AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

FELLOWSHIP GUIDELINES

Veterinary Radiology, General Track

ELIGIBILITY

1. The candidate must meet the eligibility prerequisites for Fellowship outlined in the *Fellowship Candidate Handbook*.
2. Membership of the College must be achieved prior to the Fellowship examination.
3. Membership must be in Veterinary Radiology, small or large animal.

OBJECTIVES

To demonstrate that the candidate has attained sufficient knowledge, training, experience, and accomplishment to meet the criteria for registration as a specialist in veterinary radiology. Candidates who are successful in the examination for Veterinary Radiology General Track, may use the post-nominals FANZCVS (Radiology).

LEARNING OUTCOMES

The field of veterinary radiology, general track, includes the study of imaging as it pertains to domestic animals including dogs, cats and horses, with a lesser emphasis on domestic production animals and unusual pets (small mammals, birds, reptiles and wildlife).

The candidate will have a **detailed[1] knowledge** of:

1. Radiation physics as it applies to veterinary radiography
   - 1.1. atomic and nuclear physics including atomic composition, structure and binding forces
   - 1.2. forms of electromagnetic radiation
   - 1.3. production of x-rays, interaction of x-rays with matter, components and function of the x-ray tube, components and function of x-ray detection systems (both film-screen and digital radiography)

[1] **Knowledge Levels**:
Detailed knowledge - candidates must be able to demonstrate an in-depth knowledge of the topic including differing points of view and published literature. The highest level of knowledge.
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 main literature.

1.4. radiographic artefacts (both computed and digital radiography).

2. Digital radiography:
   2.1. image formation including different capture devices
   2.2. resolution
   2.3. image data storage
   2.4. processing of photostimulable phosphor plates (PSP)
   2.5. advantages and disadvantages of different types of digital radiography.

3. Computed Tomography (CT) physics:
   3.1. image formation including CT construction and scanner types, image manipulation
   3.2. factors that affect CT image quality
   3.3. CT artefacts

4. Magnetic Resonance Imaging (MRI) physics:
   4.1. image formation, including equipment, magnet field strengths, and an understanding of the principles of acquisition of SE, FSE, GRE sequences of different tissue weightings
   4.2. factors that affect MRI image quality
   4.3. MRI artefacts
   4.4. practical applications of MRI safety

5. Ultrasound physics:
   5.1. image formation including equipment
   5.2. physical characteristics of the ultrasound beam and the interaction of ultrasound with matter
   5.3. physics of Doppler, harmonic and compound imaging
   5.4. ultrasound artefacts

6. Contrast media:
   6.1. radiographic, CT, MRI and ultrasound contrast media including mechanism, side effects, administration and dose

7. Anatomy and physiology as related to veterinary radiology of dogs, cats and horses

8. Clinical and pathophysiological features as related to veterinary radiology of canine, feline and equine disease of all body systems

9. Practical applications of all studies of all modalities

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

1. Radiation safety in veterinary medicine:
   1.1. principles of radiation protection including the ALARA concept
   1.2. interactions of electromagnetic and particulate radiation with matter
   1.3. biological effects of radiation in a clinical radiology context

1.4. mechanisms of acute and late radiation injury
1.5. radiation monitoring, safety equipment and regulations
1.6. relevant Australian and New Zealand laws and Codes of Practice as they apply to the use of ionising radiation

2. Radiation physics as it applies to:
   2.1. fluoroscopy and the image intensifier
   2.2. nuclear scintigraphy

3. Embryology of the cardiovascular, urinary and neurological systems as it relates to development of congenital conditions of these systems

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

1. Anatomy, physiology and pathophysiology of disease as related to veterinary radiology of domestic production animals and unusual pets (small mammals, birds, reptiles)

2. Radiation oncology:
   2.1. principles of radiation therapy
   2.2. radiobiology of the cell cycle

3. The biological effects of ultrasound

The candidate must be able to demonstrate a **detailed[2] level of expertise** in:

1. Image acquisition, interpretation and reporting:
   1.1. radiographic, ultrasound, CT and MRI images in dogs, cats and horses.

