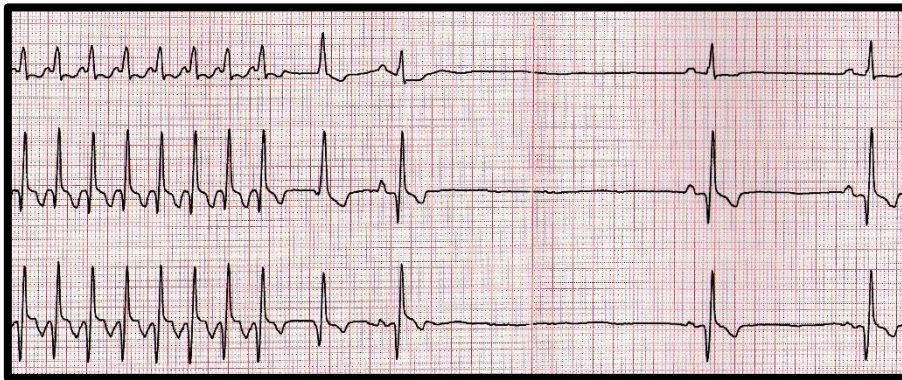


**Certificate in Advanced Veterinary Practice
C-VC.2 Cardiovascular Diagnostics**

Module Syllabus



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Introduction

This module on Cardiovascular Diagnostics can be taken from a small animal or large animal perspective and will cover the approach to diagnosis in veterinary patients presenting with cardiovascular disorders, including the appropriate selection and interpretation of diagnostic tests and techniques. This module will extend and consolidate clinical knowledge and skills gained at undergraduate level, to allow application of this knowledge to the initial assessment of patients and their subsequent diagnostic investigations. The candidate will be able to critically evaluate their own standards of practice and develop strategies for continuous improvement in the future.

This is an optional module for those wishing to obtain a Certificate in Advanced Veterinary Practice (Veterinary Cardiology).

Aims

The aim of this module is to:

1. Increase the student's depth of knowledge and understanding of the diagnostic tools available in the investigation of disorders of the cardiovascular systems of veterinary species.
2. Develop the student's knowledge and understanding of how alterations in the results of diagnostic investigations allow a diagnosis to be reached.

Learning outcomes

1. Critically evaluate the various diagnostic options available for the investigation of the cardiac patient including performing a thorough clinical examination of the cardiac patient.
2. Perform cardiovascular investigation according to standard protocols in order to safeguard the patient and make valid and repeatable conclusions.
3. Apply clinical reasoning skills and evidence-based medicine in the diagnostic approach to cardiac cases.
4. Critically appraise the literature relevant to clinical cases in the topics covered and how the literature can be used to inform practice.
5. Critically reflect on the appropriate cases for onward referral.

Module content

Clinical examination of patients with presenting signs consistent with cardiovascular disease
Principles of triage and identification of cardiac failure and shock

Decision-making regarding the most suitable diagnostic approaches to each individual patient, including consideration of initial stabilisation to ensure patient safety.

Acquisition and critical interpretation of standard diagnostic investigations pertinent to cardiovascular patients:

- Electrocardiography – acquiring a trace, minimising artefacts, analysis of rate, rhythm and any conduction abnormalities,
- Ambulatory electrocardiography, Holter devices, event recorders and patient-side monitors – indications for use and interpretation
- Blood pressure measurement – invasive versus non-invasive options and their pros and cons
- Radiography – acquiring and interpreting views relevant to cardiac patients
- Advanced imaging – principles of modalities such as CT, angiography and cases where their use would be beneficial
- Echocardiography – acquisition, interpretation and measurements of the standard 2-D and M-mode cardiac views; alterations due to the most common cardiac conditions; indications for, and acquisition of Doppler readings, overview of when more advanced echocardiographic techniques may be indicated e.g. contrast echocardiography using agitated saline
- Non-cardiac ultrasound – evaluation of the lungs, pleural space and vasculature
- Laboratory testing – indications for and interpretation of haematological, biochemical, electrolyte, blood gas and biomarker measurements

Application and integration of the results of the clinical examination and diagnostic investigations to clinical cases in order to reach a diagnosis.

Enrolment guidance

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

- a) You should have completed module B-SAP.1.
- b) If you are only enrolling for the C cardiology modules with RVC, it is **highly recommended** that you write one report from module B-SAP.1. This will be reviewed by the assessors prior to assessment of any C module work. If you have completed the B-SAP.1 module at another institution, one report may be submitted for feedback.
- c) It is your responsibility to ensure that you have access to sufficient cases to produce adequate material for the module.

