AUSTRALIAN AND NEW ZEALAND
COLLEGE OF VETERINARY SCIENTISTS

MEMBERSHIP GUIDELINES

Veterinary Emergency and Critical Care

INTRODUCTION

These Membership Guidelines must be read in conjunction with the *Membership Candidate Handbook.*

ELIGIBILITY

Refer to the *Membership Candidate Handbook.*

OBJECTIVES

To demonstrate that the candidate has sufficient knowledge of and experience in Veterinary Emergency and Critical Care, and to be able to give sound advice in this field to veterinary colleagues.

LEARNING OUTCOMES

Emergency and critical care requires the application of knowledge drawn from a broad base across body systems and traditional disciplines. The emphasis is placed on a logical, problem-based approach to cases in order to accurately diagnose and manage the disease processes and deliver clients a prognosis. A patient may have multiple problems and it is the veterinarian's responsibility to prioritise and deliver the care. Knowledge of the traditional disciplines of internal medicine, surgery, clinical pathology, pharmacology, anaesthesia and radiology must all be used in order to diagnose and treat the problems.

This examination is limited to the species of dogs and cats.

The following description of topics and areas serves as a guide to the expected level of knowledge and skills.

Anatomy, Physiology, Pathology and Therapy of Systems Derangement

The candidate will have **sound**[1] **knowledge** of:

1. Anatomy, pathophysiology, assessment and monitoring of; and therapy for the following systems:

    1.1. Cardiovascular
        1.1.1. congestive heart failure
        1.1.2. cardiac arrhythmias
        1.1.3. acute pericardial diseases
        1.1.4. acute valvular disorders
        1.1.5. acute complications of cardiomyopathies
        1.1.6. endocarditis
        1.1.7. blood pressure regulation and blood volume regulation
        1.1.8. hypertension
        1.1.9. shock - hypovolaemic, distributive, cardiogenic, septic.

    1.2. Respiratory
        1.2.1. hypoxemia and cellular hypoxia
            1.2.1.1. principles
            1.2.1.2. theories of management including oxygen therapy and oxygen toxicity
        1.2.2. thoracic trauma
            1.2.2.1. chest wall trauma
            1.2.2.2. flail chest
            1.2.2.3. pulmonary contusions
        1.2.3. pneumonia and pneumonitis
        1.2.4. cardiogenic and non-cardiogenic pulmonary oedema
        1.2.5. pulmonary embolism
        1.2.6. smoke inhalation, airway burns
        1.2.7. upper airway obstruction including brachycephalic airway syndrome, laryngeal paralysis and tracheal collapse
        1.2.8. lower airway diseases including asthma and bronchitis
        1.2.9. near drowning
        1.2.10. mechanical ventilation

[1] **Knowledge levels:**
Sound knowledge — candidate must know all of the principles of the topic including some of the finer detail, and be able to identify areas where opinions may diverge. A middle level of knowledge.
Basic knowledge — candidate must know the main points of the topic and the major literature

1.2.10.1. pressure and volume ventilation
1.2.10.2. modes of ventilation
1.2.10.3. indications for and hazards of ventilation
1.2.10.4. criteria for and methods of weaning
1.2.10.5. cardiovascular effect of mechanical ventilation
1.2.11. airway management principles
1.2.12. acute respiratory distress syndrome/acute lung injury
1.2.13. pleural space diseases
1.2.13.1. pyothorax
1.2.13.2. chylothorax
1.2.13.3. diaphragmatic hernia
1.2.13.4. haemothorax
1.2.13.5. open and tension pneumothorax.

1.3. Abdominal/Gastrointestinal
1.3.1. megaoesophagus
1.3.2. acute pancreatitis
1.3.3. upper GI bleeding
1.3.4. lower GI bleeding
1.3.5. megacolon
1.3.6. acute perforations of the GI tract
1.3.7. gastroenteritis
1.3.8. gastrointestinal foreign bodies including oesophageal foreign bodies
1.3.9. haemorrhagic gastroenteritis
1.3.10. abdominal trauma, blunt and penetrating
1.3.11. gastric dilation –volvulus
1.3.12. gastrointestinal obstructive diseases
1.3.13. ruptured/fractured liver
1.3.14. acute and fulminant hepatic failure
1.3.15. peritonitis
1.3.16. splenic disorders
1.3.17. mesenteric torsion
1.3.18. abdominal effusions

