

Certificate in Advanced Veterinary Practice

C-VDI.1 Veterinary Diagnostic Imaging Imaging in Practice

Module Outline



Module Leader:

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Enrolment guidance

The aim of the module is to enable you to extend and consolidate clinical knowledge and skills gained at undergraduate level, and to develop an in-depth understanding of the application of that knowledge in a practice environment in relation to Veterinary Diagnostic Imaging.

Before embarking on this module, you should fulfil the following criteria:

- a) You ideally should have completed module B-SAP.1.
- b) If you have completed a B Practice module at another institution, you may submit one imaging report for feedback by RVC assessors.
- c) If you are only enrolling for the VDI C modules with RVC, it is highly recommended that you write one DI report from your relevant B Practice module and this will be reviewed by the assessors prior to assessment of any C module work.
- d) This module is aimed principally at veterinary surgeons in private practice or at a veterinary school at which 500 or more cases are radiographed per annum and where the candidate is responsible for radiographing at least 250 of those cases.

Coverage of this module may be integrated with others, particularly other B and C modules. All candidates will normally have completed A-FAVP.1 Foundations in Advanced Veterinary Practice module and at least one of the practice B modules, before undertaking a C module, although candidates can choose to work through modules in a different order if they wish. In whichever order modules are tackled, compliance with best practice for all the topics covered by module A-FAVP.1 will be expected whenever these are appropriate in C modules. For example, awareness of, and compliance with, all relevant legislation, welfare and ethical principles will be required throughout.

Candidates are advised to plan a structured programme of continuing professional development to help them achieve their objectives. Involvement in 'learning sets' and networks of other candidates working towards the same or similar modules is encouraged; this could be initiated by the candidates themselves via RVC Learn. The RCVS considers that candidates will need advisers/mentors to support them through the programme. Candidates are free to choose their own advisers/mentors and the RCVS guidelines strongly advise candidates to seek advice from their mentor regarding 'seeing practice' with specialist surgeons.

The module is focused on taking images (radiography) rather than interpreting images (radiology), which is the concern of the other Veterinary Diagnostic Imaging C modules, although radiological interpretation is required in the casebook part of the module assessment. Candidates should develop the practical skills that allow appropriate case selection for imaging studies, ensure the taking of diagnostic radiographs, while complying with the relevant legal requirements for safe radiographic practice.

The module may be taken from a large animal or a small animal perspective, or a mixture of the two. It is suggested that candidates intending to proceed to a designated Certificate in Advanced Veterinary Practice (Veterinary Diagnostic Imaging):

- via C-VDI.2 and C-VDI.3 (small animal options) should present a C-VDI.1 module made up of 80-100% small animals.
- via C-VDI.4 and C-VDI.5 (large animal/equine options) should present a C-VDI.1 module made up of 80-100% large animals.

For a designated Certificate in Advanced Veterinary Practice (Veterinary Diagnostic Imaging) candidates must complete this module, two further C-VDI modules, a fourth 10 credit module of your choice and an RCVS synoptic assessment.

Learning outcomes

You must demonstrate:

- Good radiographic practice in relation to the safety of patients and personnel, positioning, processing and image quality. You should be able to produce optimal quality radiographs for the diagnosis of commonly encountered conditions seen in general veterinary practice.
- The ability to apply diagnostic imaging techniques appropriately as part of the overall investigation of a case.
- A variety of radiographic experience over the period that the module is being completed that is consistent with the more commonly encountered conditions seen in first opinion veterinary practice.