Coverage of this module may be integrated with others, particularly other B and C modules. You will normally have completed A-FAVP.1 Foundations of Advanced Veterinary Practice module, and at least one of the practice B modules, before undertaking a C module, although you can choose to work through modules in a different order if you 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.

Before embarking on any module, you are advised to plan a structured programme of continuing professional development to help you achieve your objectives. Involvement in 'learning sets' and networks of other candidates working towards the same or similar modules is encouraged; this should be initiated by the candidates themselves via RVC Learn. The RCVS considers that you will need advisers/mentors to support you through the programme; you are free to choose your own advisers/mentors.

Assessment

- One case report can be submitted for review prior to being marked. This is only permitted once per candidate per discipline.
- Case diary of 50 cases with broad range of diagnoses - list the case details, diagnostic procedures and management (where appropriate) for each case.
- At the end of the case diary you should include a 1,000 word synopsis of what you have learned from the cases.
- Two case reports, each of up to 2,000 words in length.
- Article critique (up to 800 words) from a chosen list of journal articles about an aspect of diagnosis in veterinary cardiology and how this article would alter your management of cases.
- A one hour examination to consist of multiple answer questions and/or short answer questions.

Assessment weighting

- | | |
|--------------------------------|-----|
| • 1 x Case Diary with Synopsis | 25% |
| • 2 x Case Reports | 30% |
| • 1 x Article Critique | 15% |
| • 1 x Exam | 30% |

Annual assessment timetable

Early October	'Student check in' – online Teams call with the CertAVP team and other students
11th December	You are given the opportunity to have one case report per discipline reviewed prior to marking (therefore only one for all C-VC modules). Please submit your report by this date if you haven't already had a review.
19th January	Case report feedback returned to you
Late January	'Student check in' – online Teams call with the CertAVP team and other students
1st March	All written work to be submitted
1st May	You will be notified of your results
Late May	'Student check in' – online Teams call with the CertAVP team and other students
Mid July	Formal examination to be held in July - date to be confirmed
Mid August	You will be notified of your results

You are strongly advised to have a supervisor with which you can discuss cases. Ideal supervisors would have post-graduate qualifications in your area of interest. The module leader will not be discussing case management with any candidate.

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:

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

- Articles on cognitive learning behaviours
- Articles on cardiovascular disease in veterinary species
- A selection of articles for you to pick one to critique as part of your assessment
- Access to a webinar which contains guidance on preparing written work for the cardiology C modules
- Access to the RVC online library. This is invaluable when researching literature for writing up case reports. This means that (with rare exception) all journal articles that you want to view can be downloaded to your PC with a few mouse clicks. This includes original research articles as well as review articles and case reports.
- There are also several CPD courses run each year at the RVC that support some of the learning outcomes for C-VC modules. CertAVP candidates receive a 20% discount on RVC CPD courses – please contact the CertAVP office for further details.

- **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.

- **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.

- **Webmail (<https://webmail.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 scope of the examination is related to the recognition and diagnosis of conditions that commonly affect the cardiovascular systems of the domestic species that are regularly encountered in general veterinary practice. Therefore, in selecting cases for the diary, you should choose a representative sample of cases to encompass these conditions:

- acute cardiac or cardiovascular failure
- chronic cardiac failure
- acquired heart disease, including both valvular and myocardial disease
- congenital heart disease
- pericardial disease
- cardiac arrhythmias
- thromboembolic disease

An acceptable case diary should have **at least** one case representing each of the preceding conditions. Case diaries representing only one species and cases presenting for screening are not acceptable. Cases with the same disease (e.g. degenerative mitral valve disease) should not represent more than 20% of the diary and no more than 10% of cases should be listed as second clinician. Acceptable abbreviations can be found in Appendix 1 at the end of this document, all other abbreviations must be explained.

The diary is meant to be a continuous record of all cardiology cases performed by you up to the time of submission therefore they should be listed in chronological order. The same procedure in a different patient can be used again. Cases can be collected from up to 12 months prior to the date of enrolment on the CertAVP programme.

