VETERINARY DECONTAMINATION PROCEDURES

Wayne E. Wingfield, MS, DVM
Diplomate, ACVS, ACVECC
Emeritus Professor, Colorado State University
Veterinary Medical Officer and Squad Leader, National Medical Response Team - Central USA

Decontamination is the process of removing or rendering harmless, agents that have contaminated animals, responder personnel, and equipment. The purpose for decontamination is to limit tissue damage and absorption, to prevent systemic poisoning, confine contamination to a specified area, and to prevent secondary contamination to other animals, emergency responders, and veterinary hospitals.

Decontamination is especially critical to the health and safety of responders at weapons of mass destruction (WMD) incidents and should be a priority. All veterinary hospitals and veterinary disaster response groups should have a written decontamination plan. Contacts should be made with other agencies to ensure cooperation and consistency.

Contamination

The best way to assure animals and equipment are decontaminated is to not let them be contaminated in the first place! Responders must have a thorough understanding of how contamination occurs. Contamination occurs when animals and equipment come into contact with chemical, biological, or radiological agents.

Working animals (WAs) are potentially at the highest risk of becoming contaminated during the course of their duties. It is important to remember the working animal's risk often differs from that of the human handler. The human handler is wearing clothes that can easily be removed thus eliminating a substantial amount of contamination. The WA is covered in hair that collects hazardous particles and obviously cannot remove his/her "coat". The WA's contaminated hair coat thus becomes a means to spread the contaminant to other animals, including humans! Additionally, especially with dogs, the animal cleans him/herself with its tongue, thereby ingesting the contaminant.

Chemical and biologic agent exposure may occur by three primary routes: 1) *Inhalation/absorption through mucous membranes.* Inhaled gases, vapors and aerosols may be absorbed by any part of the respiratory tract including mucosa of the nasal passages, mouth, airways, and lungs. Due to permeability and surface area along with the direct and systemic effects, especially of chemical agents, this is the route most likely to cause severe intoxication. There is currently no equipment designed to protect animals from this route of exposure. Protective shelters are under investigation but until available the only means to protect from this route is evacuation or expedient shelter. 2) *Absorption through the skin.* Liquid droplets and solid particles which come in contact with skin may be directly absorbed and have both direct and systemic effects. Due to the protective effect of the thick coat and the lower density of sweat glands in canine skin, we expect that animals are inherently less sensitive to cutaneous toxicity from chemical agents. All non-haired portions of the skin, the dense eccrine sweat gland areas of the foot pads and nose, and damaged or inflamed skin will likely promote absorption of chemical agent. In the horse, sweat glands are prominent over the body in spite of the dense hair coat and absorption of chemical weapons is likely in this species. Animals can only be protected from cutaneous absorption by preventing contact with the agent using shelters or evacuation. There is no protective garment for animals. Protection

of skin integrity (maintaining healthy skin) and use of skin protectants should help reduce risk of cutaneous absorption. 3) *Ingestion.* Ingestion of agent may occur due to feeding of contaminated food or water or the animal licking a contaminated surface including its own skin and hair. Ingested agents will have direct effect on the gastrointestinal tract and absorption may result in systemic toxicity. The most important prevention is limiting the animal from being exposed to contaminated food, water, and environments.

Site Selection for Decontamination

Selection of a decontamination site should be based upon availability, water supply, ability to contain runoff, and the proximity of drains, sewers, streams, and ponds. The site must be upwind and uphill from the incident. It should also be a safe distance from the incident but close enough to allow easy access from the hot zone and limit the spread of contaminants.

Decontamination procedures should be established before allowing entrance into the contamination area (hot zone) for any reason, including rescue. As animals and people exit the hot zone, they must be decontaminated. Decontamination will precede any sort of medical treatment. This is because we must reduce the spread of contamination by decontaminating before moving the victim(s). Contaminated equipment (leashes, halters, saddles, etc.) must also be decontaminated as it leaves the hot zone. A decontamination corridor, in which decontamination procedures are carried out, will be established in the warm zone. Within this corridor will be areas for decontamination of victims, responders, and equipment.

Patient Decontamination

Who should decontaminate victims of WMDs? Only personnel with appropriate hazardous materials training should be allowed to participate in animal decontamination operations. In many situations, this may be local hazardous materials response teams or fire departments. Some state and federal veterinary response teams have veterinary personnel with hazardous materials training, but local first responders should identify veterinarians, animal control, agricultural agents, and other animal personnel that may respond within their communities during a disaster and help them to obtain the training and certifications that will enable them to participate in animal decontamination operations.

In general, animal owners should not decontaminate their own animals. If the owner is also contaminated it is important that they themselves be effectively decontaminated, something that is less likely to occur if they are instead participating in the decontamination of their animals. In order to provide comfort and reassurance to an animal owner that does not want to become separated from their animal, the owner and animal(s) should be commonly identified before proceeding through the respective decontamination lines so they can be more easily reunited afterwards.

Working animals are the exception to this general rule. Working dogs are sometimes not safely separately from their handlers and search-and-rescue or other detection dogs (bombs, cadaver, arson, etc.) may belong to handlers who are themselves hazmat-trained, emergency first responders. Prior training in both animal and self-decontamination should be encouraged for this group of animal owners. Personal assistance dogs are service animals, and removing them from their owner may not be possible due to the severe distress this may cause both individuals in an already stressful situation. In these cases, normal human decontamination procedures will need to be altered to accommodate them.

In situations where veterinary or other animal-care personnel are unable to enter the disaster site, communication technologies may allow a veterinarian or other qualified personnel to remotely

assist on-scene responders with animal management, decontamination, and triage from an appropriate distance.

Decontamination Station Layout: Working animals are considered responders and are thus processed through the technical decontamination station. In the ideal world, a separate decontamination station for animals, away from human personnel, is desired. There are 6 components to the veterinary decontamination station: 1. equipment drop (area where equipment (leashes, muzzles, leashes, leads, halters, bridles, saddles, blankets, etc. can be dropped and decontaminated); 2) primary decontamination site (water supply, long-handled soft bristle brushes, soap, and multiple hoses, water proof tarps or tubs are used in decontamination); 3) secondary decontamination (water supply, long-handled soft bristle brushes, soap, and multiple hoses are used to again reduce contaminants on the victim; 4) drying station (dry animals with towels, paper towels, blow dryers, etc).; 5) veterinary evaluation station (exit point to the cold zone where veterinary medical personnel may attend to illnesses or injuries of the animal(s) and monitor for hypo- and hyperthermia); and 6) recovery and rehabilitation station (animals and humans need periodic rest times in order to prepare to return to home, the mission, or farm.