Content

At the end of the module, you should be able to:

Produce **good quality radiographic images** while complying with the current Ionising Radiations Regulations and in the process develop an understanding of:

- exposure assessment
- the factors influencing the choice of kV, mA, time, use of grid, etc.
- formation of technique charts
- correct positioning of patients, and the limitations that may be imposed in domestic animals
- the need for restraint using appropriate methods, including the advantages and disadvantages of the use of sedation and anaesthesia

Ensure satisfactory **radiation protection**, through an understanding of:

- the relevant legal requirements including familiarity with the current “Guidance notes for the protection of persons against Ionising Radiations arising from veterinary use”
- the risks involved in the use of radiographic procedures and the methods which can be used to minimise these risks
- hazards arising from poor design of X-ray rooms
- the control of hazards arising from secondary radiation
- the correct use of protective aprons and gloves
- familiarity with current radiation monitoring services
- the instruction of lay staff in radiation discipline

Use **contrast media** appropriately, through an understanding of:

- the nature of the more frequently used media and indications for their use
- the procedures for performing basic contrast techniques

Recognise faults due to inadequate radiographic procedure, processing and film handling.

Recognise **normal radiographic anatomy**. (You should possess a detailed knowledge of the normal radiographic anatomy of the dog, cat and horse and of their variations with breed and age, as appropriate for the case diary. In other species knowledge compatible with current use would be expected.)

Apply the **principles of radiological interpretation**:

- the recognition of tissue types
- formation of shadowgraphs
- effects of superimposition and multiple shadows
- changes in opacity, size, shape, position and function of organs
- the use of simple positional and contrast aids to elucidate radiographic problems
- the applications of these basic principles to the evaluation of radiological signs in relation to clinical problems

Understand the principles of **diagnostic ultrasonography** in veterinary practice:

- physical principles of ultrasound
- image production
- display modes
- artefacts
- normal ultrasound appearance of the major organs (heart, liver, kidney, spleen, bladder, prostate and uterus) and equine tendons, as appropriate for the case diary.
- recognition of major alterations to the normal architecture of these organs and structures and the possible diagnostic significance of these changes

Special techniques

You should be familiar with the general principles of contrast examinations and the performance and interpretation of the more commonly used techniques. They should understand the principles and appropriate use of fluoroscopy with image intensification, appropriate for the case diary. They should understand the basic principles and appropriate use of diagnostic ultrasonography in veterinary practice. For case diaries with an equine bias, you should understand the basic principles and appropriate use of diagnostic scintigraphy and for all case diaries, you should understand the role of advanced imaging techniques, such as CT and MRI, in further investigations beyond first opinion practice level.

Commentary on the content

Interpretation applies to the diagnostic radiological features of the more commonly encountered clinical conditions seen in veterinary practice. You should be able to form a differential diagnosis based on these features:

Small Animal Bias

Digestive system

- Common abnormalities affecting the teeth, pharynx, oesophagus and gastrointestinal tract
- Obstructive lesions and function disturbances
- The significance of gas shadows
- The use of contrast media

Abdomen

- Recognition of changes in outline, position and opacity of organs
- Abdominal masses and displacements caused by them
- The presence of free gas or fluid

Urogenital System

- Common abnormalities affecting the kidneys, ureters, bladder, urethra, male and female genital organs
- Intravenous urography, retrograde cystography and urethrography (positive and negative)

Cardiovascular System

- Common abnormalities affecting the heart and blood vessels and evidence of cardiovascular disease which may be recognised on plain films

Respiratory System

- Common abnormalities affecting the nasal cavity, sinuses, hyoid apparatus, larynx, trachea, thoracic wall, pleural cavity, mediastinum, diaphragm and lungs
- Pulmonary patterns

Musculoskeletal System

- Common abnormalities affecting bones and joints
- Fractures, dislocations, inflammatory and neoplastic conditions
- Congenital and developmental abnormalities
- Metabolic disorders
- Trauma

Axial Skeleton and Central Axial Nervous System

- Common abnormalities affecting the skeleton and the central nervous system
- Fractures, dislocations, congenital and developmental abnormalities
- Degenerative conditions
- Inflammatory and neoplastic changes
- The principles and problems associated with the use of contrast media to demonstrate lesions of the spinal cord

Soft Tissue

- Trauma
- Foreign bodies
- Sinuses
- Calcification
- The use of contrast media

Equine/Large Animal Bias

Digestive System

- Common abnormalities affecting the teeth, pharynx and oesophagus.

