

Resources for the optimal care of the injured veterinary patient

**American College of Veterinary Emergency and Critical Care Veterinary Committee on Trauma (ACVECC VetCOT)
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Role of the veterinary trauma center – An overview

A small animal (SA) veterinary trauma center (VTC) can provide team-based care for any trauma patient. It provides the SA trauma patient with access to comprehensive resources for their treatment. In a VTC, an emergency veterinarian is immediately available to the SA trauma patient while other veterinarians with specific specialist qualifications may be on call for emergency consultation and/or available during standard business hours, depending on the verification level of the VTC.

Veterinary trauma centers are available to receive transfers of severely injured animals referred from other primary veterinary clinics and other emergency hospitals. All VTC hospitals are also able to receive and medically address the condition of any urgent or emergent veterinary patient (i.e. not just those that have experienced trauma).

Additionally, VTCs offer the most up-to-date care for SA trauma patients by meeting standards of continuing education, remaining up to date with advances in human and veterinary trauma care, and a process of performance assessment and improvement. VTCs will contribute to the veterinary knowledge base by training veterinarians in trauma care (staff doctors, interns and/or residents), conducting trauma-related research, and maintaining medical record systems amenable to contributing required data to a trauma database that can be used for single and multi-center veterinary trauma research.

Verification levels for veterinary trauma centers - Overview

These guidelines are intended to provide a description of verification levels (I through III) and associated standards for VTC facilities. Verification levels set specific criteria and standards of care that outline the capabilities of a particular VTC. This information is designed to help animal owners and referring veterinarians in choosing the most appropriate veterinary facility for an injured animal. Below is a listing and brief description of verification levels. This document also provides more detailed requirements for each VTC level.

Level I VTCs must have the ability to provide total care for every aspect of management of the SA trauma patient from emergency stabilization through definitive medical and surgical care, and rehabilitation. This requires significant depth of resources (medical and surgical) and personnel. These hospitals are open to receive SA trauma patients (and other emergencies) 24 hours a day, 7 days a week, 365 days a year. Level I VTCs also have the responsibility of providing leadership in education, training of veterinarians and veterinary technicians, and research. Level I VTCs are likely to have internship and/or residency programs in emergency and critical care (ECC); however, this is not a current requirement. Training for emergency veterinarians and technicians should involve, at a minimum, regular in-house continuing education specifically in the field of trauma.

Level I VTCs have specialists available for in-house consultation 7-days a week in the fields of emergency and critical care, surgery, cardiology and radiology. In order to enable definitive care for trauma patients, specialists in anesthesiology, neurology, internal medicine, cardiology, and ophthalmology are also available on staff and on an on-call basis as needed. The intensive care unit (ICU) is under the supervision of an emergency and critical care specialist (DACVECC) and is staffed by experienced and/or certified veterinary technicians (CVTs) and veterinarians 24 hours a day, 7 days a week.

Level II VTCs are acute care facilities with the commitment, resources, and skilled personnel necessary to provide sophisticated medical and surgical, emergent and critical care for critically ill or injured animals. These hospitals are open to receive SA trauma patients (and other emergencies) 24 hours a day, 7 days a week, 365 days a year. Level II VTCs must have specialists in emergency and critical care, surgery and internal medicine. Additionally these centers have a radiologist(s) available for consultation (if not available in-house).

Level III VTCs facilities have similar requirements to those of Level II VTCs with the exception that they are not required to be open 24 hours a day. Level III VTCs have the commitment, resources, and skilled personnel necessary to provide high level care for injured animals during business hours. These hospitals are open to receive SA trauma patients (and other emergencies) during part of the day but not necessarily 24 hours a day. Level III VTCs are primarily involved in the stabilization of severely traumatized patients and management of less severely injured trauma patients. There must be a veterinarian on duty, on the premises, at all times during hours of operation. These hospitals are not required to be staffed with veterinarians and technicians 24 hours a day and thus may transfer patients to a Level I or II VTC following initial stabilization, for ongoing care. Additionally, these hospitals are not

required to have veterinarians with specialist qualifications on staff, and thus animals may be transferred to another facility for definitive medical or surgical care when necessary. Level III VTCs have procedures in place to allow consultation with, and easy transfer of patients to, Level I and/or II VTCs.

Based on these levels it is expected that there are relatively few Level I VTCs, larger numbers of Level II VTCs and even larger numbers of Level III VTCs. As a guideline, Level I VTCs are anticipated to include the larger, higher case-load, urban or suburban university hospitals and the largest private referral hospitals; Level II VTCs will include smaller, lower case-load university hospitals and private emergency and referral hospitals. Level III VTCs will include emergency clinics/hospitals (which may or may not be associated with a specialty referral hospital), and busy general practices with an interest in emergency and trauma medicine.

General staffing requirements for veterinary trauma centers

Regardless of the certification level of the VTC, staffing should be sufficient to allow:

- stabilization of multiple patients concurrently
- performance of life-saving procedures, including but not limited to intubation and short-term ventilation, administration of intravenous fluids, damage control surgery, placement of thoracostomy tubes and cardiopulmonary resuscitation (CPR)
- treatment of inpatients; and
- appropriate and timely consultation with veterinary specialists.

Depending on the caseload of the VTC, this requires at least (3) people, including at least (1) veterinarian and at least (1) veterinary technician, on the premises at all times during the hours of operation.

Clarification of Terminology used in this document

Please note that this document denotes specialist qualifications according to the AVMA American Board of Veterinary Specialties. Equivalent specialists in other countries may be substituted when deemed appropriate.

For the purposes of this document the term house officer is used to refer to interns and residents in formal training programs.

The term emergency surgeon will be used to refer to a Diplomate (DACVS, DAVECC), resident (ACVS or ACVECC resident) or DVM experienced in emergency surgery.

I. Requirements for Level I veterinary trauma centers

A. Systems requirements

1. VECCS Level I facility certification is required.
2. The hospital has the commitment of their ownership, administration and the medical staff to become a VTC.
3. There is sufficient infrastructure and support to the trauma service (from within the hospital) to ensure adequate provision of care.
4. The emergency department/section of the hospital has a dedicated emergency room (ER) director supported by an appropriate number of additional veterinarians and support staff to ensure immediate care for injured patients at any time of the day/night (i.e. certain staffing levels are imperative).
5. Level I VTCs are required to have at least (2) DVMs in the hospital at all times, such that one person can be dedicated to care of hospitalized animals, while another receives emergencies.
6. In addition to VECCS Level I Facility Certification requirements (One VTS-ECC, Two CVT/RVT/LVT in states that offer technician licensing or certification), Level 1 VTCs are encouraged to have at least 1 VTS-ECC in the ER/ICU at any given time.
7. CVT/RVT/LVT make up 80% of the technician/nursing support staff on the Emergency, Intensive Care Unit, Surgery, Neurology, Anesthesia and Radiology services. If hospitals don't have 80% CVT/RVT/LVT due to lack of state requirements for licensure, hospitals can submit a document outlining hiring requirements for technician nursing staff and list the skill sets common to nurse technicians on each service