Decontamination Solutions: 1) liquid dishwashing detergent and water: When comparing risks to benefits, soap and water is the best all around choice as a decontamination solution. The liquid soap can be spread liberally over the animal, worked under the hair coat using a soft bristle brush or gloved fingers. Work the soap through the hair using an S-pattern beginning at the neck, working down the back, ending up on ventral abdomen and legs. The soap is then rinsed off with copious volumes of warm water. Don't overlook the using a swimming pool for dogs or a body of water (lake, ocean, etc.) as possible means of providing decontamination for animals. The types of soaps recommended are either baby shampoo (to reduce effects on the eyes), good old fashioned "green soap, or liquid dishwasher detergent (do not use powdered dishwasher soap!). 2) hypochlorite/bleach solution: diluted bleach solutions, in the past have been recommended for decontamination of animals. The effect this agent has on the animal varies from animal to animal and will depend upon the concentration of the solution. In order to minimize effects on the animal the dilution is often to a level that the desired decontamination effect is lost. To counter this loss of effectiveness, greater contact time is required. This in turn leads to more adverse health effects on the animal. These effects are on the skin and through inhalation. 3) betadine: diluted betadine was also promoted as the best solution when decontaminating the animals exposed to a biological agent. As with hypochlorite solutions, the dilution to make the solution effective is likely ineffective on the biological agent. 4) chlorhexidine solution: in order to get the full effect from chlorhexidine solution, it would have to be left on the animal for several minutes. Time is not often a luxury when dealing with decontamination.

Suggested Reading:

Currance P. Decontamination procedures. In Currance P (ed), 2005. Medical Response to Weapons of Mass Destruction, Mosby-Jems, St. Louis, MO. Pp. 165 – 182.

Mershon MM and AV Tennyson. 1987. Chemical hazards and chemical warfare. J Amer Vet Med Assoc 190, 734-745.

American Veterinary Medical Association (AVMA). 1995. AVMA Emergency Preparedness and Response Guide. American Veterinary Medical Association, 1931 N. Meacham Rd. Suite 100, Schumberg, IL. 46204-2760.

Soric, S, MP Belanger, C Wittnich. 2008. A method for decontamination of animals involved in floodwater disasters. J Amer Vet Med Assoc. 232:364-370.

Keywords: decontamination, hot zone, warm zone, cold zone, decontamination solutions, decontamination station, decontamination site selection.

VETERINARY DISASTER TRIAGE: MAKING THE TOUGH DECISIONS

Wayne E. Wingfield, MS, DVM
Diplomate, ACVS, ACVECC
Emeritus Professor, Colorado State University
Veterinary Medical Officer and Squad Leader, National Medical Response Team - Central USA

During a disaster triage must be conducted with the purpose of doing the greatest good for the largest number of patients. Rapid examination followed by classification of patients according to the urgency of their treatment needs is critical. Triage calls for an organized approach to multiple patients and ensures that the most critical animals are identified and normalized first. To that end, triage is based upon two key points: 1) the medical needs of the patient and 2) the available medical resources (facilities, equipment, personnel, and time). Triage in local disasters requires knowledge of available facilities and capacities immediately adjacent to the disaster as well as knowing this same information for facilities located just outside of the disaster area. Without doubt, conventional triage is only the first step in a dynamic decision-making process.

Veterinary disaster triage begins with the assessment of 1) the medical needs of the patient and 2) the medical resources available. As compared to disaster triage in human medicine, triage results and treatment decisions are different because of the differences between human and veterinary medicine. Factors responsible for these differences include the following: 1. the option of euthanasia; 2. little tolerance for fair to poor outcomes of animal patients including long term/permanent disabilities or intensive nursing care requirements; 3) transport difficulties for large numbers of animals, or certain species; 4) limited veterinary medical resources (facilities, equipment, supplies, and personnel, varying 24-hour emergency care capabilities); and 5) recognizing that the treatment of animals is still dependent upon the animal owner's disposable income; therefore "medical resources" includes not only facilities, supplies, equipment, personnel, and time, but also *money*. In a disaster, <u>all animals will receive first aid care</u> regardless of the owner's ability to pay..

Presently, in veterinary medicine, there is no such designation of a Level I, II, III, or IV trauma clinic or hospital. Most veterinary practices fall into two broad categories: general practice (of 1 or more species), or specialty practice (surgery, medicine, critical care, emergency, etc). Specialty practices tend to be limited to the larger metropolitan areas and academic institutions. Many areas of the country are limited in their access to general practice care as well. Therefore, destination options may be limited, and triage will focus on identifying medical needs of the patient in light of *available* transport and medical resources, as well as the professional competency of the veterinarian.

Triage in Veterinary Medicine Involves Three Systems: Field Triage, Medical Triage, and Mobile Veterinary Unit Triage

Field Triage. Requires experienced veterinarians or rescuers and usually does not involve the individual examination of animals. More commonly, the animals are observed and decisions are made. Field triage is designed to identify animals most likely to benefit from the available care under austere conditions. It divides animals into <u>three categories</u>: 1) those that will likely die regardless of how much care they receive. Coded color = Black; 2) those that will survive whether or not they receive care. Coded color = Green; and 3) those who will benefit <u>significantly</u> from austere interventions. Coded color = Red.

Triage Color	Triage Category	Explanation
Red	Immediate	Might benefit from austere interventions
Green	Minor	Walking wounded but likely to survive
Black	Dead, dying, or euthanatize	Dead, dying, or euthanatize

Advantages of the veterinary field triage system include the following: focuses resources appropriately; requires an experienced triage team; tough decisions are made and adhered to; and after the disaster is over, the team retrospectively examines decisions and dedicates themselves to an improved performance.

Medical Triage. Medical triage is done rapidly and involves examining individual animals. One approach is to use the following four physiological criteria (RPPN): 1) **R**espiration/minute, 2) **P**ulse rate/minute, 3) **P**ulse pressure (although subjective, pulse pressure has a linear relationship to stroke volume. Therefore, if the pulse pressure is decreased (as you might see in shock) the stroke volume is also likely decreased), and 4) **N**eurological status. Coding in medical triage using RPPN is seen in the following table:

Category	Color	RPPN*
Immediate	**Red**	Abnormal RPP
Urgent	**Yellow**	Abnormal PPN
Minor	**Green**	"Normal RPPN"
Dead, Dying, or Euthanatize	**Black**	Mortal Wounds or Severely Abnormal Neurological

* RPPN = **R**espiration, **p**ulse rate, **p**ulse pressure, and **n**eurological status.

In veterinary triage, it is important to recognize that limitations of treatment and injuries for certain species will effect the triage assessment. For example a fractured femur in a dog may be tagged **Yellow**, but a fractured femur in a horse will be tagged **Black.** A relatively small number of animals can overwhelm the veterinary medical system necessitating the implementation of the field triage system discussed above.

Medical triage **always** begins with a reassessment of patients. **Immediate** and **Urgent** patients go to the treatment area, where they are treated based on severity and resources (Figure 1).