Information to be included in the diary:

- a) Date
- b) Name / case number / unique identifier
- c) Signalment: including breed, age, sex
- d) Brief list of presenting signs e.g. cough, collapse, exercise intolerance
- e) Abnormal auscultation and physical exam findings pertinent to the cardiovascular system; murmur, gallop, arrhythmia, heart rate if abnormal, other; e.g. inspiratory rates. Increased respiratory rate, abdominal distension, pyrexia etc.
- f) List of ancillary diagnostic tests in the order in which they were performed and their most significant outcomes, for example:

- ECG: sinus rhythm
 - Radiographs: mild LA enlargement
 - Echocardiography: thickened mitral valve leaflets and mild left atrial enlargement on 2D, mild to moderate mitral regurgitation detected by colour Doppler
- g) Final diagnosis
 - h) Treatment
 - i) Follow up

Preparing the case diary synopsis

A 1,000 word synopsis essay is required to accompany the case diary. This synopsis might include discussion of what might have changed in your approach to a new case, any new procedures or investigations that are now considered during case investigations, any additional reading which was helpful, and/or any unexpected features of a case which might influence decision making or case management in the future.

This is a good opportunity to explain or clarify any aspects of your case diary to the examiner and to state any plans you have for future study. Wherever appropriate use your further reading and available evidence to support any statements that you make. You will probably find it easier to write your reflective synopsis after you have finished your case reports as well as once your case diary is completed. You must stay within the word limit given or the work will be returned unmarked.

Example cardiology case diary (based on ECVIM cardiology case diary)

Date	Case number and client name	Age, sex, breed	ECG	XRAY	MMODE	2D	DOPPLER	Other diagnostics	Diagnosis	Treatment and follow-up
5.1.09	697708 Smith	12 yo MN LABR	x	x	x	x	x	Biochemistry, electrolytes	DCM, left sided CHF, VPCs, 24h Holter	Furosemide, Pimobendan, Benazepril Recheck 1 Week
5.1.09	697718 Brown	9 yo FN DSH	x	x	x	x	x	Doppler systolic blood pressure	HCM stage B1	Repeat echo 9-12 months

Example key:

MN male neutered

FN female neutered

LABR Labrador retriever

DSH Domestic Shorthair

CHF Congestive heart failure

VPCs Ventricular premature complexes

HCM Hypertrophic cardiomyopathy

Case report guidelines

The two case reports should be selected to demonstrate that you have developed proficiency in the skills and understanding of the learning objectives outlined in the module content. **It is important that the diagnosis is sufficiently justified by the case material provided, including suitable images.** The lack of images confirming a diagnosis will result in a case report failing, no matter how high the standard of the case report text.

Discussions should include personal reflection which should critically evaluate your management of the case. Appropriate cases might include those where a candidate can discuss what went well, what went badly, challenging decision making and alternative management options. It is recommended that you apportion no more than 1,000 words to the case description and at least 1,000 words to the case discussion. Case discussion **should** be limited to commentary on the diagnostic investigations. No marks will be awarded for commentary on therapeutics unless it directly relates to diagnostic investigations. However, if your therapeutic choices are considered to endanger patient safety, this will have a resultant effect on the final mark.

The use of appendices for tables and figures is discouraged. These should feature in the body of the text at an appropriate location. Any data in an appendix may not be marked, and therefore appendices should be avoided where possible.

The following frame work should be used as a guide to the structure of a case report:

- Identification of patient
- Case summary (recommended length 1,000 words), including:
 - Summary of case presentation
 - Summary of diagnostic findings
 - Final diagnosis
 - Management
- Discussion (recommended length 1,000 words) exclusively about cardiovascular diagnostics and pertinent to your case
- References; please use the style of the Journal of Small Animal Practice.

Case reports are intended to be written at Master's degree level. It can be challenging to include the level of detail required to reach this level within the word limit provided. However, concise scientific writing is one of the skills necessary to work to this level.

A few tips:

- Avoid repeating information; however relevant it is, marks can only be awarded for a particular piece of information once
- Avoid including information in the discussion that is not relevant to the learning objectives of the module
- Avoid the temptation to select cases that are too complicated to adequately discuss in 2000 words

Note that cases selected do not need to represent ideal or perfect management, and frequently well-written reports highlight where things went wrong or how they could have been done differently. It should be borne in mind that patient safety, however, is paramount. Discussion of how management could be improved if alternative equipment, etc, was available, or if costs allowed additional testing often provides a valuable component of the case report. This should be explained in the context of how it would be helpful, rather than listing all the additional equipment/drugs etc that would be used in a different setting.