2. Image guided biopsy:
   2.1. techniques, including fine needle aspiration and percutaneous biopsy

3. Critical evaluation of the current literature and concepts in the field of Veterinary Radiology

The candidate must be able to demonstrate a **sound level of expertise** in:

1. Image acquisition, interpretation and reporting:
   1.1. scintigraphic studies in cats, dogs and horses
   1.2. radiographic, ultrasound, CT and MR images of domestic production animals and unusual pets (small mammals, birds, reptiles and wildlife)

[2] **Skill levels**:
Detailed expertise – the candidate must be able to perform the technique with a high degree of skill, and have extensive experience in its application. The highest level of proficiency.
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.

EXAMINATIONS

Exam Format:
The examination will comprise of three components:

1. Two (2) written examinations (3 hours for each paper, plus 20 minutes perusal)
2. Two (2) practical examinations (3 hours for each paper, plus two (2) five-minute rest breaks). There is no perusal in the practical examinations.
3. An oral examination (1 – 2 hours)

Written exams:

Each written examination will comprise:

- Two (2) essay-type questions of 30 minutes each. Questions may be broken into sub-parts. TOTAL TIME: 60 minutes
- Six (6) short-answer questions (5 minutes each). TOTAL TIME: 30 minutes
- Forty-five (45) multiple choice questions (2 minutes each). TOTAL TIME: 90 minutes

Candidates are required to answer showing reference to the literature (e.g. citing relevant studies that inform their answers). Ideally citations should include the primary author and age of publication if important to its relevance; in cases where this recall is not possible, as much detail as possible should be included.

Candidates may also be expected to use their own clinical experience in answering questions, demonstrating experience with modalities.

Perusal time of 20 minutes will be provided at the start of each written paper; candidates are recommended to use this time to *read carefully* the questions and plan their answers. During this time candidates may make notes on the scrap paper provided. No typing is allowed during perusal.

Written Paper 1:
Designed to test the candidate's knowledge and clinical application of physics, anatomy and pathophysiology as described in the Learning Outcomes.

Written Paper 2:
Designed to test the candidate's ability to apply the principles of Radiology to particular cases/problems or tasks. The candidate may be required to draw on their knowledge of pathophysiology, physics and anatomy to answer the questions.

Practical examination:

Each practical examination will test the candidate's ability to produce written imaging reports. Each examination will have a five (5) minute rest break in the middle hour. During this break, the candidate will stop working while they have a 5-minute break. No talking will be allowed during this time. Candidates may use the bathroom during this period. Each examination will last for 185 minutes (including rest breaks). No perusal time will be given.

Practical exam format:

- The case material presented will be in a digital format. At least one large monitor will be provided for viewing studies.
- The first examination will comprise twelve (12) radiographic (XR) cases. Fifteen minutes are recommended to be spent on each case, with a 5-minute rest break provided after 90 minutes have elapsed. Candidates are allowed to work through the cases at their own pace and need to manage time allocation to each case appropriately.
- The second examination will comprise nine (9) advanced imaging cases. Within the 9 cases, approximately 3-4 cases will be CT, 3-4 cases MRI and 2-3 US or NM. Exact case numbers of each modality may vary from year to year however will comprise approximately the numbers above. Twenty minutes are recommended to be spent on each case with a 5-minute rest break provided after 100 minutes have elapsed. Candidates are allowed to work through the cases at their own pace and need to manage time allocation to each case appropriately.
- Approximately equal numbers of cases of thoracic, abdominal, musculoskeletal and neurological body systems will be presented across both examinations.
- Images will be presented in a DICOM Viewer, the details of which will be provided to the candidate by the College at least one month prior to the examination. Candidates should be familiar with the basic functions (pan, zoom, magnify, alteration of window/level, flip orientation functions) of this viewer. An instruction guide and opportunity to test the viewer will be provided ahead of the exam if a free test version of the viewer and instructions are not available online.
- For XR, US, NM and MR studies, candidates will be presented with the appropriate images in an appropriate format to make a diagnosis.
- For CT studies, candidates will be presented in a format where the pathology is visible (candidates will not be expected to make reconstructions or multiplanar reformats in different windows from those presented).