Those patients who need limited resources with a high probability of surviving will probably be treated first. **Minor** casualties go to an observation area where they are periodically reassessed. Patients who do not respond to treatment are re- tagged and sent to the observation area or euthanatized. One critical difference in veterinary triage (versus human) is that the category of patients that will die regardless of how much care they receive and those that will suffer for the lack of care will be euthanatized. Therefore, it is very important to properly identify those animals who will survive whether or not they receive care, and those who will benefit significantly from available interventions. Of note, while euthanatizing an injured animal is done for humane reasons, these decisions need to be well documented and supported. It is not uncommon for some animals (horses especially) to be insured, and the insurance company must authorize the euthanasia when possible. When contacting the insurance company is not feasible, documentation and witnesses are very important.

All animals must be identified and a variety of methods can be used. Ribbons of the appropriate triage color may be attached to the animal. These will have no information regarding the patient. An alternative would be to attach a triage tag to the animal. This tag utilizes an image of a dog but this should not deter its use on other veterinary species. The idea is to identify wounds, fractures, burns, etc. by marking an approximate location on the triage tag image. It is also important the behavioral disposition of the animal be identified to make other responders aware of potential aggressiveness.

Mobile Veterinary Unit Triage: The term "mobile veterinary unit" signifies it is unlikely we will know beforehand what sort of facility might be available during a disaster that will allow us to provide more intensive treatment of ill or injured animals. It may be a tent, a mobile veterinary vehicle, an undamaged veterinary hospital, or a large covered arena or warehouse.

Triage in a mobile veterinary unit utilizes a physiological systems approach entitled **V**eterinary **S**ystems **T**riage and **R**apid **T**reatment (**V-START**). The physiological systems priorities in V-START are as follows: 1) respiratory, 2) cardiovascular, 3) hemorrhage, 4) neurological, 5) musculoskeletal, and 6) other (abdominal) injuries (Figures 2a, 2b, 2c). The coding system used in V-START is as follows:

Triage Color	Category	Physiological System Involvement
Red	Immediate	Respiratory, Cardiovascular, (Hypothermia, Hyperthermia)
Yellow	Urgent	Cardiovascular, Musculoskeletal, Neurological, Abdominal Injuries
Green	Minor	Musculoskeletal, Neurological, Abdominal Injuries
Black	Dead, Dying, or Euthanasia	Dead or dying when initially assessed. Mortal wounds not compatible with “Quality of Life” issues. Euthanasia.

Summary

Both human and veterinary medicine use *triage* to sort and prioritize treatment of patients. Both require an understanding of the medical needs of the patient, and the available medical resources. While the medical decision-making process is similar in human and veterinary triage, the triage results and treatment decisions may differ because of the differences between human and

veterinary medicine. Recognizing these similarities and differences is important in order to optimize the triage goal of **doing the greatest good for the greatest number**.

Keywords: Triage, disaster, medical triage, field triage, veterinary mobile unit triage, V-START, RPPN, systems triage.

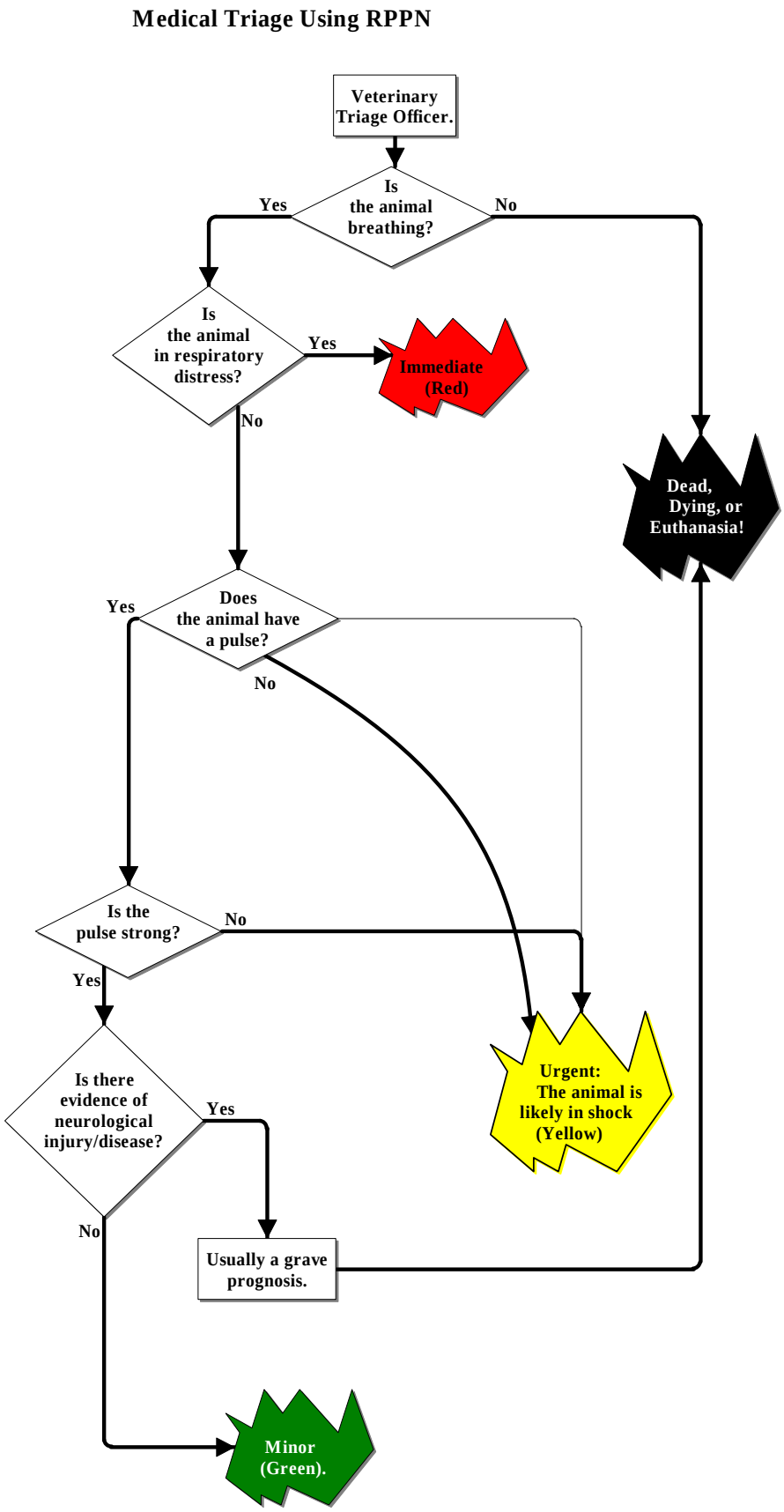

Figure 1: Algorithm to assist veterinary responders in providing Medical Triage.