1.4. Renal/Urinary Tact
    1.4.1. renal regulation of fluid balance and electrolytes
    1.4.2. acute kidney injury and chronic kidney disease
    1.4.3. peritoneal dialysis
    1.4.4. oliguria and anuria
    1.4.5. obstructive urinary diseases
    1.4.6. lower urinary tract disorders
    1.4.7. uroabdomen
1.5. Reproductive Disorders
    1.5.1. eclampsia
    1.5.2. pyometra
    1.5.3. prostatic abscess
    1.5.4. dystocia
    1.5.5. testicular torsion
    1.5.6. endometritis
    1.5.7. priapism/paraphimosis
1.6. Metabolic/Endocrine
    1.6.1. derangements secondary to alterations in osmolality and electrolytes
    1.6.2. sodium and potassium balance
    1.6.3. acute acid base disorders and their management
    1.6.4. disorders of thyroid function
    1.6.5. hypoadrenocorticism
    1.6.6. hyperadrenocorticism
    1.6.7. diabetes mellitus
    1.6.8. ketoacidosis
    1.6.9. hypoglycaemia
    1.6.10. insulinoma
    1.6.11. disorders of calcium and magnesium balance
    1.6.12. hyperosmolar non-ketotic state
    1.6.13. corticosteroid insufficiency (CIRCI)
1.7. Haemo-lymphatic
    1.7.1. disorders of primary haemostasis
    1.7.2. disorders of secondary haemostasis
    1.7.3. A basic understanding of viscoelastic testing
    1.7.4. anaemias- all causes and their relevant treatments
    1.7.5. thromboembolic disease.

1.8. Neurological
    1.8.1. obtundation/coma
    1.8.2. vestibular syndromes
    1.8.3. increased intracranial pressure
    1.8.4. trauma
        1.8.4.1. brain
        1.8.4.2. spinal cord
    1.8.5. seizures
    1.8.6. tremor
    1.8.7. neuromuscular disorders
    1.8.8. meningitides and encephalopathies including meningitis of unknown origin and steroid responsive meningitis - arteritis
    1.8.9. intervertebral disc disease
    1.8.10. acute non-compressive nuclear disc extrusion
1.9. Musculoskeletal
    1.9.1. initial management of closed and open fractures
    1.9.2. spinal trauma
    1.9.3. crush injury
    1.9.4. infectious and immune mediated arthritis
1.10. Ophthalmic
    1.10.1. corneal ulcer or laceration
    1.10.2. eyelid laceration
    1.10.3. hyphaema
    1.10.4. Horner's syndrome
    1.10.5. temporary tarsorrhaphy and third eyelid flap
    1.10.6. conjunctival flap
    1.10.7. acute glaucoma
    1.10.8. penetrating ocular foreign bodies
    1.10.9. proptosis
    1.10.10 uveitis
1.11. Integumentary
    1.11.1. skin trauma
    1.11.2. principles of wound management
    1.11.3. burns
    1.11.4. degloving injuries
1.12. Nutrition/Alimentation
    1.12.1. enteral
    1.12.2. parenteral
    1.12.3. nutritional requirements in critical illness

1.12.4. pathophysiology of anorexia/starvation and refeeding syndrome

2. Infectious Diseases

The candidate should have a **basic knowledge** of:

2.1. common viral, protozoal, coccidial, parasitic and bacterial diseases seen in emergency practice including but not limited to:

- 2.1.1 Botulism
- 2.1.2 Brucellosis
- 2.1.3 Coccidiosis
- 2.1.4 Feline Respiratory Disease Complex
- 2.1.5 Coronavirus
- 2.1.6 Cryptococcosis
- 2.1.7 FIP
- 2.1.8 FeLV
- 2.1.9 FIV
- 2.1.10 Giardia
- 2.1.11 Heartworm
- 2.1.12 Hookworm
- 2.1.13 Canine Infectious Respiratory Disease Complex
- 2.1.14 Leptospirosis
- 2.1.15 Lungworm
- 2.1.16 Parvovirus
- 2.1.17 Salmonellosis
- 2.1.18 Tetanus
- 2.1.19 Toxoplasmosis
- 2.1.20 Whipworm

2.2. antimicrobial stewardship

2.3. nosocomial infection and methods of control

Management of Global Problems.