B. Leadership

1. The trauma medical director is a DACVECC.
2. The trauma medical director is clinically active and spends time as the attending veterinarian in the emergency room/trauma center averaging 20 hours/week on the clinical floor for a minimum of 26 weeks/year (i.e. not just an administrative role). This may include primary case management and/or supervision of receiving ER veterinarians.
3. The trauma medical director will coordinate a steering committee that oversees the operations of the VTC. This advisory group will be made up of liaisons from each of the following key services from within the hospital or consulting for the hospital:
 - (i) Hospital administration
 - (ii) Surgery (either a single surgery liaison or in a larger hospital there may be a liaison from each of soft tissue surgery, orthopedic surgery and neurosurgery)
 - (iii) Neurology
 - (iv) Anesthesiology
 - (v) Radiology
 - (vi) Clinical pathology *if present*
 - (vii) Cardiology
 - (viii) Internal Medicine
 - (ix) Ophthalmology
 - (x) Dentistry *if present*; and
 - (xi) Rehabilitation therapy *if present as a separate section within the hospital *
4. It is expected that the liaison from each specialty service be a specialist in that area. This will generally be a veterinarian, however it is understood that in some circumstances it will be appropriate for a specialist technician to serve in this role.
5. Each trauma center will identify a CVT/RVT/LVT (ideally VTS-ECC) to serve as the trauma center Veterinary Technician Trauma Manager. This individual will be responsible for implementing hospital trauma protocols for the veterinary technicians, supporting trauma patient data management and overseeing continuing education on trauma for veterinary technicians

C. Patient admission

1. VTCs are expected to practice triage for all patients presenting to the ER. Veterinary technicians, students (in veterinary teaching hospitals) and veterinarians will be trained in the practice of triage.
 - (i) There is a Standard Operating Procedure for hospital triage practices. This SOP is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training involved staff on the SOP
2. In order to facilitate movement of animals, a gurney, dedicated to the emergency service will be located near the front entrance of the VTC at all times.
3. Backboards will be available for the transport of animals with known or suspected spinal injury.
4. ER veterinarians must be present in the ER at all times.
5. Seriously injured patients are to be admitted and stabilized by clinicians with advanced training (e.g., DACVECC, ACVECC residents or experienced emergency doctors) or closely supervised interns or new (<1 year) graduates.

D. Surgical commitment and resources

1. Surgical commitment is essential for a properly functioning VTC.
2. Board-certified surgeons (DACVS) with soft tissue, orthopedic and neurosurgical capabilities are available in-house at least 8–10 hours a day, 5 days a week, and on an on-call basis as needed (see below).
3. While it is a requirement that DACVS are available, it is understood that many experienced emergency veterinarians are capable of performing emergency surgery (specifically soft tissue surgery), and that this may be appropriate, even in Level I VTCs depending on the nature of the case.
4. Level I VTCs provide sufficient resources, including instruments, equipment and personnel, for modern soft tissue, orthopedic/musculoskeletal and neurosurgical trauma care with readily available operating rooms (ORs) for trauma procedures.

5. The OR(s) is immediately ready for use and has essential equipment, including but not limited to a variety of appropriate sterile, surgical packs including retractors, suction, electrocautery, and other hemostatic devices necessary to perform trauma surgery.
6. There is a Standard Operating Procedure for OR readiness that is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training staff on the SOP.
7. OR technicians, if not on-site, must be on-call and able to be in the hospital within 60 minutes of being called in. Additionally, in the interim, the emergency team in the hospital must have access to the ORs and be adequately trained in OR procedure to provide technical assistance for animals going immediately into the OR.
8. There is a minimum of 2 ORs in the hospital. There is a mechanism for providing additional staff for a second OR when the first OR is occupied.
9. Reconstructive surgery and spinal surgery capabilities are present.
10. Appropriate advanced anesthesia drugs and equipment related to highest risk patient sedation and anesthesia are available.

E. Soft-tissue surgery

1. It is expected that an emergency surgeon (either DACVS, or DACVECC, ACVS or ACVECC resident or DVM experienced in emergency surgery) can be in the hospital within 60 minutes of being called in by ER personnel.
2. If the on-call surgeon is a resident or DVM experienced in emergency surgery, they must have DACVS and/or DACVECC backup available for phone consultation and that can also be in the hospital within 60 minutes of being called in by the primary surgeon on call.
3. There is always a veterinarian in the hospital (i.e. 24 hours a day) with the necessary training and skills to perform immediate damage control (DC) surgery, with the understanding that backup is available as above.
 - (i) For the purposes of this document DC surgery will be defined as resuscitative surgery needed to stop major hemorrhage (thoracic, abdominal, cervical and truncal) and minimize major air-leaks from the trachea, bronchus or lung and to also provide required direct CPR.
 - (ii) There is a Standard Operating Procedure for the identification of a patient requiring DC surgery and the immediately available and back up personnel and equipment involved in DC surgery. This SOP is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training involved staff on the SOP.
4. There is a soft tissue surgeon who is identified as the liaison to the trauma program. This person, and/or the trauma medical director, is responsible for providing standardized training to all front-line ER veterinarians on DC surgery.
5. The hospital will provide an on-call soft-tissue surgery backup schedule with formally arranged contingency plans in case the capability of the primary on-call soft tissue surgeon is overwhelmed (eg. ideally have primary surgeon on-call (ACVS resident, ACVECC resident or experienced DVM), secondary surgeon on-call (another resident, experienced DVM or DACVS), 3rd level of backup (faculty, DACVS)).
6. ORs are promptly available for emergency soft tissue surgery.

F. Neurotrauma care

1. Level I VTCs are required to have a DACVIM-Neurology on staff.
2. Neurotrauma care is promptly and continuously available for severe traumatic brain injury (TBI) and spinal cord injury (SCI), and for less severe head and spine injuries when necessary. This may include but is not limited to availability of pharmacologic, mechanical ventilation, and neurosurgical capabilities (see below).
3. An attending neurosurgeon must be on-call at all times; this can be either a DACVS or DACVIM (Neurology) with appropriate surgical training. Residents in training in either specialty should have appropriate backup from their supervising diplomates when performing emergency neurosurgery.
4. An attending neurosurgeon is available when neurosurgical consultation is requested. It is expected that a neurosurgeon can be in the hospital within 60 minutes of being called in by ER personnel when necessary.
5. The neurosurgeon must be experienced in spinal stabilization surgery.
6. Level I VTCs will have the necessary equipment available for a spinal stabilization and craniotomy. This may include but is not limited to a pneumatic drill, bone plates, bone screws, intramedullary pins, K wires, polymethyl-methacrylate, and equipment for external skeletal fixation.

7. There is a neurosurgeon that is identified as the liaison to the trauma program. This person is responsible for providing standardized training to all front-line ER veterinarians regarding neurotrauma management.
8. The hospital will provide an on-call neurosurgery backup schedule with formally arranged contingency plans in case the capability of the primary on-call neurosurgeon is overwhelmed.
9. ORs are promptly available to allow for emergency neurosurgery.

G. Musculoskeletal/orthopedic surgery

1. An attending surgeon (DACVS) must be available at all times for consultation on complex orthopedic procedures/surgical fracture stabilization. It may be the same surgeon that is available for soft tissue, neuro and orthopedic surgery.
2. It is expected that an orthopedic surgeon can be in the hospital within 2 hours of being called in by ER personnel.
3. There is an orthopedic surgeon who is identified as the liaison to the trauma program. This person is responsible for providing standardized training to all front-line ER veterinarians regarding management of orthopedic trauma.
4. The hospital will provide an on-call orthopedic surgery backup schedule with formally arranged contingency plans in case the capability of the primary on-call orthopedic surgeon is overwhelmed (i.e. ideally have 2nd orthopedic surgeon on-call).
5. ORs are promptly available to allow for emergency operations on musculoskeletal injuries, such as open fracture debridement and stabilization.