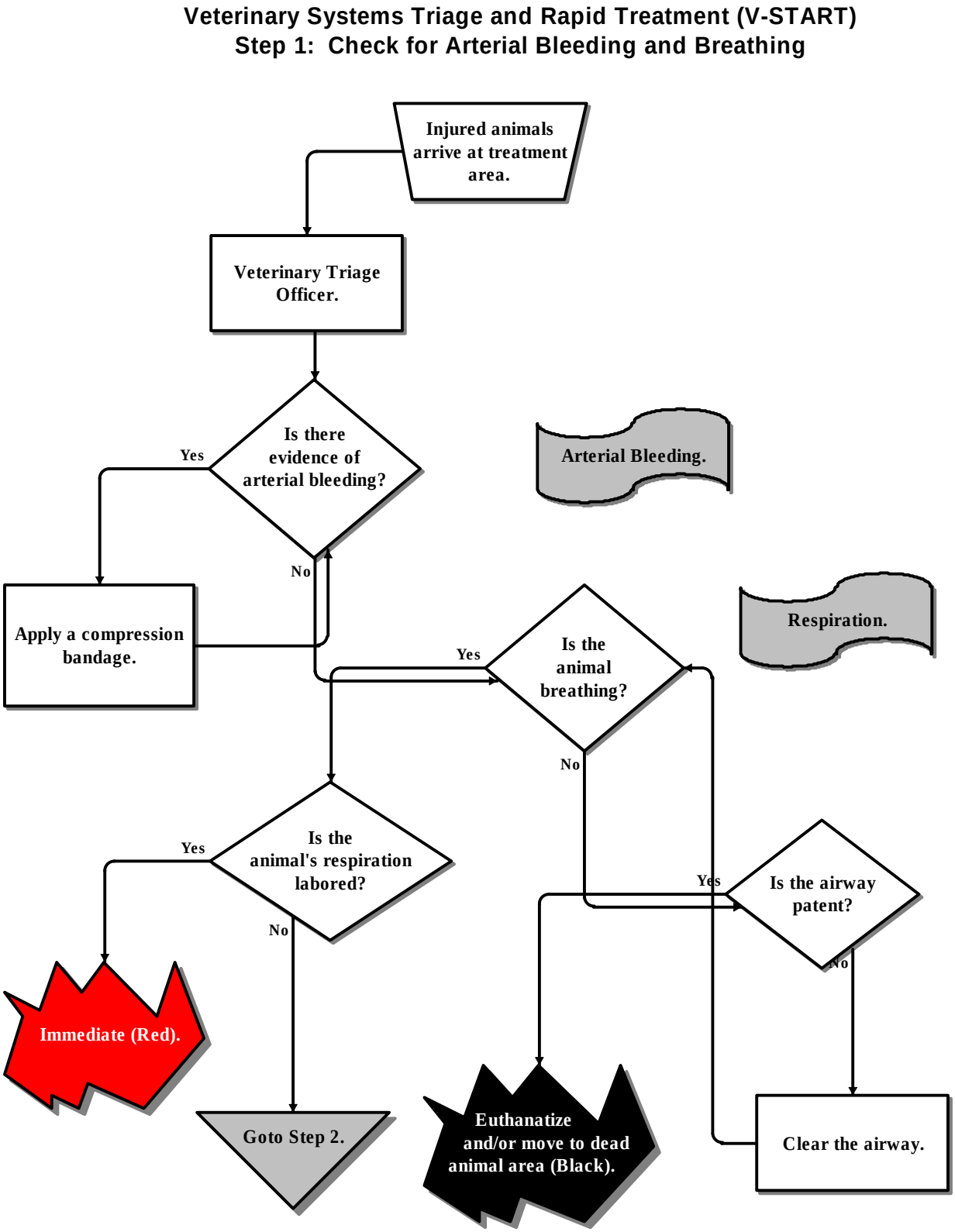

Figure 2a: Step 1 in providing Mobile Veterinary Unit Triage using V-START.

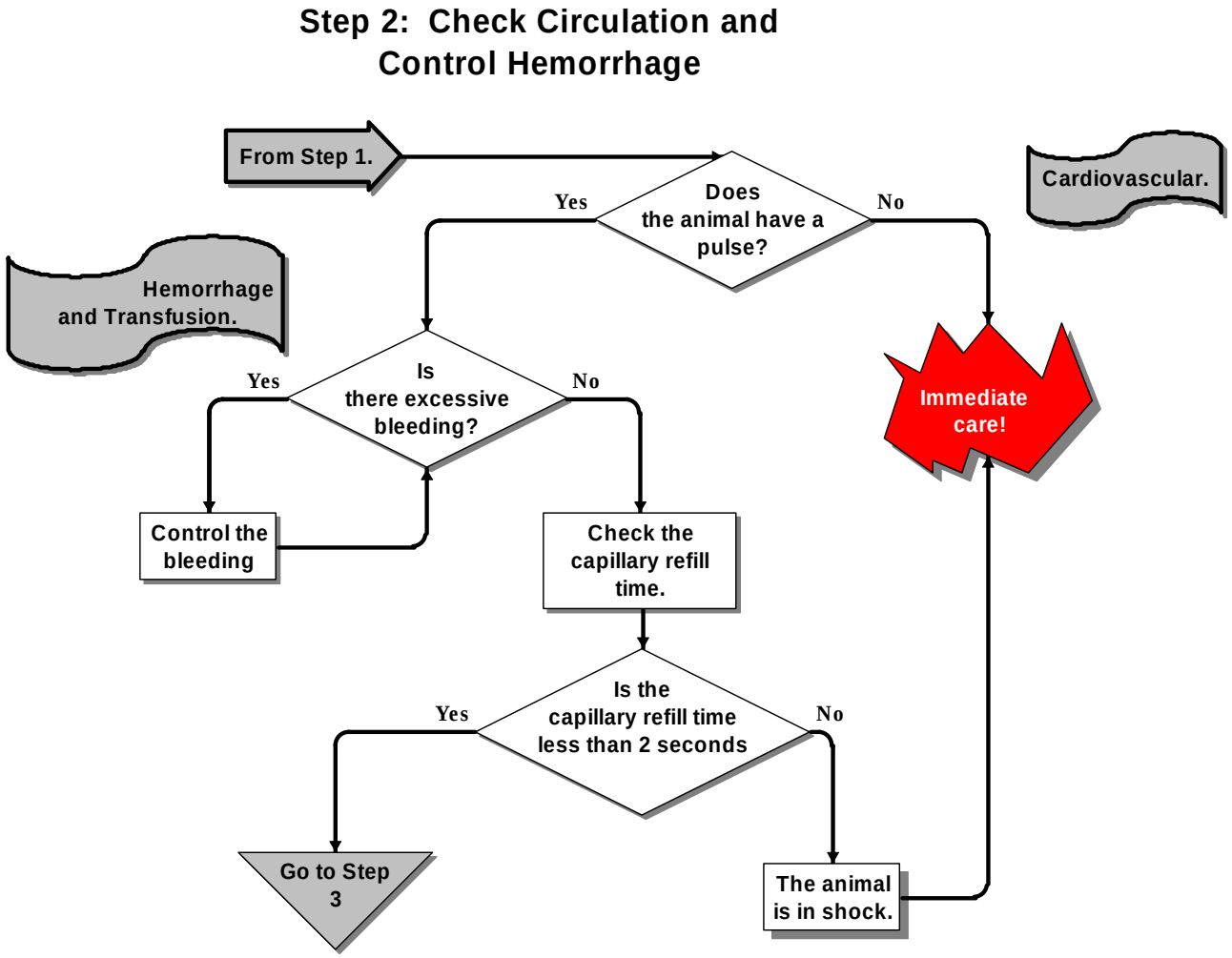

Figure 2b: Step 2 in providing Mobile Veterinary Unit Triage using V-START.