The candidate will have **sound**[1] **knowledge** of:

1. the pathophysiology, assessment and management of the following global problems:

1.1. cardiopulmonary arrest

1.2. sepsis/systemic inflammatory response syndrome

1.3. disseminated intravascular coagulation

1.4. hyperthermia

1.5. trauma —initial approach, including ABCs of triage and primary, secondary and tertiary surveys.

1.6. general toxicity management

1.7. commonly encountered toxicities and envenomations including but not limited to:

- 1.7.1. molluscicides — metaldehyde, methiocarb, iron EDTA
- 1.7.2. organophosphate toxicity
- 1.7.3. synthetic pyrethrins
- 1.7.4. rodenticides including vitamin K antagonists and bromethalin
- 1.7.5. elapid snake envenomation
- 1.7.6. *Ixodes holocyclus* (tick) paralysis
- 1.7.7. cane toad poisoning
- 1.7.8. tetrodotoxin
- 1.7.9. plant toxicities including lily, cycad, B*runfelsia*, karaka
- 1.7.10. fungal and algal toxicities
- 1.7.11. food toxicities including grapes, macadamia nuts, chocolate, xylitol
- 1.7.12. home medication toxicities including NSAIDs, paracetamol, salbutamol, common antidepressants including SSRIs and TCAs
- 1.7.13. serotonin syndrome
- 1.7.14. heavy metals including lead and zinc
- 1.7.15. illicit drugs including marijuana and amphetamines

1.8. Oncological emergencies
    1.8.1. tumour lysis syndrome
    1.8.2. mast cell tumour degranulation
    1.8.3. tumour rupture
    1.8.4. paraneoplastic syndromes including hyperviscosity, hypercalcaemia, hypoglycaemia, GIT ulceration, coagulopathy, neuropathy.
    1.8.5. chemotherapy associated adverse events:
        1.8.5.1. doxorubicin induced cardiomyopathy
        1.8.5.2. haemorrhagic cystitis
        1.8.5.3. chemotherapy-induced haematological derangements.
        1.8.5.4. extravasation of chemotherapy agents
        1.8.5.5. gastrointestinal signs
1.9. Anaphylaxis

Pharmacology and Fluid Therapy in the Emergency/ICU Patient.

The candidate will have a **sound knowledge** of:

1. The dose, indications, contraindications and drug interactions of drugs used in the management of the emergency and critically ill patient. The following list is intended to give a broad view of the categories of drugs that may be covered. Specific drugs have not been listed.

    1.1. Cardiovascular — inotropes, vasopressors, vasodilators, diuretics, antiarrhythmics, anti-platelet drugs
    1.2. Respiratory — bronchodilators
    1.3. Gastrointestinal/hepatic — antiemetics, antiulcer medications, gastrointestinal protectants, prokinetics, drugs used in enteritis, drugs used in hepatic failure
    1.4. Renal — diuretics, consequences of reduced renal function upon drugs used in therapy
    1.5. Metabolic/endocrine — glucocorticoids, mineralocorticoids, insulin, thyroxine, mitotane and trilostane, progesterone receptor blockers, prostaglandins, oxytocin, other hormones
    1.6. Haemo-lymphatic —antibiotics, heparins, fibrinolytics, anti-fibrinolytics, anti-platelet drugs, other anticoagulants
    1.7. Neurological — corticosteroids, mannitol, anaesthetics, analgesics, anticonvulsants
    1.8. Musculoskeletal — anti-inflammatories
    1.9. Oculo-otic — atropine, ocular antibiotics, ocular anti-inflammatories, prostaglandin, mannitol, carbonic anhydrase inhibitors
    1.10. Fluid, acid-base and electrolytes — crystalloids (isotonic and hypertonic) colloids (natural and synthetic), use of fluids in manipulation of metabolic acid-base derangements.
    1.11. Blood product administration — whole blood, packed red cells, fresh frozen plasma.

Management of Anaesthesia and Analgesia.

The candidate will have **sound knowledge** of:

1. The principles of anaesthesia and analgesia as they apply to the emergency or critically ill patient, including the following concepts:
    1.1. pain pathways and mechanism of action of different analgesics
    1.2. balanced analgesia
    1.3. balanced anaesthesia
    1.4. use of local/regional anaesthesia/analgesia
    1.5. management of anaesthetic emergencies
    1.6. post-operative intensive care.