H. Anesthesia service

1. A board certified anesthesiologist is employed by the hospital. They are regularly scheduled for clinical and on call duty and are available for consultation regarding drug and technique choices for diagnostics and surgical anesthesia, pain management, and advanced monitoring techniques.
2. The anesthesiologist is responsible for providing regular and standardized training to all front-line ER veterinarians and technicians regarding appropriate analgesia and anesthesia in an ER setting (see H7).
3. Anesthesia services are available in-house 24 hours a day. This does not have to be an anesthesia technician, anesthesia house-officer or anesthesiologist, but must be someone trained in ACVAA approved critical anesthesia case protocol development, advanced monitoring, locoregional blockade, POCT imaging techniques, different species techniques, difficult airway securement, neuromuscular blockade (see H7).
4. An experienced anesthesia technician (VTS-Anesthesia or approved by staff boarded anesthesiologist), ACVAA or ACVECC resident, or DACVAA boarded anesthesiologist is available for emergency procedures (surgery, diagnostic imaging), and able to be in the hospital within 60 minutes of being called in.
5. The hospital will provide an on-call anesthesia backup schedule with formally arranged contingency plans in case the capability of the primary on-call anesthesia team member(s) is/are overwhelmed.
6. Appropriate advanced anesthesia drugs, equipment related to highest levels of trauma anesthesia and highest risk patient airway attainment, invasive and end tidal gas monitoring, neuromuscular blockade, local/regional blockade, point-of-care ultrasound, pain management diagnosis, mechanical ventilation and intravenous anesthesia must be available
7. Ideally, anesthesia staff training would focus on the following key skills/task areas including but not limited to surgical prioritization for trauma patients; resuscitation techniques and appropriate drug use; difficult airway attainment, management, oxygenation and ventilation strategies; vascular (venous and arterial) access; bronchoscopy management; thoracic ultrasound point of care assessment; one lung equipment, intubation and ventilation; intracranial and spinal perfusion and pressure management; fluid and pressor therapy; use of paralytics and neuromuscular monitoring; neurostimulation and ultrasound location of nerve and plexus; local/regional blockade single shot and continuous; interventional technique sedation and anesthesia techniques; trauma coagulopathy nuances; principles of blood component and transfusion product therapy; anesthesia machine equipment use, upkeep and troubleshooting; physiologic effects of drugs used in sedation, pain management, and anesthesia including volatile anesthesia principles and practice; invasive and noninvasive monitoring techniques and equipment, echocardiography principles; and post-operative intensive care including pain management

I. Clinical pathology/laboratory services

1. Laboratory services are available 24 hours a day for the standard analyses of blood, urine and other body fluids.
2. Blood testing capabilities must include:
 - (i) Complete blood counts:
 1. including manual differentials and morphologic review
 2. must be available during daytime hours
 3. either in-house or with turn-around (<6 hours) using an off-site laboratory
 - (ii) Hematology afterhours must include PCV/TS and blood smear interpretation by ER DVMs as necessary
 - (iii) Full biochemical analyses:
 1. must be available during daytime hours
 2. either in-house or with turn-around (<6 hours) using an off-site laboratory
 - (iv) Point of care biochemical testing must include measurement of blood glucose, lactate and electrolytes including ionized calcium.
3. The capability for performing coagulation testing (PT/aPTT), blood gas analysis, and microscopy (eg. blood, urine, fecal and tissue cytology) must be available 24 hours a day.

J. Diagnostic Imaging

1. Conventional radiography is available 24 hours a day, 7 days a week.
2. It is expected that the majority of radiographs performed after-hours will be interpreted solely by the attending ER veterinarians; however, on-call radiology personnel are available, if needed.
3. Radiologists are promptly available (within 60 minutes), in-person or by teleradiography when requested for the interpretation of radiographs, performance of complex imaging studies, or interventional procedures.
4. Level I VTCs are required to have a DACVR on staff.
5. Level I VTCs are required to have fluoroscopy and contrast radiography capabilities. Interventional radiography (IR) capabilities are encouraged.
6. Ultrasonography is available 24 hours a day, 7 days a week; both for use by ER personnel, and by an on-call radiology staff member.
7. ER veterinarians are required to be trained in abdominal FAST, thoracic FAST and lung ultrasound either by a board-certified radiologist or emergency and critical care specialist.
8. Computed tomography (CT) is available 24 hours a day, 7 days a week. A CT technologist is available on-call and able to be in the hospital within 60 minutes of being called in.
9. A radiology staff member (skilled ultrasound/CT/MRI technician as appropriate, radiology house officer or DACVR) is available on-call and able to be in the hospital within 60 minutes of being called in by ER personnel.
10. There is a radiologist who is identified as the liaison to the trauma program.
11. Level I VTCs are required to have endoscopy and bronchoscopy available.
12. If sedation or anesthesia is required for diagnostic imaging, an individual trained by the anesthesiologist in critical trauma skill set is available for the procedure

K. Post-operative and ICU care

1. The post-operative care unit (PACU) (can be the ICU) has technicians available 24 hours a day as needed during the patient's post-anesthesia recovery phase or ICU hospitalization.
2. The PACU and/or ICU has the necessary equipment to monitor and resuscitate patients.
3. This should include equipment for re-intubation as necessary, a crash cart, defibrillator, and the ability to continuously monitor the ECG, blood pressure (both invasively and non-invasively), central venous pressure (CVP), SpO₂, ETCO₂, temperature, etc.
4. Veterinarians overseeing the post-operative recovery of critically ill trauma patients must be dedicated to that task (i.e. not also receiving ER patients) and capable of rapid response to deal with urgent problems as they arise. This means that there must be at least two DVMs in the hospital at all times.
5. The patients in Level I facilities have in-house veterinarian coverage for the ICU at all times. This is a person dedicated to the management of ICU patients, and not also required to be receiving ER patients.

6. Veterinarians and technicians experienced with management of patients requiring medium to long term critical care mechanical ventilation (on a dedicated critical care ventilator) must be available to care for trauma patients 24 hours a day.
7. The intensive care unit is under the leadership of an emergency and critical care specialist (DACVECC) and is staffed by veterinary technicians and veterinarians 24 hours a day.

L. Other specialty services

1. Cardiology - Level I VTCs are required to have a DACVIM (Cardiology) on staff. Requirements are not set for daytime availability; however, a cardiologist or cardiology resident must be available on an on-call basis and able to be in the hospital within 60 minutes of being called in by ER personnel.
2. Dentistry - While it is recognized that having veterinary dentists (DAVDC) to do oro-maxillary-facial reconstructive work is ideal in a Level I VTC, it is understood that this is unlikely to be feasible at this time. It is expected that Level I VTCs have the ability to consult with a DAVDC (or resident) or DACVS (or resident) with experience performing such surgeries.
3. Ophthalmology – Level 1 VTC requirement for ophthalmology shall include one of the following: a DACVO on staff OR an established relationship with a DACVO, documented between parties with a memorandum of understanding including an outline of expectations of services for the trauma patient and the DACVO's willingness to consistently provide on call services (on site at the VTC and by phone, within 60 minutes). An ophthalmologist or ophthalmology resident must be available on an on-call basis and able to be on site at the VTC within 60 minutes of being called in by ER personnel. For the DACVO on staff, requirements are not set for daytime availability.
4. Nutrition – While it is not necessary for Level I VTCs to have a DACVN, they must be able to provide on-site enteral nutrition and partial parenteral nutrition. Total parenteral nutrition should be available within 24 hours of hospitalization for the trauma patient.
5. Rehabilitation services & physical therapy - Rehabilitation services and physical therapy must be available during all phases of care (acute and chronic) for the trauma patient at Level 1 VTCs. At this stage, there is not a requirement that Level I VTCs have staff certified in rehabilitation (i.e. Certified Canine Rehabilitation Therapists [CCRTs] or American College of Veterinary Sports Medicine and Rehabilitation); however, this is strongly encouraged in practices with a high orthopedic and neurosurgery caseload.
6. Internal medicine – Level I VTCs are required to have a DACVIM (SAIM) on staff and available by phone, within 24 hours, 7 days a week; in hospital within 48 hours, 7 days a week. Having a DACVIM (SAIM) on-site during regular business hours is encouraged.
7. An on staff licensed social worker (or equivalent access to 24 hour mental health care providers) with training in the veterinary field is strongly encouraged for Level I VTCs.