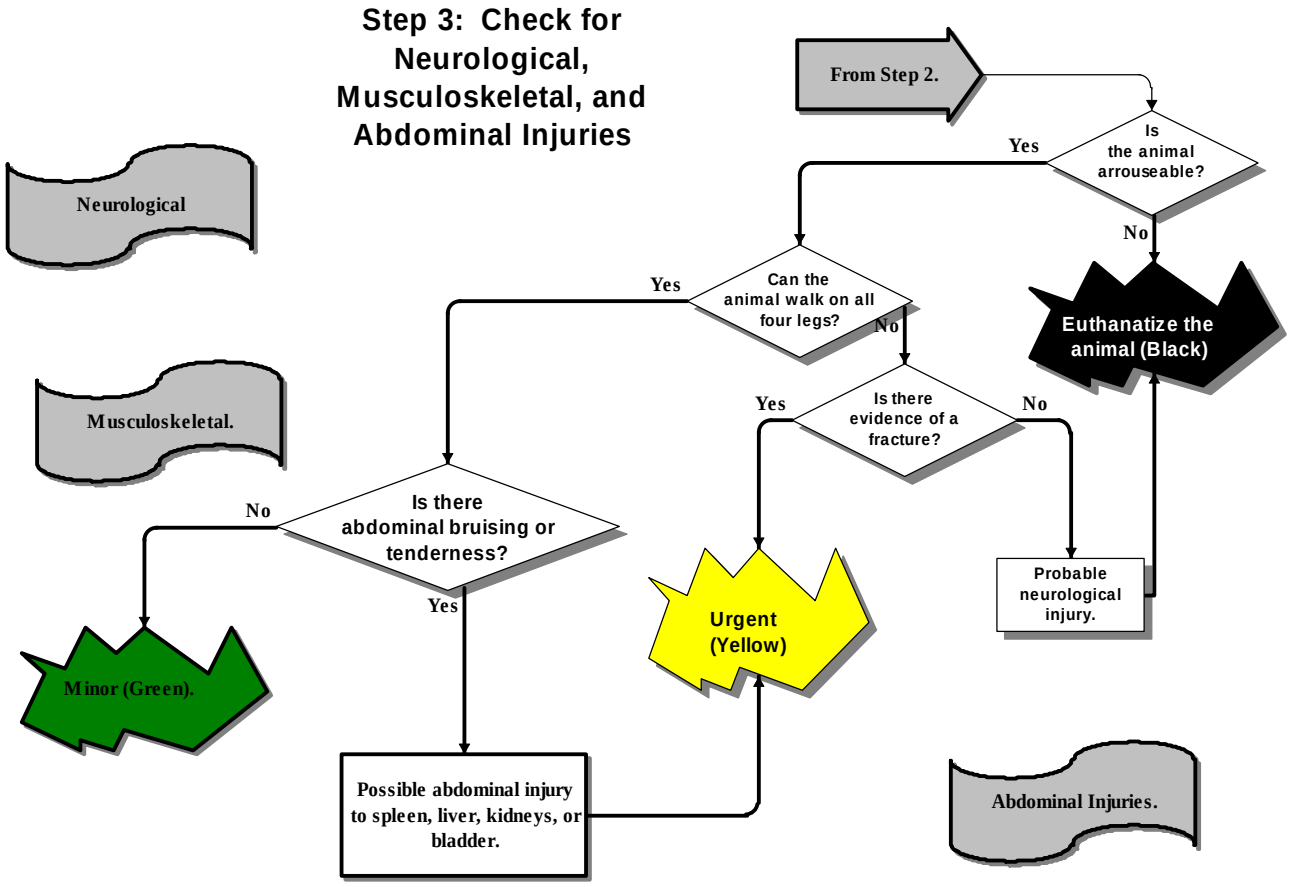

Figure 2c: Step 3 in providing Mobile Veterinary Unit Triage using V-START.

VETERINARY DISASTER TRIAGE: MAKING THE TOUGH DECISIONS

Wayne E. Wingfield, MS, DVM
Diplomate, ACVS, ACVECC
Emeritus Professor, Colorado State University
Veterinary Medical Officer and Squad Leader, National Medical Response Team - Central USA

During a disaster triage must be conducted with the purpose of doing the greatest good for the largest number of patients. Rapid examination followed by classification of patients according to the urgency of their treatment needs is critical. Triage calls for an organized approach to multiple patients and ensures that the most critical animals are identified and normalized first. To that end, triage is based upon two key points: 1) the medical needs of the patient and 2) the available medical resources (facilities, equipment, personnel, and time). Triage in local disasters requires knowledge of available facilities and capacities immediately adjacent to the disaster as well as knowing this same information for facilities located just outside of the disaster area. Without doubt, conventional triage is only the first step in a dynamic decision-making process.

Veterinary disaster triage begins with the assessment of 1) the medical needs of the patient and 2) the medical resources available. As compared to disaster triage in human medicine, triage results and treatment decisions are different because of the differences between human and veterinary medicine. Factors responsible for these differences include the following: 1. the option of euthanasia; 2. little tolerance for fair to poor outcomes of animal patients including long term/permanent disabilities or intensive nursing care requirements; 3) transport difficulties for large numbers of animals, or certain species; 4) limited veterinary medical resources (facilities, equipment, supplies, and personnel, varying 24-hour emergency care capabilities); and 5) recognizing that the treatment of animals is still dependent upon the animal owner's disposable income; therefore "medical resources" includes not only facilities, supplies, equipment, personnel, and time, but also *money*. In a disaster, <u>all animals will receive first aid care</u> regardless of the owner's ability to pay..

Presently, in veterinary medicine, there is no such designation of a Level I, II, III, or IV trauma clinic or hospital. Most veterinary practices fall into two broad categories: general practice (of 1 or more species), or specialty practice (surgery, medicine, critical care, emergency, etc). Specialty practices tend to be limited to the larger metropolitan areas and academic institutions. Many areas of the country are limited in their access to general practice care as well. Therefore, destination options may be limited, and triage will focus on identifying medical needs of the patient in light of *available* transport and medical resources, as well as the professional competency of the veterinarian.