Respiratory System

- Common abnormalities affecting the nasal cavity, sinuses, guttural pouch, hyoid apparatus, larynx.

Musculoskeletal System

- Common abnormalities affecting bones and joints
- Fractures, dislocations, inflammatory and neoplastic conditions
- Congenital and developmental abnormalities
- Metabolic disorders
- Trauma

Axial Skeleton and Central Axial Nervous System

- Common abnormalities affecting the skeleton and the central nervous system
- Fractures, dislocations, congenital and developmental abnormalities
- Degenerative conditions
- Inflammatory and neoplastic changes
- The principles and problems associated with the use of contrast media to demonstrate lesions of the cervical spinal cord

Soft Tissue

- Trauma
- Foreign bodies
- Sinuses
- Calcification
- The use of contrast media

Assessment

- A case diary, which documents a total of 500 cases taken by you. Cases can be collected from up to 12 months prior to the date of enrolment on the CertAVP programme.
- At the end of the case diary you should include a 1,000 word synopsis of what you have learned from the cases. This might include what has changed in your approach to a case, any new procedures or investigations that are now considered, any additional reading which was helpful, and/or any unexpected features of a case which will influence decision making in the future.
- A case book of ten radiographic cases, each of up to 500 words in length. These cases should be selected by you from the case diary and should demonstrate good radiographic practice appropriate for each case. The selection should include an appropriate balance of bone and soft tissue cases, and plain radiography and “special techniques”. These “special techniques” should include radiographic cases with special radiographic projections, contrast studies and/or ultrasonography. DICOM-format images (or original radiographs where conventional film-screen technology is used) and any images of special techniques should accompany each of the cases in the casebook.

You are given the opportunity to have **one** of your cases **reviewed** for this module prior to marking.

Assessment timetable

1st October	Please inform the CertAVP office if you are intending on submitting work, and whether your work will be Small Animal or Equine/Large Animal
5th November	You are given the opportunity to have one case report reviewed for this module prior to marking. Please submit your report for review by this date.
5th December	Case report feedback returned to you
15th January	Case diary, synopsis and case book to be submitted
16th March	You will be notified of your results

Assessment weighting

- Case diary with synopsis 50%
- Case book 50%

Learning support

Learning support is provided to aid self-directed learning and to provide easy access to published articles. You will be given a username and password which will allow you to log on to 4 different systems:

1. RVC Learn (<http://learn.rvc.ac.uk/>)

- Imaging articles
- Sample reports
- Access to presentations from the CertAVP Induction Day
- Access to discussion forums that are used by all CertAVP candidates as well as RVC tutors. The forums can be used to discuss any topic relevant to the CertAVP ECC modules or simply to find out who else is out there!
- Study buddy list
- Guidelines for mentors
- Access to SCOUT, RVC's solution for the discovery and delivery of resources including books, ebooks, journal articles and digital objects, all in one single search. Log in to SCOUT using your RVC username and password to save items on your eshelf. If you are able to use the library in person, you can borrow a book for one week with photo ID. IT and Library support is available for this facility.

2. RVC Intranet (<https://intranet.rvc.ac.uk>)

Access to all information available to all RVC students and employees, for example, news, events, policies, committees, services, Library, IT helpdesk, etc.

3. Athens (<http://www.openathens.net/>)

A huge amount of any library's information is now available online, e.g. electronic journals, e-books and databases. 'Athens' is a system used by UK universities for controlling access to these type of online services and with your username and password, you can access many of a library's online databases, electronic journals and e-books seamlessly.

4. Webmail (<http://mail.rvc.ac.uk>)

You are given an RVC email address, which is compulsory to use for CertAVP communication and submission of work.

Case diary guidelines

The case diary documents a total of 500 cases that you were responsible for and provides evidence that the required imaging experience has been attained. Cases can be collected from up to 12 months prior to the date of enrolment on the CertAVP programme.