M. Blood product availability

1. The blood bank must be capable of at least basic blood typing for cats (as A or B) and dogs (as DEA 1.1 positive or negative).
2. The blood bank must be capable of performing major cross matching, at a minimum, for those animals that have previously received a transfusion.
3. The blood bank must have an adequate supply of blood products to meet the needs of injured cats and dogs; this should include type specific (pRBCs), fresh frozen plasma (FFP), and platelets (in fresh whole blood or as platelet concentrate, platelet rich plasma or the ability to make fresh platelets rapidly).
4. Level I VTCs are expected to have an established canine and feline blood donor program, with typed donors available on an on-call basis to give fresh, whole blood if needed.

N. Outcomes assessment

1. See Appendix I: A *Performance Improvement and Patient Safety (PIPS) program* is required for all Veterinary Trauma Centers (Levels I, II and III). A PIPS program serves to monitor, evaluate and improve the performance of a trauma program. While there is no precise prescription for trauma PIPS, the VetCOT calls for each trauma program to demonstrate a continuous process of monitoring, assessment and management directed at improving trauma care.
2. VTCs will be evaluated by a biennial ACVECC VetCOT reverification process.
3. An education course is currently being established for VTCs. VTCs will be expected to participate at least annually.

II. Requirements for Level II veterinary trauma centers

A. Systems requirements

1. VECCS facility certification is required. The certification must be Level I or II.
2. The hospital has the commitment of their ownership, administration and the medical staff to become a VTC.
3. There is sufficient infrastructure and support to the trauma service (from within the hospital) to ensure adequate provision of care.
4. The emergency department/section of the hospital has a dedicated emergency room (ER) director supported by an appropriate number of additional veterinarians and support staff to ensure immediate care for injured patients at any time of the day/night (i.e. certain staffing levels are imperative).
5. Level II VTCs must have one VTS-ECC and two CVT/RVT/LVT (in states that offer technician licensing or certification).
6. CVT/RVT/LVT make up 50% of the technician/nursing support staff on the Emergency, Intensive Care Unit, Surgery, Neurology, Anesthesia and Radiology services. If hospitals don't have 50% CVT/RVT/LVT due to lack of state requirements for licensure, hospitals can submit a document outlining hiring requirements for technician nursing staff and list the skill sets common to nurse technicians on each service

B. Leadership

1. The trauma medical director is a DACVECC
2. The trauma medical director is clinically active and spends time as the attending veterinarian in the emergency room/trauma center averaging 20 hours/week on the clinical floor for a minimum of 26 weeks/year (i.e. not just an administrative role). This may include primary case management and/or supervision of receiving ER veterinarians.
3. The trauma medical director will coordinate a steering committee that oversees the operations of the VTC. This advisory group will be made up of liaisons from each of the following key services from within the hospital. A liaison shall be available to the trauma team from each of the following services:
 - (i) Hospital administration
 - (ii) Surgery (to represent soft tissue, orthopedic and neurosurgery)* required
 - (iii) Neurology *if present*
 - (iv) Anesthesiology *required but does not have to be a DACVAA*
 - (v) Radiology * required but does not have to be a DACVR*
 - (vi) Clinical pathology *if present*
 - (vii) Internal medicine
 - (viii) Cardiology *if present*
 - (ix) Ophthalmology *if present*
 - (x) Rehabilitation/physical therapy *if present*
4. It is expected that the liaison from each specialty service be a specialist in that area. This will generally be a veterinarian; however, it is understood that in some circumstances it will be appropriate for a specialist technician to serve in this role.
5. Each trauma center will identify a CVT/RVT/LVT (ideally VTS-ECC) to serve as the trauma center Veterinary Technician Trauma Manager. This individual will be responsible for implementing hospital trauma protocols for the veterinary technicians, supporting trauma patient data management and overseeing continuing education on trauma for veterinary technicians.

C. Patient admission: (as for Level I)

1. VTCs are expected to practice triage for all patients presenting to the ER. Veterinary technicians, students (in veterinary teaching hospitals) and veterinarians will be formally trained in the practice of triage.
 - (i) There is a Standard Operating Procedure for hospital triage practices. This SOP is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training involved staff on the SOP
2. In order to facilitate movement of animals, a gurney, dedicated to the emergency service will be located near the front entrance of the VTC at all times.
3. Backboards will be available for the transport of animals with known or suspected spinal injury.

4. ER veterinarians must be present in the ER at all times.
5. Seriously injured patients are to be admitted and stabilized by clinicians with advanced training (eg. DACVECC, ACVECC residents or experienced emergency doctors) or closely supervised interns or new (<1 year) graduates.

D. Surgical commitment and resources: (as for Level I)

1. Surgical commitment is essential for a properly functioning VTC.
2. Board certified surgeons (DACVS) with soft tissue, orthopedic and neurosurgical capabilities are available in-house at least 8–10 hours a day, 5 days a week and on an on-call basis as needed (see below).
3. While it is a requirement that DACVS are available, it is understood that many experienced emergency veterinarians are capable of performing emergency surgery (specifically soft tissue surgery), and that this may be appropriate, even in Level II VTCs depending on the nature of the case.
4. Level II VTCs provide sufficient resources, including instruments, equipment and personnel, for modern soft tissue, orthopedic/musculoskeletal and neurosurgical trauma care with readily available ORs for trauma procedures.
5. The OR(s) is immediately ready for use and has essential equipment, including but not limited to a variety of appropriate sterile, surgical packs, retractors, suction, electrocautery, and other hemostatic devices necessary to perform trauma surgery.
6. There is a Standard Operating Procedure for OR readiness that is reviewed on an annual basis by the Steering Committee. There is a documented process in place for updating and training staff on the SOP.
7. OR technicians, if not on-site, must be on-call and able to be in the hospital within 60 minutes of being called in. Additionally, in the interim, the emergency team in the hospital must have access to the ORs and be adequately trained in OR procedure to provide immediate technical assistance for animals going immediately into the OR.
8. There is a minimum of 2 ORs in the hospital.
9. Reconstructive surgery capabilities are present.
10. Spinal fracture stabilization capabilities are not necessary in Level II VTCs.
11. Anesthesia and sedation is expected to be performed by anesthesia experienced and trained veterinarians which are under the direction of a boarded specialist. An anesthesia trained technician team will assist the veterinarians performing anesthesia and sedation