Triage in Veterinary Medicine Involves Three Systems: Field Triage, Medical Triage, and Mobile Veterinary Unit Triage

Field Triage. Requires experienced veterinarians or rescuers and usually does not involve the individual examination of animals. More commonly, the animals are observed and decisions are made. Field triage is designed to identify animals most likely to benefit from the available care under austere conditions. It divides animals into <u>three categories</u>: 1) those that will likely die regardless of how much care they receive. Coded color = Black; 2) those that will survive whether or not they receive care. Coded color = Green; and 3) those who will benefit <u>significantly</u> from austere interventions. Coded color = Red.

Triage Color	Triage Category	Explanation
Red	Immediate	Might benefit from austere interventions
Green	Minor	Walking wounded but likely to survive
Black	Dead, dying, or euthanatize	Dead, dying, or euthanatize

Advantages of the veterinary field triage system include the following: focuses resources appropriately; requires an experienced triage team; tough decisions are made and adhered to; and after the disaster is over, the team retrospectively examines decisions and dedicates themselves to an improved performance.

Medical Triage. Medical triage is done rapidly and involves examining individual animals. One approach is to use the following four physiological criteria (RPPN): 1) **R**espiration/minute, 2) **P**ulse rate/minute, 3) **P**ulse pressure (although subjective, pulse pressure has a linear relationship to stroke volume. Therefore, if the pulse pressure is decreased (as you might see in shock) the stroke volume is also likely decreased), and 4) **N**eurological status. Coding in medical triage using RPPN is seen in the following table:

Category	Color	RPPN*
Immediate	**Red**	Abnormal RPP
Urgent	**Yellow**	Abnormal PPN
Minor	**Green**	"Normal RPPN"
Dead, Dying, or Euthanatize	**Black**	Mortal Wounds or Severely Abnormal Neurological

* RPPN = **R**espiration, **p**ulse rate, **p**ulse pressure, and **n**eurological status.

In veterinary triage, it is important to recognize that limitations of treatment and injuries for certain species will effect the triage assessment. For example a fractured femur in a dog may be tagged **Yellow**, but a fractured femur in a horse will be tagged **Black.** A relatively small number of animals can overwhelm the veterinary medical system necessitating the implementation of the field triage system discussed above.

Medical triage **always** begins with a reassessment of patients. **Immediate** and **Urgent** patients go to the treatment area, where they are treated based on severity and resources (Figure 1).

Those patients who need limited resources with a high probability of surviving will probably be treated first. **Minor** casualties go to an observation area where they are periodically reassessed. Patients who do not respond to treatment are re- tagged and sent to the observation area or euthanatized. One critical difference in veterinary triage (versus human) is that the category of patients that will die regardless of how much care they receive and those that will suffer for the lack of care will be euthanatized. Therefore, it is very important to properly identify those animals who will survive whether or not they receive care, and those who will benefit significantly from available interventions. Of note, while euthanatizing an injured animal is done for humane reasons, these decisions need to be well documented and supported. It is not uncommon for some animals (horses especially) to be insured, and the insurance company must authorize the euthanasia when possible. When contacting the insurance company is not feasible, documentation and witnesses are very important.

All animals must be identified and a variety of methods can be used. Ribbons of the appropriate triage color may be attached to the animal. These will have no information regarding the patient. An alternative would be to attach a triage tag to the animal. This tag utilizes an image of a dog but this should not deter its use on other veterinary species. The idea is to identify wounds, fractures, burns, etc. by marking an approximate location on the triage tag image. It is also important the behavioral disposition of the animal be identified to make other responders aware of potential aggressiveness.

Mobile Veterinary Unit Triage: The term "mobile veterinary unit" signifies it is unlikely we will know beforehand what sort of facility might be available during a disaster that will allow us to provide more intensive treatment of ill or injured animals. It may be a tent, a mobile veterinary vehicle, an undamaged veterinary hospital, or a large covered arena or warehouse.

Triage in a mobile veterinary unit utilizes a physiological systems approach entitled **V**eterinary **S**ystems **T**riage and **R**apid **T**reatment (**V-START**). The physiological systems priorities in V-START are as follows: 1) respiratory, 2) cardiovascular, 3) hemorrhage, 4) neurological, 5) musculoskeletal, and 6) other (abdominal) injuries (Figures 2a, 2b, 2c). The coding system used in V-START is as follows:

Triage Color	Category	Physiological System Involvement
Red	Immediate	Respiratory, Cardiovascular, (Hypothermia, Hyperthermia)
Yellow	Urgent	Cardiovascular, Musculoskeletal, Neurological, Abdominal Injuries
Green	Minor	Musculoskeletal, Neurological, Abdominal Injuries
Black	Dead, Dying, or Euthanasia	Dead or dying when initially assessed. Mortal wounds not compatible with “Quality of Life” issues. Euthanasia.

Summary

Both human and veterinary medicine use *triage* to sort and prioritize treatment of patients. Both require an understanding of the medical needs of the patient, and the available medical resources. While the medical decision-making process is similar in human and veterinary triage, the triage results and treatment decisions may differ because of the differences between human and

veterinary medicine. Recognizing these similarities and differences is important in order to optimize the triage goal of **doing the greatest good for the greatest number**.

Keywords: Triage, disaster, medical triage, field triage, veterinary mobile unit triage, V-START, RPPN, systems triage.