Assessment of the Emergency and ICU Patient.

The candidate will be able to do the following with **sound[2] expertise**:

1. prioritise a patient's problems based on principles of triage.
2. assess a patient using history, physical examination findings, clinical pathology, radiography, basic ultrasound techniques and electrocardiography.

Principles of Monitoring.

The candidate will be able to do the following with **sound expertise:**

1. Interpret various tests and monitoring parameters including, but not limited to:
    1.1. clinical pathology
    1.2. haemogram or components thereof
    1.3. chemistry profile or components thereof
    1.4. electrolytes
    1.5. blood gases
    1.6. urine analysis including sediment examination
    1.7. coagulation profiles — ACT, PT, PTT, platelet counts
    1.8. antigen cage side testing
    1.9. lactate monitoring
    1.10. blood smear examination
    1.11. cytology and lab assessment of effusions
    1.12. faecal flotations
    1.13. C-reactive protein
    1.14. Snake Venom Detection Test

[2] **Skill levels:**
Sound expertise — the candidate must be able to perform the technique with a moderate degree of skill, and have moderate experience in its application. A middle level of proficiency.
Basic expertise — the candidate must be able to perform the technique competently in uncomplicated circumstances

2. Radiography and ultrasound interpretation (Point-of-Care Ultrasound)

3. Cardiovascular

   3.1. blood pressure – arterial, central venous; invasive and non-invasive techniques
   3.2. electrocardiographic monitoring
   3.3. indicators of perfusion status.

4. Respiratory

   4.1. arterial blood gases (including alveolar-arterial oxygen gradient)
   4.2. pulse oximetry including oxygen-haemoglobin dissociation curve
   4.3. capnography.

5. Neurologic

   5.1. modified Glasgow coma scoring.
   5.2. cranial and spinal nerve exam

6. Fluid balance

   6.1. "Ins and Outs" monitoring
   6.2. physical examination and laboratory parameters.

Techniques used in Emergency and Critical Care.

The candidate will be able to do the following with **sound expertise:**

1. techniques and procedures commonly used in emergency and critical care.

   The candidate will have **sound knowledge** regarding the necessary materials, techniques, risks and complications of the techniques.

   1.1. Vascular access procedures
      1.1.1. central venous catheterisation
      1.1.2. venous cut downs
      1.1.3. intraosseous fluid administration
      1.1.4. peripheral venous catheterisation
      1.1.5. arterial catheterisation.

   1.2. Cardiovascular system
      1.2.1. defibrillation
      1.2.2. pericardiocentesis.

1.3. Respiratory system
    1.3.1. techniques of oxygen administration:
        1.3.1.1. nasal oxygen, high flow nasal oxygen, oxygen hood, oxygen box, flow-by therapy
        1.3.1.2. percutaneous tracheal administration of oxygen
    1.3.2. thoracentesis
    1.3.3. thoracic drain placement
    1.3.4. thoracic drainage
        1.3.4.1. passive techniques — Heimlich valve, one bottle technique
        1.3.4.2. active techniques — continuous suction 3-bottle technique.
    1.3.5. airway management
        1.3.5.1. endotracheal intubation
        1.3.5.2. tracheostomy

1.4. Urinary system
    1.4.1. urinary catheterisation — male and female/dog and cat
    1.4.2. peritoneal dialysis
    1.4.3. cystocentesis
    1.4.4. techniques for managing urethral obstruction

1.5. Enteral feeding administration
    1.5.1. nasogastric/ nasoesophageal
    1.5.2. oesophagostomy
    1.5.3. gastrostomy
    1.5.4. jejunostomy.

1.6. Diagnostic procedures
    1.6.1. abdominocentesis
    1.6.2. arthrocentesis

EXAMINATIONS

For information on both the standard and the format of the written and oral examinations, candidates are referred to the *Membership Candidates Handbook.* The Membership examination has **two separate, autonomous components**:

1. **Written Examination** *(Component 1)*
   Written Paper 1 (two hours): Principles of the Subject
   Written Paper 2 (two hours): Applied Aspects of the Subject

2. **Oral Examination** *(Component 2)*
   Oral (one hour)

The written examination will comprise of two separate two-hour written papers taken on the same day. There will be an additional 15 minutes perusal time for each paper, during which no typing is permitted. Each paper will include 120 marks and questions may be long essay, short answer, or multiple choice. There is no choice of questions. Answers may be provided as text, tables and formulas. The exam format does not allow answers as drawings, graphs or diagrams. Marks allocated to each question and to each subsection of questions will be clearly indicated on the written paper.