Practical answer style:

- Each case presented in an exam section is worth a total of 15 marks per case in the first exam and 20 marks per case in the second exam.
- Candidates will be provided with information about the study (whether XR, US, CT etc.), signalment and limited history.
- Examiners are looking for a systematic evaluation of the study.
- Candidates will be awarded points marks for the following:
    - Detailed description of imaging abnormalities.
    - Interpretation of the imaging abnormalities in light of the patient's signalment, history and clinical signs.
    - Formulation of a ranked list of differential diagnoses or diagnosis where appropriate.
    - Provision of appropriate patient management recommendations, including both imaging-related diagnostics and other pertinent diagnostic testing
- Candidates must demonstrate to the examiners their thought processes, prioritisation and conclusions.
- Normal findings do not need to be listed except where their assessment is relevant to the differential diagnoses or recommendations. For example, cardiomegaly with left atrial enlargement but no pulmonary vascular enlargement; or hepatomegaly with normal adrenal size; or aggressive bone lesion with normal lungs.

- Candidates should not comment on artefacts unless they are pertinent to interpretation of the study.
- Individual candidate style will not affect the allocation of marks (e.g. descriptive sentences or dot points can both be valid answers for the observation of imaging abnormalities or conclusions) however as marks are awarded for a systematic appraisal, regardless of style.
- Terminology should utilise the Nomina Anatomica Veterinaria and avoid colloquial language.

Oral Examination:

- Questions will be provided in a digital format using a proprietary viewer or Power Point.
- These questions aim to test how the candidate arrives at their radiographic conclusions.
- Candidates will be provided with information about the study such as signalment and limited history.
- For imaging studies consisting of large data sets, the relevant images (single images, series, sequences) will be provided.
- Candidates may request additional imaging studies.
- Candidates must demonstrate to the examiners their thought processes, prioritisation and conclusions.
- Candidates will be awarded points for the following:
    - Description of imaging abnormalities.
    - Formulation of rational imaging conclusions and a ranked differential diagnosis list, or diagnosis where appropriate
    - Ability to synthesise imaging findings with the patient's clinical history and signs.
    - Candidates should demonstrate an understanding of the pathophysiology of observed abnormalities and rational justification for theuse of ancillary tests.
    - Ability to make appropriate patient management recommendations, including both imaging-related diagnosticsand other pertinent diagnostic testing. The candidate may recommend and ask for further imaging studies. E.g. if it is appropriate after reading a radiographic study to recommend ultrasound, the candidate may ask whether such a study is available.
- Candidates should verbalise their thought process reading the entire study, including briefly mentioning normal structures as they are assessed (e.g. the cardiac silhouette is normal, the pleural and mediastinal spaces are normal).
- Candidates should not comment on artefacts unless they are pertinent to interpretationof the study.

Examples of questions:

1. Thoracic radiograph series of a dog. “This is a 7-year-old Doberman with recent onset tachypnoea. Provide the radiographic description and conclusions”.
2. Two transverse images of an MRI study of a canine brain, pre and post contrast. “Describe briefly the pathology that you see. What are the differential diagnoses for this lesion?” (The images demonstrate a typical meningioma.)

3. An image showing a spectral Doppler trace through a normal LVOT: “What is this image depicting? What are the expected findings if a patient had aortic stenosis?”
4. “Describe the artefact present and discuss how this occurred”
5. An image depicting a brand of contrast medium. “What is this chemical? What are the indications and contraindications for its use?”

Additional notes for the Practical and Oral Examination

In the practical and oral examinations, candidates will be provided with information about the study they are receiving. They will not be awarded marks for describing that a study is a three-view thoracic radiographic study, or an echocardiogram of a cat’s heart, etc.

Examples:

1. Three-view thorax. History and signalment provided.
2. MRI brain, T1W pre and post, transverse, sagittal planes, T2W transverse sagittal plane, FLAIR, transverse plane, GRE transverse plane. History and signalment provided.
3. Thoracic CT: lung window, soft tissue window pre- and post-contrast. Sagittal MPR (post-contrast soft tissue window). History and signalment provided.

An exception to this may be a specific question requiring recognition of MRI sequences, naming radiographic projections or similar.

TRAINING PROGRAMS

Refer to the *Fellowship Candidate Handbook*, Section 3.3.

In addition to the stipulations of the *Fellowship Candidate Handbook*:

1. Full Time Training Program

The Radiology Chapter requires a Full time Training Program (FTP) to be of 144 weeks duration, with a standard 38 hours week. With the addition of four weeks annual leave per year, a resident would be expected to complete a FTP over 3 years. As per the Fellowship Candidate Handbook, both Primary and Secondary supervisors should be identified, who are Specialist Radiologists working in the field a minimum of 25 hours per week. Approval of a FTP is contingent on an expectation that the training institution will have sufficient breadth and volume of case material to allow residents to satisfy case minima as specified in the Radiology Chapter Guidelines, and any identified deficits in case material able to be filled with externship training.