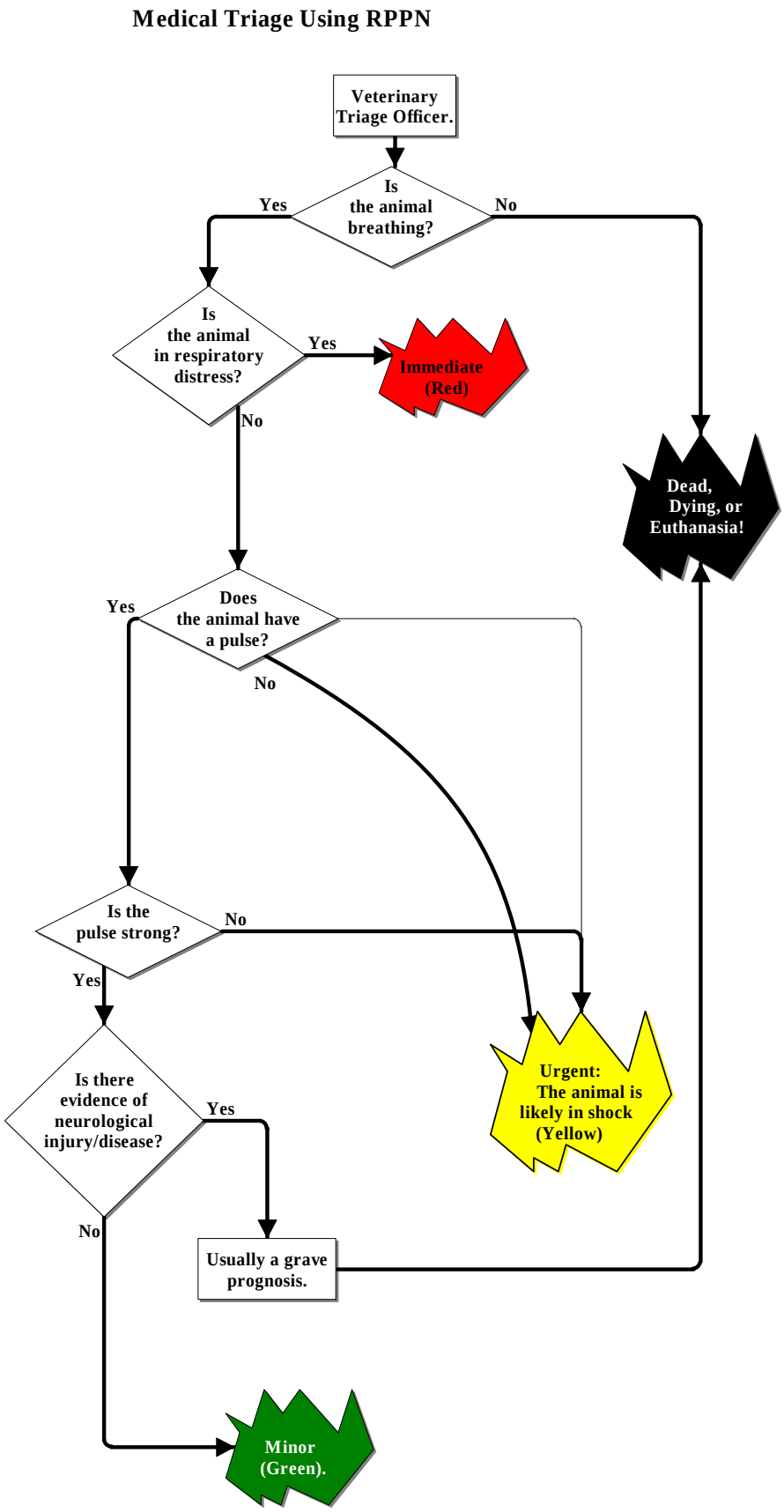

Figure 1: Algorithm to assist veterinary responders in providing Medical Triage.

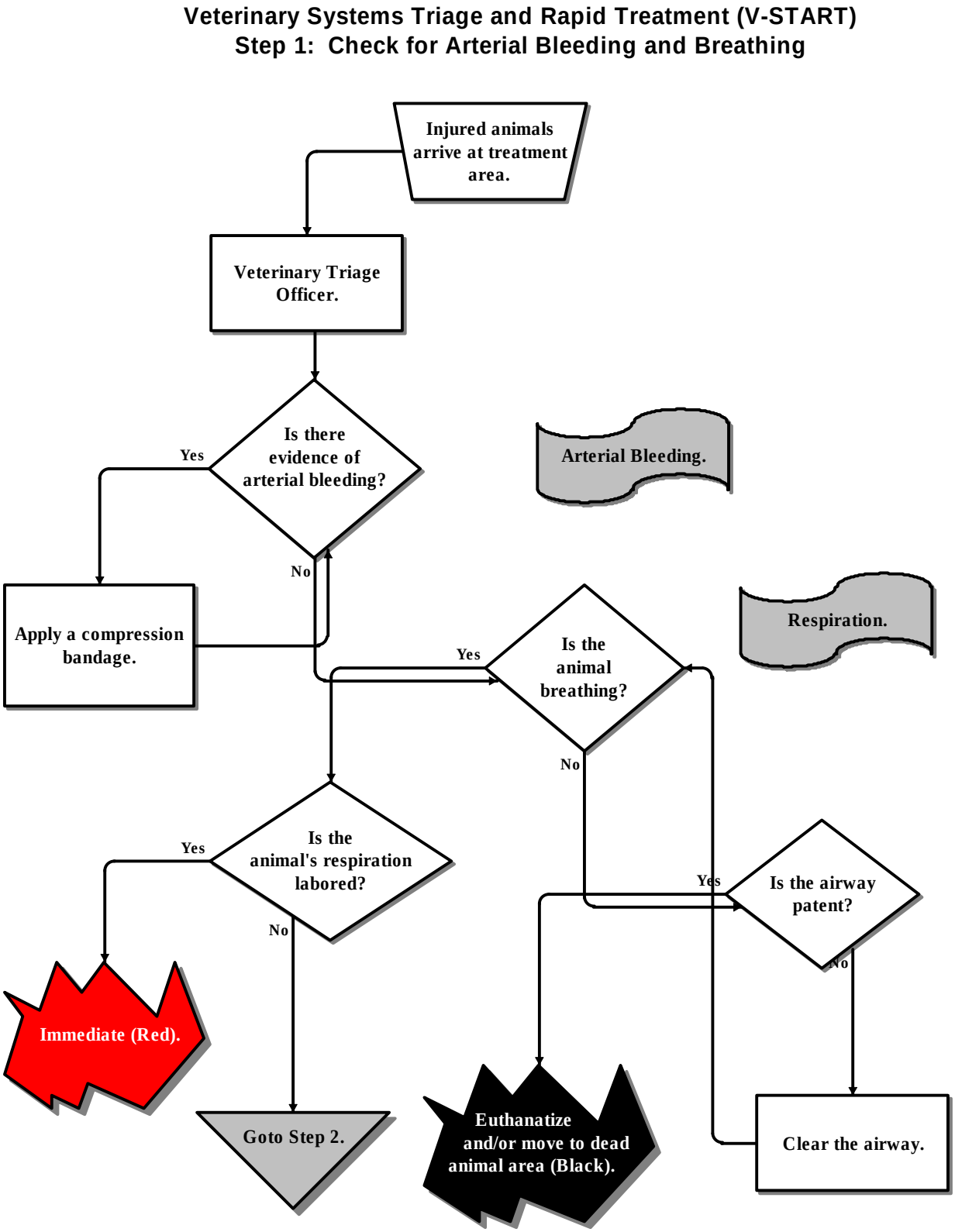

Figure 2a: Step 1 in providing Mobile Veterinary Unit Triage using V-START.