Written Paper 1:

This paper is designed to test the candidate's knowledge of the principles of Emergency and Critical Care as described in the Learning Outcomes listed earlier. Answers may cite specific examples where the general principles apply but should primarily address the theoretical basis underlying each example.

Written Paper 2:

This paper is designed to (a) test the candidate's ability to apply the principles of Veterinary Emergency and Critical Care to particular cases/problems or tasks and (b) test the candidate's familiarity with the current practices and current issues that arise from activities within the discipline of Veterinary Emergency and Critical Care in Australia and New Zealand.

Oral Examination:

This examination further tests the candidate's achievement of the Learning Outcomes. Clinical and clinicopathologic images, laboratory test results, radiographs and basic ultrasound images may be used during this examination to discuss case material. The duration of this examination is approximately one (1) hour. Up to five (5) cases are presented with supporting questions asked verbally in a face-to-face setting. The oral examination has a total of 100 marks.

RECOMMENDED READING LIST

The candidate is expected to read widely within the discipline, paying particular attention to areas not part of their normal work experiences. This list of books and journals is intended to guide the candidate to some core references and other source material. Candidates also should be guided by their mentors. *The list is not comprehensive and is not intended as an indicator of the content of the examination.*

Recommended Textbooks

Drobatz, Hopper, Rozanski, Silverstein. *Textbook of Small Animal Emergency Medicine* 1st Edition. Wiley Blackwell, 2018

Silverstein D & Hopper K. *Small animal critical care medicine*. 3rd ed. Saunders Elsevier, 2022

Additional Textbooks

Burkett-Creedon JM, Davis H. *Advanced Monitoring and Procedures for Small Animal Emergency and Critical Care*. 2nd Ed Wiley, 2023.

DiBartola SP. *Fluid, electrolyte and acid-base disorders in small animal practice*. 4th ed. Saunders Elsevier, 2011.

Johnston, SA, & Tobias, KM. *Veterinary surgery: Small animal expert consult*. 2nd ed. Elsevier, 2018.

Nelson RW & Couto CG. *Small Animal Internal Medicine.* 6th ed. Elsevier, 2019.

Ettinger SJ & Feldman EC*. Textbook of Veterinary Internal Medicine Vols I & II.* 9th Edition. Elsevier Saunders, St. Louis, 2024.

Lumb and Jones. *Veterinary Anaesthesia and Analgesia.* 6th ed. Wiley, 2024

Marino, PL. *The ICU book*. 5th ed. Lippincott Williams and Wilkins, 2024.

Peterson ME & Talcott PA. *Small animal toxicology.* 3rd ed. Saunders Elsevier, 2013.

King L, Boag A. *Manual of canine and feline emergency and critical care*. 3rd ed. BSAVA, 2018.

Recommended Journals

Journal of Veterinary Emergency & Critical Care
Australian Veterinary Journal
Australian Veterinary Practitioner

Additional Journals

Journal of Feline Medicine and Surgery
American Journal of Veterinary Research
Journal of the American Veterinary Medical Association
Veterinary Clinics of North America: Small Animal

Circulatory Shock
Critical Care Medicine

Recommended Websites
Veterinary Information Network, www.vin.com

[3] **Recommended textbook** – candidates should own or have ready access to a copy of the book and have a sound knowledge of the contents.
Additional references – candidates should have access to the book and have a basic knowledge of the contents
Additional Reading Materials - These are conference proceedings, other non-refereed publications and other journals that would offer some information in the subject area including differing points of view but are not required reading.
[4] **Recommended Journal** – candidates should have ready access to either print or electronic versions of the journal and have a sound knowledge of the published articles in the subject area.
Additional Journal – candidates should be able to access either printed or electronic versions of the journal and have a basic knowledge of the published articles in the subject area.

FURTHER INFORMATION

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