Up to 20% of the FTP may be devoted to the research project and publications, with the pattern of time on the project to be tailored for each program. Examples include but are not limited to one day per week, or 30 weeks of the 144 weeks program taken in blocks, to be devoted to research and publications. The remaining time should be spent in clinical work or other appropriate training activities. Clinical work includes case discussion with clinicians, hospital rounds, acquiring studies of a variety of modalities (including special procedures), reporting cases and report correction, and the chapter requires weekly direct supervision of a minimum of 25 hours per week of clinical work. Other training activities such as Journal Club and Known Case Conference Rounds fall outside this definition of clinical work, but may form part of a typical 38 hour work week.

For the Fellowship in Veterinary Radiology General Track, clinical training should include primarily exposure to dogs, cats and horses, with lesser exposure to production animals, unusual pets and wildlife.

Clinical training should include the following: radiography, radiology, contrast procedures, fluoroscopy/image intensification, digital radiography, sonography, sonology, scintigraphy, computed tomography and magnetic resonance imaging.

2. Supervision

Primary Supervision

At the commencement of a Training Program the candidate is expected to be at the emerging level of competency for most modalities. Thus, at the commencement of a Training Program all clinical supervision should be provided as Direct In Person Supervision (see below). As the resident progresses through competence in various modalities, a transition in the mode of direct supervision may occur to also include Direct Remote Supervision as defined below. Other training activities such as Journal Club or Known Case Conference Rounds may be conducted under Direct Remote Supervision from the commencement of the training program. These fall outside the 25 hours per week of supervised clinical training. The competency document should be reviewed with the resident no less than 6 monthly and the document should be included in the activity log summary.

If the candidate's skills are found to be less than competent at the end of the third year of

their approved training program, the candidate will be required to undertake further training before being further assessed.

A pro-forma letter (Appendix 1) will be completed by the candidate's supervisor and submitted with the Fellowship training credentials documentation, to state whether the candidate is considered technically proficient in ultrasound, and to justify the reasons for the assessment.

Direct In Person Supervision (DIPS)

1. DIPS requires the supervisor to be in physical attendance at the training institution and be able available to directly attend and work in conjunction with the resident.
2. At the commencement of the training program, the resident has direct in person access to the supervisor for a minimum of 25 hours per week for clinical work.

Direct Remote Supervision (DRS)

1. DRS requires a supervisor to be present and available in real time, via phone or videolink, with the capacity for screen sharing for simultaneous review of images.
2. As the resident progresses through levels of competency, a gradual increase in the proportion of DRS may be appropriate.
    a. DRS may be implemented when the "consolidating" level of competency has been reached for XR, CT, MRI and NM, and "competent" level reached for ultrasound and special procedures.

In the latter stages of a Training Program, DRS should in general comprise no more than 10 of 25 hours (40%) of Directly Supervised Training time. The remaining 15 hours should be DIPS.

It is noted that adequate technical support in the event of equipment failure must be available to the resident at all times.

Secondary Supervision

The secondary supervisor may be present in the workplace or could provide case review (XR, CT, MRI, nuclear medicine only) and ancillary support (journal club, rounds, publication review etc.) remotely (via videoconference or interactive online messaging).

If the primary supervisor is absent for a period of more than a week (annual leave, illness etc.), for the training to count as directly supervised training the secondary supervisor must provide equivalent supervision in terms of hours and proportion of DIPS and DRS, otherwise the training will revert to Indirectly Supervised Training.

3. Other types of programs

Part Time Programs

In principle, the same supervision requirements apply as for a full time program, however the weekly hours may vary according to the duration of the program, and should be applied on a pro-rata basis. Overall number of supervised hours must be equivalent however the program will run over a longer duration. There is still a requirement for primary and secondary supervisors. The Fellowship Candidate Handbook prescribes minimum weekly hours and duration of training program for specific part-time hours required for Part Time Programs.