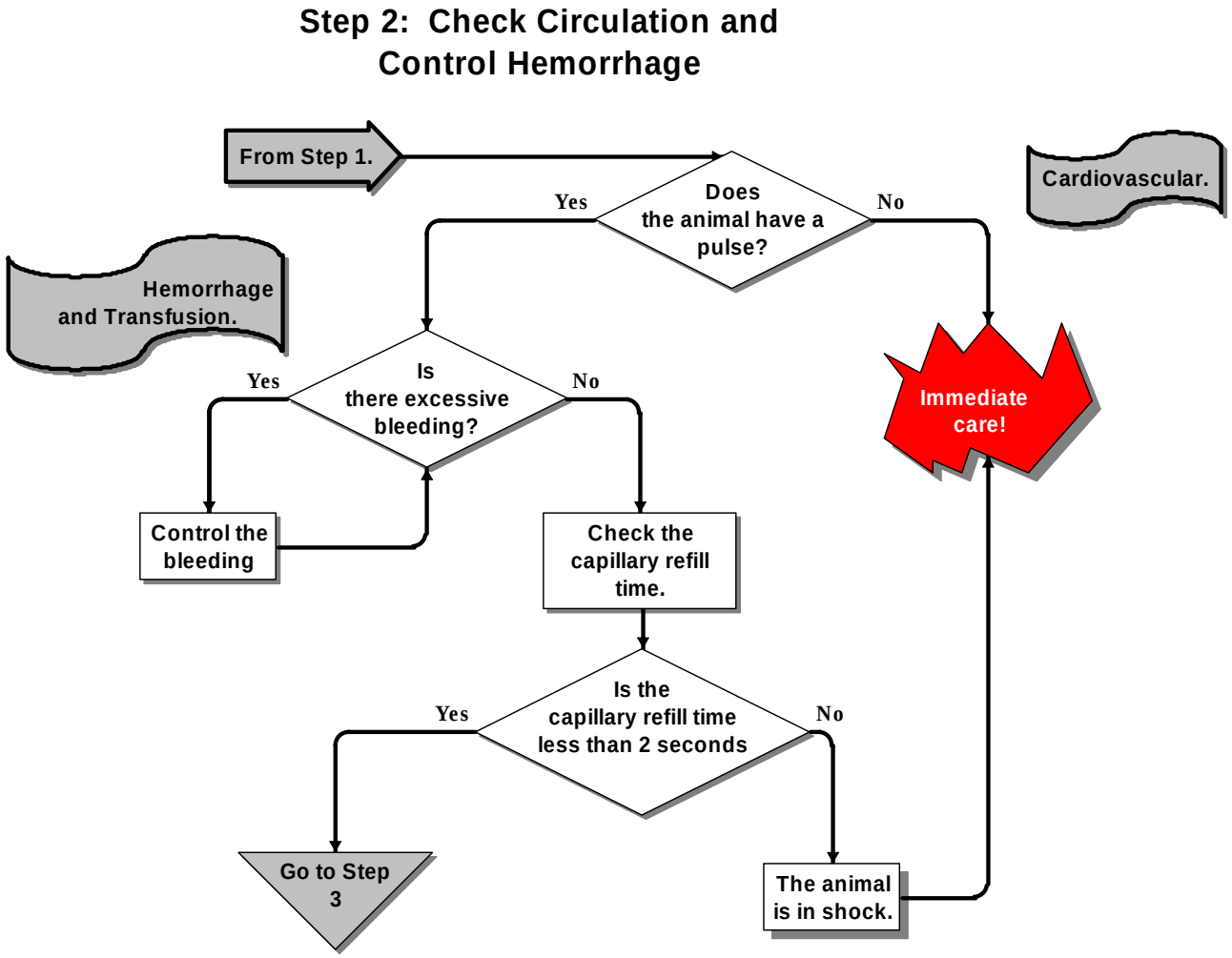

Figure 2b: Step 2 in providing Mobile Veterinary Unit Triage using V-START.

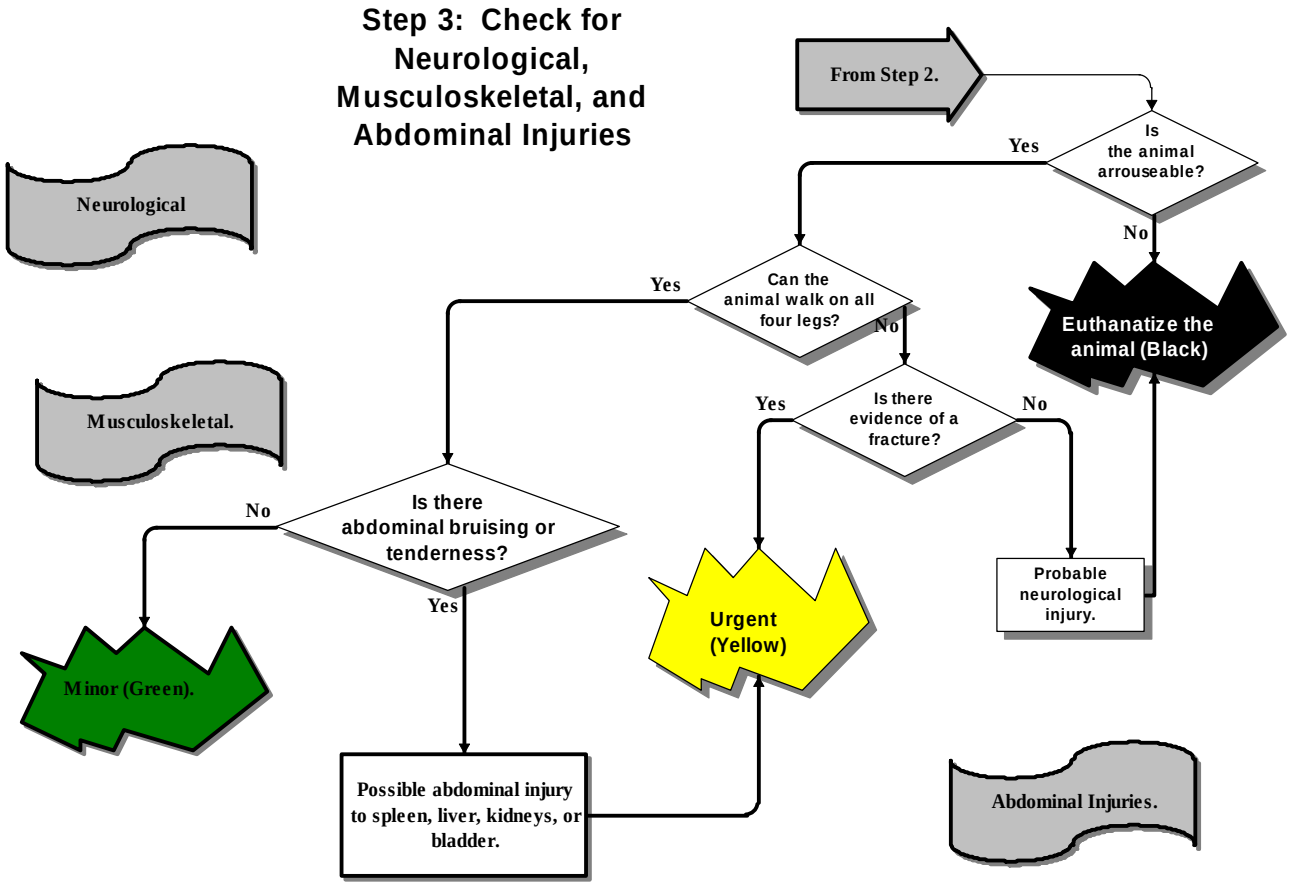

Figure 2c: Step 3 in providing Mobile Veterinary Unit Triage using V-START.