All imaging cases should be listed and numbered chronologically, with case numbers and/or other identifying details included. You must adhere to the format shown on the case diary sample below, use the headings as set out.

Suitable methods of patient identification would include client surname, the patient's hospital reference number, the individual case reference number, or similar means of identification. The most important feature(s) of the clinical presentation should be included: a dog with a grade 3/6 left sided cardiac murmur, reduced exercise tolerance, increased respiratory effort, and a cough could be written as "cardiac murmur, exercise intolerance, cough". The region(s) imaged should be listed, including any radiographic views. Other imaging procedures (e.g. ultrasound, contrast studies, stressed views etc) should be listed separately.

The radiographic diagnosis should be included. It is accepted that there may be normal radiographic findings and a definitive diagnosis may be made through other means (e.g. surgical biopsy, necropsy). In these instances, the definitive diagnosis should also be included. In those cases where imaging findings are inconclusive, and no further means of diagnosis were undertaken, then the diagnosis should be listed as "open".

Case diary template

Case						Clinical signs	Procedure			Diagnosis	
No	Date	Ref	Breed	Age	Sex		Region	Views	Other procedures	Imaging diagnosis	Definitive diagnosis
1	1.10.18	Smith	Canine Labrador	3y	MN	Cough, cardiac murmur	Thorax	Lat, DV	Echo	L heart failure	DCM
2	1.10.18	Jones	Equine Arab	4y	M	Forelimb lame	Carpus	Lat, DP, DLPMO DMPLO	Skyline dorsoprox dorsodistal obl	Radial carpal sclerosis	
3	1.10.18	08-076	Feline DSH	12y	FN	Cough, increased respiratory effort	Thorax	Lat, DV		Bronchial disease	Feline asthma
4	2.10.18	08-077	Feline DSH	14y	MN	Haematuria	Abdomen Thorax	Lat, VD Lat, DV	Bladder US DC cystogram	Bladder neck tumour	Transitional cell carcinoma
5	4.10.18	08-078	Canine Bulldog	4m	F	Asymptomatic heart murmur	Thorax	Lat, DV	Referral	WNL	Pulmonic stenosis aberrant R coronary aa

Case book guidelines

The ten radiographic reports are selected by you from the case diary, and are to be submitted with the case diary. They should demonstrate good radiographic practice appropriate for each case, and include an appropriate balance of orthopaedic and soft tissue cases*. All ten cases should include plain radiography and five of the ten should also include “special techniques”. These “special techniques” should include radiographic cases with special radiographic projections (e.g. where skyline or stressed views were used), contrast studies and/or ultrasonography. In those case diaries that include equine radiographic cases, scintigraphy would also be included as a “special technique”. MRI and CT studies are not considered appropriate for including as one of these case reports.

The reports should focus on the reason for the study, your assessment of its justification and its quality, the important imaging features, and the diagnosis. The DICOM-format images (or original radiographs where conventional film-screen technology is used) and any other images arising from the use of special techniques should accompany each of the cases in the casebook (via USB flashdrive in DICOM format). All radiographs relevant to the case should be submitted, even if you feel that there are no abnormalities on those films. Each report (excluding Patient Identification) should be **no more than 500 words** in length and should follow the following outline:

- **Patient Identification:** Number, Date, Reference, Breed, Age, Sex (as per the case diary)
- **Reason for the Study:** A very brief account of the relevant history and clinical signs
- **Radiographic Appraisal:** Positioning, exposure, centering, processing, collimation, artefacts/faults, safety factors, labelling
- **Radiological Report:** A description of the radiological findings
- **Diagnosis / Differential Diagnosis:** Differentials should be ranked in order of likelihood, with a brief justification for this ranking
- **Any further tests or investigations performed leading to a definitive diagnosis**
- **Discussion:** if appropriate a brief discussion of any shortcomings in this case, or points of particular interest from an imaging perspective

* An appropriate balance of orthopaedic and soft tissue cases in a predominantly small animal casebook would approximate a 50:50 split. Across a small animal casebook, radiographic images of all of the main regions should be included (i.e. thorax, abdomen, limbs, spine & skull).