Case reports should be written in the third person in a style suitable for publication in a Journal (for example Journal of Small Animal Practice). You are expected to demonstrate a high standard of literacy and please ensure that any spelling and grammatical errors have been corrected – not doing so will result in a negative effect on your final mark.

Images should be included in the body of the case report, rather than in an appendix. You must include any images that you think are relevant, as these enhance your report and enable examiners to assess your interpretation of diagnostic tests. Normal ultrasound images need not be included, but if questions arise as to your level of practical capability, normal images may help to support your standard of clinical work. Abnormal images should always be included; to not do so will affect your final mark.

The word limit is 2,000 words per report. Tables, figure legends, appendices and reference list are NOT included in the word count. The report title and titles within the report ARE included. You should not put important information, such as the physical examination, into a table to avoid the word count; only numerical data should appear within a table (such as laboratory results). In the interests of fairness to all candidates the word count is adhered to strictly and reports that exceed it will be returned unmarked.

Article critique guidelines

A selection of articles to critique are available on Learn. You need to write about how your chosen article would alter your management of cases. Include comments on how the paper has affected your own practising of cardiology in relation to diagnosis and how this may have informed your learning. You are encouraged to make reference to related veterinary literature in the reference critique.

Examination

The exam paper for C-VC.2 is multiple answer questions and/or short answer questions, to include theoretical knowledge as well as interpretation of gross pathology images.

It is a one hour exam and each question will show the mark assigned. Sample exam questions are available on Learn and you are encouraged to work through the samples as part of your exam preparation.

The RVC Study Skills team is available to assist with any revision techniques.

Instructions for submitting work

Each piece of work you submit must be anonymous and please ensure that your work includes this table on the front page:

Student number:	
Module:	C-VC.2
Piece of work:	<i>case report 1, case report 2 etc</i>
Word count:	

Contact the CertAVP office if you need a reminder of your student number (found on your Rover email when you first enrolled). All work is submitted online via Learn; you will be given further instructions when you enrol.

The content of case reports must also be anonymous, e.g., removing practice details from discharge notes or laboratory reports.

References should be properly cited in the text, in accordance with the style in the Journal of Small Animal Practice (JSAP). Do not list references that were not cited in the text or vice versa. We recommend using Harvard referencing and you will find it very helpful to use a program such as Endnote® or Reference manager® to organise your references.

You may include appendices but please note that the examiners are not obliged to read them (so please do not include essential case information; omitting this from the body of the case report will affect your mark). Laboratory reports may be included here but all abnormalities need to be written in the text and reference ranges must be included. It is acceptable to scan printed reports rather than re-type them if you prefer, but any case details or details of your name or practice must be blanked out.

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.

Suggested reading

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 candidates to read texts from cover to cover or to use all of the texts listed, however we do recommend you make use of the most recent edition of textbooks where available. We apologise if candidates feel a particular favourite is missing - feel free to use the Learn discussion board to pass on additional suggestions to other candidates.

Essential reading:

- Manual of Canine and Feline Cardiology. *Eds:* LP Tilley, FWK Smith Jr, M Oyama, MM Sleeper. 2015, Elsevier Ltd, London.
- Santilli, R., Moïse, S., Pariaut, R. and Perego, M., 2019, June. Electrocardiography of the dog and cat.: Diagnosis of arrhythmias. Edra.

General cardiology:

- Feline Cardiology. *Eds:* E Côté, KA MacDonald, KM Meurs KM, MM Sleeper. 2011, Wiley Blackwell, Chichester.
- Topics in Cardiology. An Issue of Veterinary Clinics: Small Animal Practice (The Clinics: Veterinary Medicine). Volume 47, Issue 5, pp 955-1122 September 2017. *Ed:* João S. Orvalho. TheClinics.com
- Robinson R and Borgeat K (2016). Cardiovascular Disease, Ch21 in Duke-Novaskovski T, de Vries M, Seymour C (Eds), BSAVA Manual of Canine and Feline Analgesia and Anaesthesia, BSAVA Publishing, Gloucestershire, UK.
- BSAVA Manual of Canine and Feline Cardiorespiratory Medicine. *Eds:* V Luis Fuentes, LR Johnson, S Dennis. 2010, BSAVA, Gloucester.
- Cardiovascular Disease in Small Animal Medicine. *Ed:* WA Ware. 2007, Manson Publishing Ltd, London.
- Cardiology of the Horse. *Eds:* C Marr, M Bowen. 2010, Elsevier Ltd, London.
- Cardiology. An Issue of Veterinary Clinics: Exotic Animal Practice (The Clinics: Veterinary Medicine). Volume 12, Number 1, Feb 2009. *Ed:* JJ Heatley. TheClinics.com