Alternative Training Programs

Alternative Training Programs are, by nature, able to be flexible in design to accommodate unique training circumstances. These will be approved on a case by case basis, to ensure a minimum standard of supervision continues to be provided to the resident. Such a program may include training at more than one institution in order to meet minimum case numbers, and fulfill deficits (such as modalities or available species). It may also include a greater proportion of DRS. Progression through supervision requirements must remain competency based, with the same thresholds reached to be applied as for Full Time Training Programs.

4. Minimum case numbers

Minimum case numbers are as follows:

Dogs, cats, unusual pets and wildlife–

3000 radiographic examinations (mostly dogs and cats)

1000 sonographic examinations (mostly dogs and cats)

400 CT/MRI/scintigraphy examinations that demonstrate adequate knowledge and interpretive skills (a minimum of 150 of which should be CT and a minimum of 150 of which should be MRI).

Horses and production animals –

500 radiographic examinations (mostly horses)

100 CT/MRI/scintigraphy examinations that demonstrate adequate knowledge and interpretive skills (a minimum of 25 of which should be CT, a minimum of 25 of which should be MRI, and a minimum 25 of which should be scintigraphy).

A minimum of 80% of cases should be 'contemporary' cases; to this end, a 'contemporary' case is for a patient actively being seen by the attending clinician, where the radiologist's input may influence case management. This may be a case actively seen in the veterinary hospital (sometimes referred to as a 'live' case), or seen through a teleradiology service; importantly the supervisor must ensure the candidate has access to case discussions with the attending clinician and have ready access to patient hospital files for follow-up (such as results of pathology or surgery, responses to treatment). This acknowledges the learning benefits from interaction between radiologist and clinician, and value of follow-up findings to validate imaging interpretation. Sonographic examinations must all be contemporary cases. No more than 20% of all cases (radiographic, CT, MRI, scintigraphy) may be derived from archived historic material and no more than 30 % of all cases (contemporary or archived) may be sourced through a teleradiology service.

Cases to be included in the Activity Log Summary will be those cases in which the candidate has produced a written report that has been reviewed by a Supervisor. If, for example, a case has an osteosarcoma of its radius and thoracic radiographs for a metastasis check then this may be counted as two cases if a report is produced for both regions. If a "whole body" study is interpreted, this is considered as 2 regions. For each case within the activity log summary there is to be an indication as to whether the case is contemporary or archived case.

The training program should be targeted, with achievable goals set by the Supervisor and candidate for each 6 months. It is anticipated that the first year should be spent developing radiography and ultrasonography skills, and reporting radiographic and ultrasound studies, with some exposure to other modalities. The second year is spent

consolidating the first with introduction of CT, nuclear medicine and MRI. In the third year a continued shift in emphasis toward CT , MRI and nuclear medicine, with further consolidation of radiology and ultrasound. It should be expected that the candidate's Activity Log Summary output is lower in the first year but that they become more independent and productive in their second and third years. It is very important not to neglect radiographic interpretation in favour of advanced imaging throughout the training program.

TRAINING IN RELATED DISCIPLINES

Refer to the *Fellowship Candidate Handbook*, 2.4.2.

Candidates for Fellowship in Veterinary Radiology must spend time as stipulated by the *Fellowship Candidate Handbook* in any four of the following related disciplines: Pathology, Small Animal Medicine, Canine Medicine, Feline Medicine, Cardiology, Small Animal Surgery, Equine Medicine, Equine Surgery, Equine Sports Medicine, Neurology, Oncology.

EXTERNSHIPS

Refer to the *Fellowship Candidate Handbook*, Section 2.4.1.

ACTIVITY LOG SUMMARY

An Activity Log Summary should be provided for each imaging modality (Radiology, Ultrasound, Special Radiographic Procedures, CT, MRI and Scintigraphy) according to the template provided in Appendix 2. Each summary should be submittedwith the annual supervisor's report, with a cumulative total for the total training period. For each imaging modality, cases are recorded by species and the region imaged (as listed below). This allows the candidate and their supervisor to monitor their case load for each modality (e.g. numbers of canine abdominal ultrasounds, numbers of equine musculoskeletal radiographs, etc), and assess whether the targets mentioned above (section 4 under the 'Training Programs' heading) are being achieved.