E. Soft-tissue surgery: (as for Level I)

1. It is expected that an emergency surgeon (either DACVS, or DACVECC, ACVS or ACVECC resident or DVM experienced in emergency surgery) can be in the hospital within 60 minutes of being called in by ER personnel.
2. If the on-call surgeon is a resident or DVM experienced in emergency surgery, they must have DACVS or DACVECC backup available for phone consultation and that can also be in the hospital within 60 minutes of being called in by the primary surgeon on call.
3. There is always a veterinarian in the hospital (i.e. 24 hours a day) with the necessary training and skills to perform immediate damage control (DC) surgery, with the understanding that backup is available as above.
 - (i) For the purposes of this document DC surgery will be defined as resuscitative surgery needed to stop major hemorrhage (thoracic, abdominal, cervical and truncal) and minimize major air-leaks from the trachea, bronchus or lung and to also provide required direct CPR.
 - (ii) There is a Standard Operating Procedure for the identification of a patient requiring DC surgery and the immediately available and back up personnel and equipment involved in DC surgery. This SOP is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training involved staff on the SOP.
4. There is a soft tissue surgeon (DACVS) who is identified as the liaison to the trauma program. This person, and/or the trauma medical director, is responsible for providing standardized training to all front-line ER veterinarians on DC surgery.
5. The hospital will provide an on-call soft-tissue surgery schedule.
6. ORs are promptly available for emergency soft tissue surgery.

F. Neurotrauma care

1. Medical neurotrauma care is promptly and continuously available for traumatic brain injury and spinal cord injury.

2. Surgical neurotrauma care includes an on-call DACVS, DACVIM (Neurology), or appropriately trained resident to perform emergency hemilaminectomy procedures for intervertebral disc disease (IVDD) and acute traumatic disc herniation.
3. Level II VTCs are not required to have a surgeon available (or equipment necessary) for spinal fracture/luxation stabilization surgery.
4. The on-call neurosurgeon is available when neurosurgical consultation is requested and can be in the hospital within 60 minutes of being called in by ER personnel.
5. There is a neurosurgeon who is identified as the liaison to the trauma program.
6. The hospital will provide an on-call neurosurgery schedule.
7. It is not a requirement of Level II VTCs to have two neurosurgeons available concurrently.

G. Musculoskeletal/orthopedic surgery

1. An attending orthopedic surgeon (DACVS) must be available for consultation for complex orthopedic procedures/fracture stabilization.
2. It is expected that an orthopedic surgeon can be in the hospital within 2 hours of being called in by ER personnel.
3. There is an orthopedic surgeon who is identified as the liaison to the trauma program.
4. The hospital will provide an on-call orthopedic surgery schedule.
5. It is not a requirement of Level II VTCs to have two orthopedic surgeons available concurrently.

H. Anesthesia service

1. Level II VTCs do not require an in-house board certified anesthesiologist, an on call boarded anesthesiologist, nor regular training/consultation availability with an ACVAA-certified anesthesiologist.
2. A veterinarian trained in critical anesthesia and sedation, with technical staff trained in critical anesthesia and sedation, both under the supervision of a boarded specialist is available to provide anesthesia services 24 hours a day.
3. Personnel providing anesthesiology services are able to be in the hospital within 60 minutes of being called in for emergency procedures (surgery, imaging, etc.).
4. Another experienced veterinarian is able to be in the hospital within 60 minutes of being called in if needed in busy times.
5. A staff member with significant experience and clinical duty involved in anesthetizing patients is identified as the liaison to the trauma program; in a Level II VTC this person may be a veterinary technician and/or also have another role in the trauma program (e.g. DACVECC).
6. The hospital will provide an on-call anesthesia backup schedule with formally arranged contingency plans in case the capability of the primary anesthesia team member(s) is/are overwhelmed.
7. Appropriate advanced anesthesia drugs, equipment related to trauma patient airway attainment, invasive and end tidal gas monitoring, neuromuscular blockade, local/regional blockade, point of care ultrasound, pain management diagnosis, mechanical ventilation and intravenous anesthesia must be available.

I. Clinical pathology/laboratory services

1. Laboratory services are available 24 hours a day for the standard analyses of blood, urine and other body fluids.
2. Blood testing capabilities must include:
 - (i) Complete blood counts:
 1. including manual differentials and morphologic review
 2. must be available during daytime hours
 3. either in-house or with turn-around (<12 hours) using an off-site laboratory
 - (ii) Hematology afterhours must include PCV/TS and blood smear interpretation by ER DVMs as necessary
 - (iii) Full biochemical analyses:
 1. must be available during daytime hours
 2. either in-house or with turn-around (<12 hours) using an off-site laboratory
 - (iv) Point of care (POC) biochemical testing must include measurement of blood glucose, lactate and electrolytes.
3. The capability for performing coagulation testing (PT/PTT), blood gases, and cytology must be available 24 hours a day.

J. Diagnostic Imaging

1. Conventional radiography is available 24 hours a day, 7 days a week.
2. It is expected that the attending ER veterinarians will interpret the majority of radiographs performed afterhours; however interpretation by a radiologist (DACVR) is available in a timely fashion (<4 hours), either in person or by teleradiography, when needed.
3. Level II VTCs are not required to have a DACVR on staff.
4. Level II VTCs are required to have contrast radiography capabilities. Interventional radiography (IR) capabilities and fluoroscopy are encouraged.
5. It is not a requirement of Level II VTCs that fluoroscopy, contrast radiography or IR is available.
6. Ultrasonography is available 24 hours a day, 7 days a week; it is expected that the majority of ultrasonography performed in Level II VTCs will be by ER personnel.
7. ER veterinarians are required to be trained in abdominal FAST, thoracic FAST and lung ultrasound either by a board-certified radiologist or emergency and critical care specialist.
8. It is not a requirement of Level II VTCs that computed tomography (CT) be available; however, advanced imaging is strongly encouraged.
9. Level II VTCs are required to have a diagnostic imaging staff member to serve as a liaison to the trauma program; given that Level II VTCs are not required to have a DACVR this does not have to be a DACVR.
10. Level II VTCs are required to have endoscopy and bronchoscopy available.
11. If sedation or anesthesia is required for diagnostic imaging, an anesthesia experienced/trained veterinarian is available for the procedure

K. Post-operative and ICU care

1. The post-operative care unit (PACU) (can be the ICU) has technicians available 24 hours a day as needed during the patient's post-anesthesia recovery phase or ICU hospitalization.
2. The PACU and/or ICU has the necessary equipment to monitor and resuscitate patients.
3. This should include equipment for re-intubation as necessary, a crash cart, defibrillator, and the ability to continuously monitor the ECG, blood pressure (both invasively and non-invasively), central venous pressure (CVP), SpO₂, ETCO₂, temperature, etc.
4. The provision of short-term mechanical ventilation (<6 hours) is a requirement of Level II VTCs; however, it is not expected that all Level II VTCs will be able to provide medium to longer term mechanical ventilation. As such, Level II VTCs are required to have at minimum an anesthesia ventilator. Availability of a critical care ventilator is strongly encouraged.
5. The ICU is under the leadership of an emergency and critical care specialist (DACVECC) and is staffed by veterinary technicians and veterinarians 24 hours a day.