Cardiac auscultation:

- Rapid Interpretation of Heart and Lung Sounds: A Guide to Cardiac and Respiratory Auscultation in Dogs and Cats. FWK Smith Jr, BW Keene, LP Tilley. 2006, Saunders Elsevier, St Louis.

- Cardiac Auscultation and Phonocardiography in Dogs, Horses and Cats. *Eds:* C Kwart, J Häggström. 2002, Clarence Kwart, Uppsala.

Electrocardiography:

- Willis, R., Oliveira, P. and Mavropoulou, A. eds., 2018. *Guide to canine and feline electrocardiography*. John Wiley & Sons.
- Rapid Review of ECG Interpretation in Small Animal Practice. *Eds:* MA Oyama, MS Kraus, AR Gelzer. 2013, Manson Publishing Ltd, London.
- Small Animal ECGs: An Introductory Guide. *Ed:* M Martin. 2007, Blackwell Publishing Ltd, Oxford.
- ECG for the Small Animal Practitioner (Made Easy). *Eds:* LP Tilley, NL Burtnick. 1999, Teton New Media, Jackson.

Radiography:

- Textbook of Veterinary Diagnostic Radiology. *Ed:* DE Thrall. 2012, Saunders Elsevier, St Louis.
- BSAVA Manual of Canine and Feline Thoracic Imaging. *Eds:* T Schwarz, V Johnson. 2008, BSAVA, Gloucester.

Echocardiography:

- BSAVA Manual of Canine and Feline Thoracic Imaging. *Eds:* T Schwarz, V Johnson. 2008, BSAVA, Gloucester.
- Veterinary Echocardiography. *Ed:* JA Boon. 2011, John Wiley & Sons, Chichester.
- Small Animal Diagnostic Ultrasound. *Eds:* TG Nyland, JS Mattoon. 2002, WB Saunders, Philadelphia.
- Otto, C.M., 2023. *Textbook of clinical echocardiography*. Elsevier Health Sciences.

Acceptable abbreviations for case log

ACDO: Amplatz Canine Duct Occluder

AF: atrial fibrillation or flutter (denote which is being referred to at least once prior to using abbreviation)

AI: aortic insufficiency

AoV: aortic valve

AR: aortic regurgitation; synonym for aortic insufficiency

ARVC: Arrhythmogenic right ventricular cardiomyopathy

AS: aortic stenosis

ASD: atrial septal defect

ATE: arterial thromboembolism

AV: atrioventricular

AVB: atrioventricular block (1AVB: 1st degree atrioventricular block 2AVB: 2nd degree atrioventricular block 3AVB: 3rd degree atrioventricular block)

AVSD: atrioventricular septal defect

BV: balloon valvuloplasty

CHF: Congestive heart failure

CM: cardiomyopathy

CT: computed tomography

CTD: Cor Triatriatum Dexter

CTS: Cor Triatriatum Sinister

CdVC: caudal vena cava

CrVC: cranial vena cava

DCM: Dilated cardiomyopathy

DLVOTO: Dynamic left ventricular outflow tract obstruction

DRVOTO: Dynamic right ventricular outflow tract obstruction

DVD: Degenerative valve disease (followed by Stage A, B1, B2, C, D) - acceptable as an alternative to MMVD as "Myxomatous" is technically a histopath diagnosis.

HCM: Hypertrophic cardiomyopathy

HF: heart failure

HOCM: Hypertrophic obstructive cardiomyopathy

HSA: hemangiosarcoma

HW: heartworm

HWD: Heartworm disease

LA: Left atrium/atrial

LAE: Left atrial enlargement

LAu: left auricle

LPA: left pulmonary artery

LV: Left ventricle/ventricular

LVEH: Left ventricular eccentric hypertrophy

LVCH: Left ventricular concentric hypertrophy

MMVD: myxomatous mitral valve disease (followed by Stage A, B1, B2, C, D)

MPA: main pulmonary artery

MRI: magnetic resonance imaging

MS: mitral stenosis

MV: mitral valve