Radiology:

- Thorax
- Abdomen
- Musculoskeletal - appendicular
- Musculoskeletal - axial
- Other

Ultrasound:

- Thorax - non cardiac
- Thorax - cardiac
- Abdomen
- Musculoskeletal
- Small Parts (eg thyroid, eye, etc)
- Biopsies/FNA

Special Radiologic Procedures:

- Myelography
- Urinary contrast studies
- Oesophagrams
- Other contrast studies
- Fluoroscopy (non-contrast)

CT:

Thorax
Abdomen
Musculoskeletal – appendicular
Musculoskeletal – axial including head
Neurological

MRI:

Neurological
Musculoskeletal
Other

Scintigraphy:

Musculoskeletal
Thyroid
Hepatic
Other

Species list for each modality:

Canine
Feline
Equine
Production animals (cows, sheep, goats, alpacas, pigs)
Unusual pets (small mammals, birds, reptiles and wildlife)

Note that an imaging study of a region is considered a case. If multiple regions are imaged of a single patient (e.g. radiographs of a long bone and thorax for metastasis check) these would be considered two cases; one musculoskeletal and one thorax – non cardiac, provided both are reported. For the purposes of the activity log summary, "whole body" studies can be counted as 2 regions.

PUBLICATIONS and PRESENTATION

Refer to the *Fellowship Candidate Handbook*, Section 2.10.

RECOMMENDED READING LIST

The candidate is expected to research the depth and breadth of the knowledge of the discipline. This list is intended to guide the candidate to some core references (indicated by underline) and other useful reference material. The list is not comprehensive and is not intended as an indicator of the content of the examination. Candidates at Fellowship level are expected to havelibrary search skills and maintain a watching brief over relevant literature.

Physics

Bushberg JT, Seibert JA, Leidholdt Jr EM, Boone LM (2020) The Essential Physics of Medical Imaging 4th ed. Lippincott, Williams and Wilkins

Curry T.S. et al (1990) Christensen's Physics of Diagnostic Radiology 4th ed. Lea and Febiger, Philadelphia.

Kremkau F.W. (2020) Sonography Principles and Instruments. 10th ed W.B Saunders CO. Philadelphia.

Radiation Protection and Safety

Relevant Australian State or New Zealand legislation and codes of practice governing the safe use of ionising radiation.

Anatomy

Coulson A and Lewis N (2008) An Atlas of Interpretive Radiographic Anatomy of the Cat and Dog, 2nd ed. Blackwell Publishing

Denoix JM (2005) The Equine Distal Limb – An Atlas of Clinical Anatomy and Comparative Imaging. Manson Publishing, London.

Denoix JM (2019) Essentials of clinical anatomy of the equine locomotor system. CRC Press

Evans HE and Christensen CC (2020) Miller's Anatomy of the Dog. 5th Ed. W.B. Saunders Co. Philadelphia.

Getty R (1975) Sisson and Grossman's Anatomy of Domestic Animals. 5th ed. W.B. Saunders Co. Philadelphia.

Mihaljevic, Michael; Kramer, Martin; Gomercic, Hrvoje; CT-und MRT Atlas Transversale anatomie des Hundes (2009 Parey).

Schebitz H and Wilkens H (1986) Atlas of Radiographic Anatomy of the Horse. Verlag Paul Parey, Berlin.

Schebitz H and Wilkens H (1986) Atlas of Radiographic Anatomy of the Dog and Cat. Verlag Paul Parey, Berlin.

Smith SA and Smith BJ. (1992) Atlas of Avian Radiographic Anatomy. Saunders. Philadelphia

Thrall DE and Robertson IS. Atlas of Normal Radiographic Anatomy and Anatomic Variants in the Dog and Cat. (2015) 2nd ed Elsevier

Imaging

Barr FJ and Kirberger RM (2006) BSAVA Manual of Canine and Feline Musculoskeletal Imaging. Pub BSAVA

Berry C.R. and Daniel G.B. (2006) Textbook of Veterinary Nuclear Medicine, North Carolina State University, Raleigh.

Boon JA (2011) Manual of Veterinary Echocardiography, 2nd ed. Wiley-Blackwell

Brown M, Brown L, Lavin's Radiography for Veterinary Technicians. (2017) 6th ed.

Saunders, Philadelphia.

Butler J.A. et al (2016) Clinical Radiology of the Horse, 4th ed. Blackwell Scientific Publications, Oxford.

Capello V, Lennox AM: Clinical Radiology of Exotic Companion Mammals. Wiley-Blackwell, Iowa, 2008.