The factors that help to produce a good casebook include:

- keeping it simple when selecting cases for the casebook
- choice of cases that showcase your radiographic and radiological interpretative ability
- an adequate series of radiographs to assess the region of interest in selected cases
- good quality radiography : radiographs should be well positioned, well centred, correct exposures, and show good attention to processing
- good inspiratory thoracic radiographs where appropriate
- appropriate radiographic criticism ... however, repeated instances of poor radiography, even when correctly criticised, would not be considered appropriate for a good casebook, as it would be expected that these errors would be corrected over time as the candidate gains experience.
- the use of accepted radiological terminology where appropriate
- a differential diagnosis list that is appropriate to the particular case after consideration of history, clinical findings and imaging findings
- a justification of the differential diagnosis list that is brief and pertinent to that case
- the choice of cases where radiography played a key part in the diagnosis.

The factors that would contribute to producing a poor casebook include:

- failure to follow the required format outlined above
- exceeding the 500 word limit for any case
- an inadequate series of radiographs to assess the region(s) of interest
- misinterpretation of radiographic errors and faults, and deciding that they represent disease
- not identifying significant lesions
- inadequate radiographic description of changes seen
- poor patient preparation (e.g. faeces-filled colon when performing a urinary contrast procedure)
- gloved or ungloved fingers in the primary beam (results in a failure of the casebook)
- inappropriate differential diagnosis list, particularly if this led to inappropriate further investigations or inappropriate treatment options; regurgitation of a textbook list that has not been individualized to the case should be resisted
- positioning and/or processing faults unrecognized and therefore uncorrected across the casebook
- discussing radiographs that were not included in the films submitted with the casebook
- choice of cases with no or insignificant radiological findings.

Instructions for submitting work

Each piece of work you submit must be anonymous. Please name your files to include the following: module code, your student number, and the type of work you are submitting, and email them to certavp@rvc.ac.uk:

CVDI1 Student Number – Case book review.doc

CVDI1 Student Number – Case diary.xls

CVDI1 Student Number – Synopsis.doc

CVDI1 Student Number – Case book.doc

Please ensure that the beginning of your work include:

- Module name
- Your student number
- Case report title
- Word count (excluding the above, tables, photo titles and references)

If a piece of work is a re-submission, please name your file like this:

CVDI1 Student Number – Case book RE-SUB.doc

References

- These should be properly cited in the text, in accordance with the style in the Journal of Small Animal Practice (JSAP). Avoided listing references that were not cited in the text or vice versa.
- We recommend using Harvard referencing as described by the Anglia-Ruskin University (<http://libweb.anglia.ac.uk/referencing/harvard.htm>).
- You will find it very helpful to use a program such as Endnote® or Reference manager® to organise your references.

Any work that exceeds the permitted word count will be returned to you for re-submission within the word limit. This is in the interest of fairness as it is difficult to compare work exceeding the word limit with one which has been kept to the required limits.

Additionally, the ability to keep a discussion tightly focused, with every word counting, is an important skill to have developed at this level. You should not put important information, such as the physical examination, in to a table to avoid the word count; only numerical data should appear within a table (such as laboratory results). Figure legends, appendices and a

reference list are NOT included in the word count. The report title and titles within the report ARE included.

All written work submitted to the Royal Veterinary College is passed through plagiarism detection software. Work submitted for this module should not have been submitted for any other courses at RVC or other institutions.