L. Other specialty services

1. Cardiology - Level II VTCs are not required to have a DACVIM (Cardiology) on staff; however a cardiologist must be available for phone consultation during business hours.
2. Dentistry – Level II VTCs are not required to have a DAVDC on staff; however, the DACVS must have a comfort level performing reparative oro-maxillary-facial surgery, or be able to refer such patients following stabilization.
3. Ophthalmology – Level II VTCs are required to have a DACVO on staff OR an established relationship with a DACVO, documented between parties with a memorandum of understanding including an outline of expectations of services for the trauma patient and the DACVO's willingness to consistently provide on call services (by phone, within 24 hours, 7 days a week; in hospital within 48 hours, 7 days a week).
4. Nutrition – Level II VTCs are not required to have a DACVN on staff; however, they must have the capabilities to provide enteral nutrition and at a minimum partial parenteral nutrition.
5. Rehabilitation services & physical therapy - Must be available during the acute phase of care in Level II VTCs. At this stage, there is not a requirement that Level II VTCs have staff certified in rehabilitation (CCRTs); however, this is strongly encouraged in practices with a high orthopedic and neurosurgery caseload. Additionally, a strong relationship with a nearby veterinary rehabilitation facility for the chronic phase of care is encouraged.
6. Internal medicine – Level II VTCs are required to have a DACVIM (SAIM) available on an on-call basis for phone consultations as needed. Having a DACVIM (SAIM) available on-call for in-house examinations and on-site during regular business hours is encouraged.

7. An on staff licensed social worker (or equivalent access to 24 hour mental health care providers) with training in the veterinary field is strongly encouraged for Level II VTCs.

M. Blood product availability

1. The blood bank must be capable of basic blood typing for cats (as A or B) and dogs (as DEA 1.1 positive or negative) at a minimum.
2. The blood bank must be capable of performing major cross matching, at a minimum, for those animals that have previously received a transfusion.
3. The blood bank must have an adequate supply of type specific pRBCs, and FFP, to meet the needs of injured cats and dogs.
4. Level II VTCs must have an established relationship with another blood bank (either commercial or the blood bank at a nearby Level I VTC) that can provide additional blood product stock at short notice.
5. While it is not a requirement, Level II VTCs are encouraged to have an established dog and cat blood donor program, with typed donors available on an on-call basis to give fresh whole blood if needed.

N. Outcomes assessment: (as for Level I)

1. See Appendix I: A *Performance Improvement and Patient Safety (PIPS)* program is required for all Veterinary Trauma Centers (Levels I, II and III). A PIPS program serves to monitor, evaluate and improve the performance of a trauma program. While there is no precise prescription for trauma PIPS, the VetCOT calls for each trauma program to demonstrate a continuous process of monitoring, assessment and management directed at improving trauma care.
2. VTCs will be evaluated by a biennial ACVECC VetCOT reverification process.
3. An education course is currently being established for VTCs. VTCs will be expected to participate at least annually.

III. Requirements for Level III veterinary trauma centers

A. Systems requirements

1. VECCS facility certification is required. The certification may be Level I, II or III.
2. The hospital has the commitment of their ownership, administration and the medical staff to become a VTC.
3. There is sufficient infrastructure and support to the trauma service (from within the hospital) to ensure adequate provision of care.
4. The hospital has an emergency service available to provide immediate care for injured patients during opening hours; however Level III VTCs are not required to be open 24 hours a day.
5. Level III VTCs must have at least 1 FTE DACVECC on staff.
6. Level III VTCs must have a close relationship with specialists in the fields of surgery and radiology to facilitate consultation as necessary.
7. Level III VTCs must have a working relationship with a Level I and/or II VTC, to include a documented system for addressing and referring trauma patients that need additional care beyond hospital resources. This relationship will include mechanisms to discuss care provided prior to and during transport to allow easy patient transfer.
8. CVT/RVT/LVT make up 25% of the technician/nursing support staff in the hospital. If the hospital doesn't have 25% CVT/RVT/LVT due to lack of state requirements for licensure, hospitals can submit a document outlining hiring requirements for technician nursing staff and list the skill sets common to nurse technicians on each service

B. Leadership

1. The trauma medical director is a DACVECC, DACVS or DACVAA.
2. The trauma medical director is clinically active and spends time as an attending clinician with their respective service averaging 20 hours/week on the clinical floor for a minimum of 26 weeks/year (i.e. not just an administrative role). This may include primary case management and/or supervision of receiving veterinarians.
3. Since Level III VTCs are expected to be relatively smaller facilities than Level I and II VTCs, there is not a requirement for the formation of a 'trauma team' within the hospital, but the commitment of the entire hospital (as above).
4. Each trauma center will identify a CVT/RVT/LVT (ideally VTS-ECC) to serve as the trauma center Veterinary Technician Trauma Manager. This individual will be responsible for implementing hospital trauma protocols for

the veterinary technicians, supporting trauma patient data management and overseeing continuing education on trauma for veterinary technicians

C. Patient admission

1. VTCs are expected to practice triage for all patients presenting to the hospital. Veterinary technicians and veterinarians will be formally trained in the practice of triage.
 - (i) There is a Standard Operating Procedure for hospital triage practices. This SOP is reviewed minimally on an annual basis by the Steering Committee. There is a documented process in place for updating and training involved staff on the SOP
2. In order to facilitate movement of animals, a gurney, dedicated to the emergency service will be located near the front entrance of the VTC at all times.
3. Backboards will be available for the transport of animals with known or suspected spinal injury.
4. ER veterinarians must be present in the hospital/ER at all times during opening hours.
5. Seriously injured patients are to be admitted and stabilized by clinicians with advanced training (e.g. DACVECC, ACVECC residents or experienced emergency doctors) or closely supervised interns or new (<1 year) graduates.
6. Pain management and stabilization are primary goals of Level III facilities and as such, advanced training in acute pain management should be sought annually

D. Surgical commitment and resources

1. ER doctors have the necessary training and skills to perform routine emergency soft tissue surgical procedures (e.g. laceration repairs, exploratory celiotomy, gastrotomy/ectomy, enterotomy/ectomy, intestinal resection and anastomosis, cystotomy etc.) and take an animal to the OR for damage control (DC) surgery.
2. If the ER veterinarians in the hospital do not have considerable surgical experience, the hospital will provide an on-call surgery schedule, and it is expected that the on call emergency surgeon can be in the hospital within 60 minutes of being called in by ER personnel.
3. Level III VTCs must have an OR available for emergency procedures. There is a Standard Operating Procedure for OR readiness that is reviewed on an annual basis by the Steering Committee. There is a documented process in place for updating and training staff on the SOP.
4. It is not necessary for Level III VTCs to have 2 ORs available simultaneously.
5. The OR must have essential equipment; including but not limited to a variety of appropriate sterile, surgical packs, retractors, suction, electrocautery, and other hemostatic devices necessary to perform trauma surgery.
6. Multi-parameter anesthesia monitoring and infusion equipment is available for anesthesia and sedation triage
7. Individuals (doctors or technicians) trained in anesthesia are available

E. Soft-tissue surgery

1. It is expected that an emergency surgeon (either DACVS, or DAVECC, ACVS or ACVECC resident or DVM experienced in emergency surgery) can be in the hospital within 60 minutes of being called in by ER personnel.
2. There is always a veterinarian in the hospital (i.e. 24 hours a day) with the necessary training and skills to perform immediate damage control (DC) surgery, with the understanding that backup is available as above.
 - (i) For the purposes of this document DC surgery will be defined as resuscitative surgery needed to stop major hemorrhage (thoracic, abdominal, cervical and truncal) and minimize major air-leaks from the trachea, bronchus or lung and to also provide required direct CPR.
 - (ii) There is a Standard Operating Procedure for the identification of a patient requiring DC surgery and the immediately available and back up personnel and equipment involved in DC surgery. This SOP is reviewed minimally on an annual basis by the Trauma Medical Director and appropriate allied specialty services (e.g., surgery). There is a documented process in place for updating and training involved staff on the SOP.
3. The trauma medical director or a soft tissue surgeon is responsible for providing standardized training to all front-line ER veterinarians on DC surgery.
4. OR is promptly available for emergency soft tissue surgery.