Dennis R, Kirberger R, Wrigley R. (2010) Handbook of Small Animal Radiological Differential Diagnoses, 2nd ed. W. B. Saunders

DuPont GA and Debowes LJ. Atlas of dental radiography in dogs and cats: (2008) Saunders, Philadelphia.

Ettinger SJ, Feldman (2017) Textbook of Veterinary Internal Medicine. 8th ed. W.B. Saunders Co. Philadelphia.

Kidd, Lu, Frazer. (2014) "Atlas of Equine Ultrasonography", Wiley-Blackwell

Kittleson and Keinle (1998) Small Animal Cardiovascular Medicine. Mosby,

St Louis

Mai W. Diagnostic MRI in Dogs and Cats (2018) Taylor and Francis

Mattoon JS and Nyland TG (2015) Veterinary Diagnostic Ultrasound. 3rd ed. Saunders Philadelphia.

Morgan JP (2002) Radiology of Veterinary Orthopedics: Features of Diagnosis. Wiley.

Morgan JP, Leighton RL (1995) Radiology of Small Animal Fracture Management. WB Saunders Co. Philadelphia

Morgan JP, Wind A and Davidson AP (2000) Heriditary Bone and Joint Diseases in the Dog. Schlutershe & Co , Germany

Murray E (2010) Equine MRI. Wiley Blackwell

Niemiec BA, Gawor J, Jekl V. Practical Veterinary Dental Radiography (2017) Routledge

O'Brien T.R. (1978) Radiographic Diagnosis of Abdominal Disorders in the Dog and Cat. W.B. Saunders Co. Philadelphia.

Penninck D and D'Anjou M (2015) Atlas of Small Animal Ultrasonography 2nd ed. Blackwell Publishing

Rantanen NW and McKinnon AO (1998) Equine Diagnostic Ultrasonography. Williams and Wilkins

Reef VB (1998) Equine Diagnostic Ultrasound. W. B. Saunders. Philadelphia

Ross M.W., Dyson S.J. (2011) Diagnosis and Management of Lameness in the Horse 2nd ed. Elsevier

Schwartz T and Johnson VJ (2008) BSAVA Manual of Canine and Feline Thoracic Imaging. BSAVA

Schwartz T and Saunders J. (2011) Veterinary Computed Tomography. Wiley Blackwell

Sharp NJH and Wheeler SJ. (2005) Small Animal Spinal Disorders 2nd ed. Elsevier
Silverman S and Tell L (2005) Radiology of Rodents, Rabbits, and Ferrets. Pub Elsevier Saunders, Missouri.

Stashak TS (2001) Adam's lameness in horses. 4th ed. Lea and Febiger, Philadelphia.

Suter PR (1984) Thoracic Radiography. A text atlas of thoracic diseases of the dog and cat. Peter F. Suter, Wettswil, Switzerland

Thrall DE (2017) Textbook of Veterinary Diagnostic Radiology. 7th edition. Saunders Co. Philadelphia.

Wisner E Zwingenberger A. Atlas of Small Animal CT and MRI.(2015) Wiley

Withrow SJ MacEwan EG (2012) Small animal clinical oncology. 5th ed. Saunders., Philadelphia

Journals

Veterinary Radiology and Ultrasound
Journal of Small Animal Practice
Journal of Veterinary Internal Medicine
Journal of Veterinary Cardiology
Veterinary Comparative Orthopaedics and Traumatology
Veterinary Surgery
Journal of Feline Medicine and Surgery
Journal of the American Veterinary Medical Association
The Veterinary Record
The American Journal of Veterinary Research
Radiology
The British Veterinary Journal
The Australian Veterinary Journal
The Equine Veterinary Journal

FURTHER INFORMATION

For further information contact the College Office

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Appendix 1:

Australian and New Zealand College of Veterinary Scientists

Ultrasound Proficiency Report, Veterinary Radiology Fellowship (template)

Date:
Candidate's name:
Fellowship Subject:

Supervisor's name and qualifications:
Supervisor's position:

This report certifies that I have continually assessed the Candidate's development of sonography and sonology skills throughout the period of directly supervised training.

The Candidate *has/has not* [delete the inappropriate string] developed these skills to a satisfactory level during this time.

Comments:
[Please enter any comments that justify your assessment].

Supervisor's signature.

Appendix 2:

See attached Spreadsheets