Mentors

Candidates who study for the CertAVP C-VDI modules with the Royal Veterinary College are advised to find a mentor who can guide them. Finding a mentor and maintaining appropriate and regular contact are the responsibility of the candidate, and mentors operate on a goodwill basis only. Mentors are usually either holders of the RCVS CertVDI/CertVR or RCVS CertAVP qualifications or holders of American, European or RCVS Diploma qualifications. Ideally mentors will have some experience of teaching and examining at either undergraduate or post-graduate level. Members of the RVC Imaging department cannot act as mentors as they are involved in setting and marking the assessed work. We recommend that an individual mentor does not take on more than 5 CertAVP candidates if possible.

We consider that the role of a mentor should/may include:

- Becoming familiar with the module outlines that are supplied to candidates.
- Encouraging candidates to undertake continuing professional development and to 'see practice' at a relevant centre/s appropriate to their strengths and weaknesses.
- Encourage candidates to join relevant societies and associations and attend meetings where appropriate.
- Guide candidates on the level and amount of reading that they should be doing during their period of study. There is a reading list for each C-VDI module which can be used as a framework.
- Encourage candidates to plan their time carefully for logging cases, writing case reports and essays.
- Encourage candidates to get support from other CertAVP candidates either through the RVC learning support discussion forums or by other means.

What is the mentor's role regarding submitted work?

We consider that a mentor can give general advice on preparation of a case log and selection of cases for writing up into full length reports. Unlike the previous RCVS CertVDI we do not recommend that mentors read any of the case reports in detail and/or give detailed written advice. However, one read through of one case report and some general feedback (ideally verbally) is acceptable.

Please notify the CertAVP office when you have a mentor as there is a Mentor Guidance document that is provided to them.

Recommended reading list

The following list is given as a guide as to where to start and for this reason cannot be considered 'complete'. We also don't expect you to read texts from cover to cover or to use all the texts listed, however we do recommend you make use of the most recent edition of textbooks where available. We apologise if you feel a particular favourite is missing - feel free to use the Learn discussion board to pass on additional suggestions to other candidates.

Small Animal:

- Coulson A, Lewis N. An Atlas of Interpretive Radiographic Anatomy of the Dog and Cat; Blackwell Scientific Publications, Oxford. 2008.
- Thrall DE (Ed). Textbook of Veterinary Diagnostic Radiology 7th edition. Elsevier, Philadelphia. 2018.
- Kealy K, McAllister H, Graham JP. Diagnostic Radiology and Ultrasonography of the Dog and Cat 5th edition; Elsevier. 2010.
- Kirberger RM, McEvoy FJ (Eds). BSAVA Manual of Canine and Feline Musculoskeletal Imaging. Cheltenham: BSAVA Publications. 2016.
- Schwarz T, Johnson V (Eds) BSAVA Manual of Canine & Feline Thoracic Imaging. Cheltenham, BSAVA Publications. 2008.
- O'Brien R, Barr F (Eds) BSAVA Manual of Canine & Feline Abdominal Imaging. Cheltenham, BSAVA Publications. 2009.
- Holloway A, McConnell JF (Eds) BSAVA Manual of Canine and Feline Radiography and Radiology. Cheltenham, BSAVA Publications. 2013
- Barr F, Gaschen L (Eds) BSAVA Manual of Canine and Feline Ultrasonography. Cheltenham, BSAVA Publications. 2011.

Equine:

- Butler JA, Colles CM, Dyson SJ, Kold SE & Poulos PW. Clinical Radiology of the Horse; Wiley Blackwell. 2008.
- Farrow, C S Veterinary Diagnostic Imaging - The Horse. Mosby. 2005.

Radiography & Physics:

- Douglas SW, Williamson HD & Herrtage M. Principles of Veterinary Radiography; Bailliere Tindall, London. 1987.
- Ticer JW. Radiographic Technique in Veterinary Practice; WB Saunders Co, Philadelphia. 1984.

Journals:

Relevant imaging articles and case reports in the previous 5 years of:

- Journal of Small Animal Practice
- In Practice
- Veterinary Radiology and Ultrasound. This provides a comprehensive range of imaging articles much of which is beyond the scope of the modular assessment. However, you should be familiar with those articles relevant to the learning objectives set out in each module.