F. Neurotrauma care

1. Medical neurotrauma care is promptly and continuously available for traumatic brain injury (TBI) and spinal cord injury (SCI) during opening hours.
2. Level III VTCs are not required to have surgical neurotrauma capabilities, and rather are expected to refer patients requiring such care to a Level I or II VTC, or other facility with neurosurgical capabilities, following appropriate stabilization. This may include, but is not limited to, thorough assessment of neurologic status, resuscitation from shock, provision of appropriate analgesia and stabilization of the spine on a backboard.
3. Additionally, it is expected that Level III VTCs have a close relationship with a Level I and/or II VTCs to facilitate seamless transfer of cats and dogs requiring emergency neurosurgery.

G. Musculoskeletal/orthopedic surgery

1. It is expected that Level III VTCs have a close relationship with a Level I and/or II VTCs to facilitate seamless transfer of cats and dogs requiring further surgical care for their traumatic injuries after appropriate stabilization. Stabilization may involve, but is not limited to, resuscitation from shock, administration of appropriate analgesia, wound management, bandaging and/or external coaptation.

H. Anesthesia service

1. Anesthesiology services are promptly available for emergency operations. A veterinarian or veterinary technician under the supervision of a veterinarian (in accordance with state law), with experience anesthetizing unstable animals, and access to appropriate drugs and equipment (e.g. anesthesia machines, endotracheal tubes etc.) is available for anesthesia services.
2. This team should receive annual CE in acute pain management, sedation and anesthesia triage techniques
3. It is not a requirement of Level III VTCs to be able to have two patients under anesthesia concurrently.
4. Minimal training in acute pain management should be attained regularly by technicians and doctors involved in triage.
5. Multi-parameter anesthesia monitoring and infusion equipment should be available for anesthesia triage.
6. Level III trauma centers must have an anesthetic ventilator available (note: a long-term ventilator is not required, see III.K.4)

I. Clinical pathology/laboratory services

1. Laboratory services are available during opening hours for the standard analyses of blood, urine and other body fluids.
2. Blood testing capabilities must include:
 - (i) Complete blood counts:
 1. including manual differentials and morphologic review
 2. must be available during daytime hours
 3. either in-house or with turn-around (<12 hours) using an off-site laboratory
 - (ii) Hematology after hours must include PCV/TS and blood smear interpretation by ER DVMs as necessary
 - (iii) Full biochemical analyses:
 1. must be available during daytime hours
 2. either in-house or with turn-around (<12 hours) using an off-site laboratory
 - (iv) Point of care biochemical testing must include measurement of blood glucose, lactate and electrolytes
3. The capability for performing coagulation testing (ACT) and cytology must be available during opening hours.
4. Level III VTCs are not required to have point-of-care blood gas capabilities.

J. Diagnostic Imaging

1. Conventional digital radiography is available during opening hours.
2. There must be capabilities to copy digital radiographs to send with the patient, or provide in another way, when animals are transferred to another hospital.
3. It is expected that the attending ER veterinarians will interpret the majority of radiographs performed after hours; however, interpretation by a radiologist (DACVR) is available in a timely fashion (<6 hours), by teleradiography, when needed.

4. Level III VTCs are not required to have a DACVR on staff.
5. It is not a requirement of Level III VTCs that fluoroscopy, contrast radiography, interventional radiography or CT is available.
6. Ultrasonography is available during opening hours; it is expected that the majority of ultrasonography performed in Level III VTCs will be by ER personnel. ER veterinarians are required to be trained in abdominal FAST, thoracic FAST and lung ultrasound either by a board-certified radiologist or emergency and critical care specialist.

K. Post-operative and ICU care

1. There is not a requirement that Level III VTCs have a dedicated ICU; however, technicians must monitor hospitalized animals during opening hours.
2. Level III VTCs have the necessary equipment to monitor and resuscitate patients. This should include equipment for re-intubation as necessary, a crash cart, defibrillator, and the ability to continuously monitor the ECG, blood pressure (non-invasively at a minimum), SpO₂, ET/CO₂, temperature etc.
3. It is not a requirement of Level III VTCs that the veterinarians overseeing hospitalized patients including the post-operative recovery of critically ill trauma patients be dedicated to that task; however, their workload must be such that they are available to deal with urgent problems as they arise.
4. It is not a requirement that Level III VTCs have a mechanical ventilator; however, they must be able to intubate and provide IPPV with an bag valve mask to facilitate transport to a Level I or II VTC.

L. Other specialty services

1. Cardiology - Level III VTCs are not required to have a DACVIM (Cardiology) on staff; however, a relationship must exist with a nearby cardiologist that can provide phone consultation or be available to take referrals.
2. Dentistry – Level III VTCs are not required to have a DAVDC on staff; however, should have a strong relationship with a nearby veterinary dentist or DACVS to facilitate transfer of animals requiring oromaxillary facial surgery after trauma.
3. Ophthalmology – Level III VTCs are not required to have a DACVO on staff; however, should have a strong relationship with a DACVO to facilitate transfer of animals sustaining ocular trauma.
4. Nutrition – Level III VTCs are not required to have a DACVN on staff; however, they must have the capabilities to provide enteral nutrition.
5. Rehabilitation services & physical therapy – Level III VTCs are not required to have rehabilitation services; however, a strong relationship with a nearby veterinary rehabilitation facility is encouraged.
6. Internal medicine – Level III VTCs are not required to have a DACVIM (SAIM) on staff

M. Blood product availability

1. The blood bank must be capable of blood typing cats (as A or B) and dogs (as DEA 1.1 positive or negative) at a minimum.
2. The blood bank must be capable of performing major cross matching, at a minimum.
3. Level III VTCs must have a supply of pRBCs and FFP to meet the immediate needs of injured cats and dogs. If the in-house supply is limited, they must have an established relationship with a nearby blood bank (either commercial or the blood bank at a nearby Level I VTC) that can provide blood products at short notice.

N. Outcomes assessment

1. See Appendix I: A *Performance Improvement and Patient Safety (PIPS) program* is required for all Veterinary Trauma Centers (Levels I, II and III). A PIPS program serves to monitor, evaluate and improve the performance of a trauma program. While there is no precise prescription for trauma PIPS, the VetCOT calls for each trauma program to demonstrate a continuous process of monitoring, assessment and management directed at improving trauma care.
2. VTCs will be evaluated by a biennial ACVECC VetCOT re-verification process.
3. An education course is currently being established for VTCs. VTCs will be expected to participate at least annually.

