 positive, and the minority are DEA 1.1 negative.
- DEA 1.1 negative patients are considered "universal donors."


### Cats

- There are four feline blood types. The most common are A, B, and AB.
- The vast majority of felines are A, a rare group of pedigree felines is B, and type AB is very rare in all breeds.
- Cats are type-specific recipients only.

There are many kits available to help teams easily determine an individual's blood type. The COVE uses the canine and feline versions of Alvedia Quick Tests. Each kit contains all the materials needed and will give you a result in 2 minutes.

# Did You Know?

## A Blood Donation Program Can Benefit Your Hospital

The COVE receives the majority of its pRBCs from a blood bank, but it also has its own in-house blood donors. We use employee pets that fit the criteria for being suitable donors. This is a great program when outsourced blood is scarce or when we require whole blood products. To start a program in your hospital, pets need to be screened with particular protocols.

### Canine Donor Requirements

- Good temperament
- Between 1 and 7 years of age
- 50 lbs. or greater
- Generally healthy: CANNOT be receiving any other medications besides preventatives
- Current on vaccinations (DHPPC and rabies)
- On monthly heartworm and flea prevention, with a 1-year history prior
- Yearly lab work, including fecal, IDEXX Senior Profile with reflex UPC, IDEXX Blood Donor RealPCR with lab 4DX
- One-time blood typing for all qualifying donors

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## Did You Know? (continued)

### Feline Donor Requirements

- Good temperament and easy to manage
- Between 1 and 10 years of age
- 10 lbs. or greater (not obese)
- Generally healthy: No history of serious disease and not on other medications besides preventatives
- Indoor only and has minimal contact with "strange cats" (does not foster or pet sit in their home)
- Current on vaccinations (FVRCP and rabies)
- On monthly heartworm and flea prevention, with a 1-year history prior
- Yearly lab work, including fecal, IDEXX Senior Profile with reflex UPC, IDEXX Blood Donor RealPCR Panel with FeLV/FIV
- One-time blood typing for all qualifying donors


*Our refrigerated blood storage area at The COVE*

# News You Can Use

**The COVE is happy and excited to announce the addition of two new full-time emergency veterinarians, Nicolette Brinkman, DVM, and Christian Lapp, DVM.**


**Nicolette Brinkman** received her BS in Biomedical Science from the University of New Hampshire in 2014 and her DVM from Lincoln Memorial University College of Veterinary Medicine in 2018. She has been working as an ER DVM since July 2018 in Pennsylvania, at both private and corporate-owned practices. After relocating to Virginia, Dr. Brinkman is excited to join our privately owned ER and specialty practice to continue her career and passion for providing advanced emergency veterinary care.


**Christian Lapp** earned his BS in Agriculture from the University of Georgia in 2014 and his DVM from the University of Georgia College of Veterinary Medicine in 2017. He completed his SA Rotating Internship at Iowa State University (June 2017-2018) and SA Surgical Internship at Dallas Veterinary Surgical Center (July 2018-2019). He has loved traveling around the country and honing his expertise through visiting numerous practices.

Meet our full team of emergency and specialty doctors on our Team page.