List of abbreviations used in this document

ACVECC = American College of Veterinary Emergency and Critical Care
ACVECC VetCOT = ACVECC Veterinary Committee on Trauma
ACVS = American College of Veterinary Surgery
ACVAA = American College of Veterinary Anesthesia and Analgesia
abdominal FAST = abdominal focused assessment with sonography for trauma
AMA = against medical advice
aPTT = activated partial thromboplastin time
AVMA = American Veterinary Medical Association
CCU = critical care unit (used interchangeably with ICU)
CPR = cardiopulmonary resuscitation, cardiopulmonary cerebral resuscitation
CT = computed tomography
CVP = central venous pressure
CVT = certified veterinary technician
DACVAA = Diplomate of the American College of Veterinary Anesthesia & Analgesia
DACVECC = Diplomate of the American College of Veterinary Emergency and Critical Care
DACVIM = Diplomate of the American College of Veterinary Internal Medicine
DACVR = Diplomate of the American College of Veterinary Radiology
DACVS = Diplomate of the American College of Veterinary Surgery
DAVDC = Diplomate of the American Veterinary Dental College
ECC = emergency and critical care
ED = emergency department (used interchangeably with ER)
ER = emergency room
ETCO₂ = end-tidal concentration of carbon dioxide (mmHg)
FFP = fresh frozen plasma
Hbc = hit by car
ICU = intensive care unit
IR = interventional radiology/radiography
IVDD = intervertebral disc disease
LVT = licensed veterinary technician
MRI = magnetic resonance imaging
MVA = motor vehicle accident (used interchangeably with hbc)
OR = operating room
PACU = post-operative care unit (used interchangeably with ICU and CCU with reference to post-op care)
PCV = packed cell volume
POC = point of care
POMR = problem oriented medical record
PRBCs = packed red blood cells
PT = prothrombin time
RVT = registered veterinary technician
SA = small animal
SCI = spinal cord injury
SOAP = subjective, objective, assessment, plan
SpO₂ = % saturation of hemoglobin with oxygen
STAT = spontaneous trauma in animals team
TBI = traumatic brain injury
thoracic FAST = thoracic focused assessment with sonography for trauma
TS = total solids (protein)
US = ultrasound
VECCS = Veterinary Emergency and Critical Care Society
VTC = veterinary trauma center
VTS-ECC = Veterinary Technician Specialist – Emergency and Critical Care

APPENDIX I: Performance Improvement and Patient Safety (PIPS)

A *Performance Improvement and Patient Safety (PIPS) program* is required for all Veterinary Trauma Centers (Levels I, II and III). A PIPS program serves to monitor, evaluate and improve the performance of a trauma program. While there is no precise prescription for trauma PIPS, the VetCOT calls for each trauma program to demonstrate a continuous process of monitoring, assessment and management directed at improving trauma care.

1. Veterinary Trauma Centers (VTCs) must have a PIPS program that includes a written plan describing how the program continuously measures, evaluates and improves trauma patient outcome and care. The written plan outlining the VTCs PIPS includes:
 - (a) Identifying the personnel responsible for the PIPS program (suggested: trauma medical director and veterinary technician trauma manager)
 - (b) VTCs must demonstrate that all trauma patients can be identified and describe mechanisms for tracking all registry required data.
 - (c) Data Entry Personnel (DEP) responsible for entering trauma patient data into the VetCOT REDCap based registry.
 - (d) The process for identifying cases for review and how the cases are reviewed.
 - (e) The make-up of the review committee (this may be a subset of the steering committee).
 - i. Each member of the committee must attend at least 50 percent of all multidisciplinary trauma peer review committee meetings
2. The trauma PIPS program's written plan is reviewed and updated at least annually.
3. The trauma medical director or veterinary technician trauma manager will inform the VetCOT-Registry Subcommittee chair and/or registry manager when there are changes in Data Entry Personnel (DEP).
4. Trauma cases are entered and updated into the VetCOT trauma registry on a quarterly basis. Data may be directly entered in the registry, or onto data capture forms, but documentation must be made within 30 days of case presentation to the hospital.
5. All cases are entered into registry by the end of each quarter: January 31 (cases seen through December 31), April 30 (cases seen through March 31), July 31 (cases seen through June 30) and October 31 (cases seen through September 30).
6. Sufficient mechanisms must be available to identify operational events for review by the trauma PIPS program. Documentation (minutes) reflects the review of operational events and, when appropriate, the analysis and proposed corrective actions.
7. Mortality data, adverse events and selected cases identified for review must undergo multidisciplinary trauma peer review.
8. Reviewed "events" (#6) and cases (#7) that lead to identification of an "event" must result in the development of corrective action plans, and methods of monitoring and reevaluation must be present. An effective performance improvement program demonstrates through clear documentation that identified opportunities for improvement lead to specific interventions that result in an alteration in conditions such that similar adverse events are less likely to occur.
9. The following information will be documented by the PIPS and submitted during verification and re-verification:
 - (a) Trauma CE provided by and to personnel within the hospital
 - (b) Trauma CE provided by hospital personnel to regional attendees
 - (c) Publications related to trauma patient care
 - (d) Minutes of Steering committee (or entity determined to be equivalent for Level III) and PIPS review committee

Resources provided to VTCs:

1. Summary quarterly reports on all data (de-identified) in the trauma registry
2. Continuing education tracking template
3. Suggested resources for utilizing M&M rounds effectively for case review
4. Template SOPs for Triage, Damage Control Surgery/Resuscitation, Emergency Room readiness.
5. FAQ document (updated each cycle that VTCs are identified).
6. Modified from, "Verification Change log 2017" (<https://www.facs.org/quality-programs/trauma/vrc/resources>) and "Resources for the optimal care of the injured patient 2014" (the "orange" book);

7. Link: https://www.facs.org/~media/files/quality_programs/trauma/vrc_resources/resources_for_optimal_care.ashx

APPENDIX II: General medical records requirements for veterinary trauma centers

A complete and thorough medical record must be maintained for every small animal patient seen at a VTC. The medical record is expected to include:

1. Client identification (owners name, address and contact phone number(s))
2. Patient signalment (age or approximate age, breed, sex, neutering status)
3. Time and date of admission/presentation to the VTC
4. Time and date of death, euthanasia or discharge from the VTC
5. Outcome (death, euthanasia or discharge from the VTC). Discharge against medical advice (AMA) should be clearly documented, as should animals that are dead on arrival (DOA) and those that receive CPR attempts
6. Presenting complaint
7. History. For trauma patients this should be specific as to the nature of the trauma (e.g. hbc 1 hour ago after escaping from the house, owner did not witness (but heard the accident) accident, found the dog unconscious on the road). History should ideally include routine medical information such as vaccination status, notably whether the animal's Rabies vaccination status is in compliance with local laws, drug allergies and transfusion history. It will not be uncommon for this history to be taken after patient stabilization. It is understood that an abbreviated history may be taken in emergency trauma cases.
8. Physical examination (including measurement of body weight, temperature, heart rate, respiratory rate and mental status from the time of presentation/triage/admission). Additionally evidence of examination of the entire animal should be documented and abnormalities recorded
9. Clinicopathologic tests performed and results; with documented reference intervals
10. Diagnostic imaging procedures performed and interpretation of findings.
11. Tentative diagnosis and/or differential diagnoses
12. All treatments administered, performed or prescribed (including anesthesia and surgical records); Anesthesia risk categories should be substantiated for each case.
13. Progress notes (at least once daily; ideally in the SOAP format)
14. Daily treatment sheets documenting medications/treatments administered, time of treatments and the person who administered the treatment
15. Client communications during hospitalization (and following discharge)
16. Client instructions at the time of discharge from the hospital
17. Referring veterinarian communications
18. Financial notes (ideally including communication of cost of treatment with the pet owner)
19. Anesthesia risk categories (ASA status) will be substantiated for each case sedated and/or anesthetized within the hospital.