THE UNIVERSITY OF MELBOURNE

Melbourne Veterinary School

Clinical examination of the cardiovascular system

Dr Nick Bamford
Senior Lecturer, Veterinary Biosciences

n.bamford@unimelb.edu.au

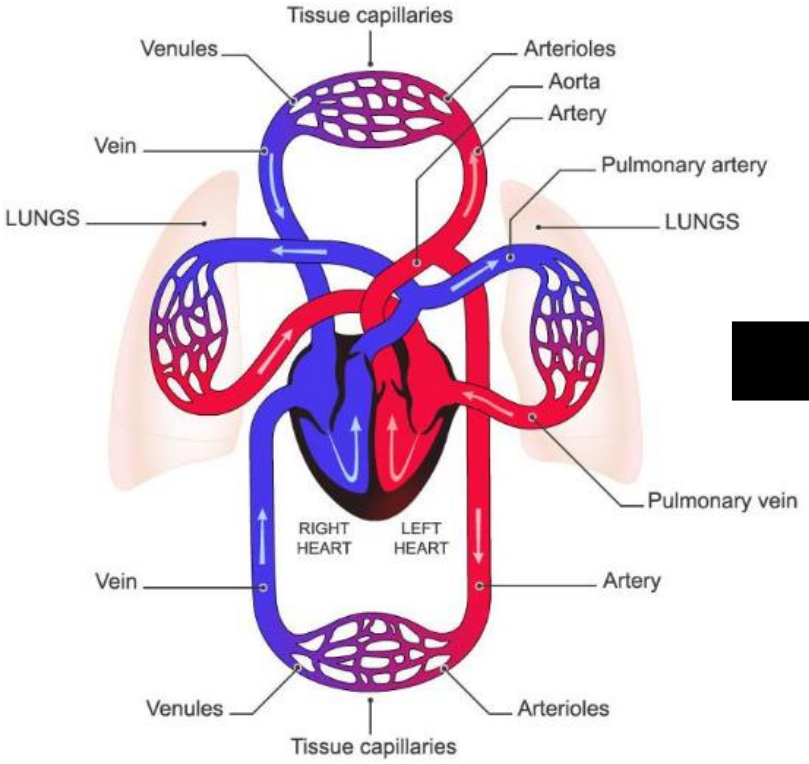
VETS30014 / VETS90124

Intended learning outcomes

- Identify key aspects of a general clinical examination pertinent to assessing function of the cardiovascular system
- Describe what dynamic changes during the heart cycle create each of the normal heart sounds (S1, S2, S3, S4)
- Know where anatomically to clinically auscultate the major heart valves
- Know what changes to the normal heart sounds may be detectable on cardiac auscultation
- Be able to identify the key factors used to characterise murmurs
- Appreciate the respiratory signs and pulmonary auscultation findings that may be associated with cardiac failure

Clinical examination

- Application of anatomy and physiology
- Know normal, recognise abnormal



Clinical examination

“More is missed by not looking than not knowing”

- Thomas McCrae

Clinical examination

- Overview
  - Appraisal of body condition
  - Observation of respiratory rate and effort
  - Mucous membrane colour and capillary refill time
  - Jugular vein examination
  - Precordial palpation
  - Arterial pulses
  - Cardiac auscultation

  } Heart rate and rhythm

  - Pulmonary auscultation and percussion
  - Abdominal palpation

Body condition

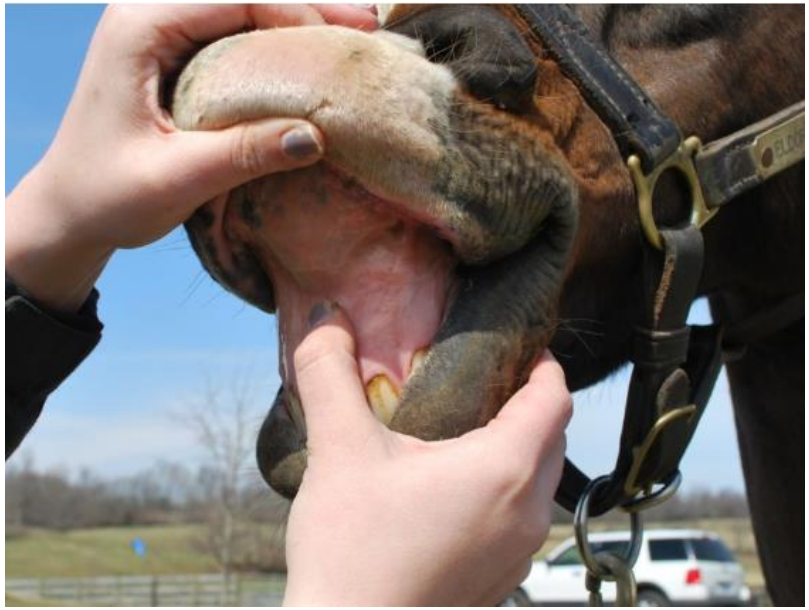
- General appraisal
  - Appropriately grown for age?
  - Loss of muscle mass?
  - Non-thoracic abnormalities?

Observation at rest

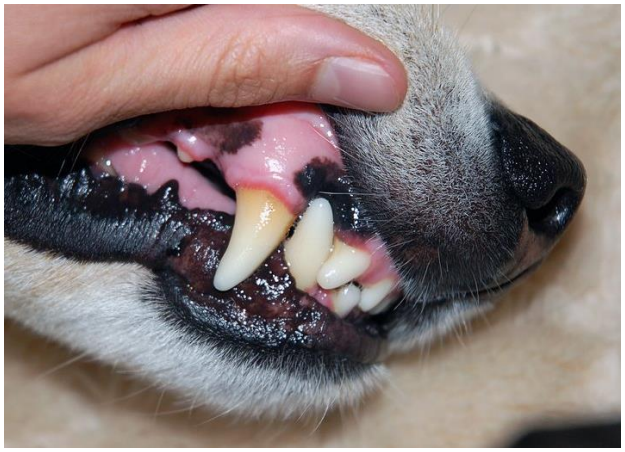
- Respiratory rate and effort
  - Can be difficult in consultation setting
  - Train owners to monitor at home
- Increased rate can indicate congestive heart failure
  - Dogs and cats: normal sleeping rate <30 breaths/min
  - Horses: normal resting rate 8 – 16 breaths/min

Mucous membranes

- Mucous membrane colour
  - Normal: ‘healthy pink’
- Capillary refill time
  - Normal: <2 sec



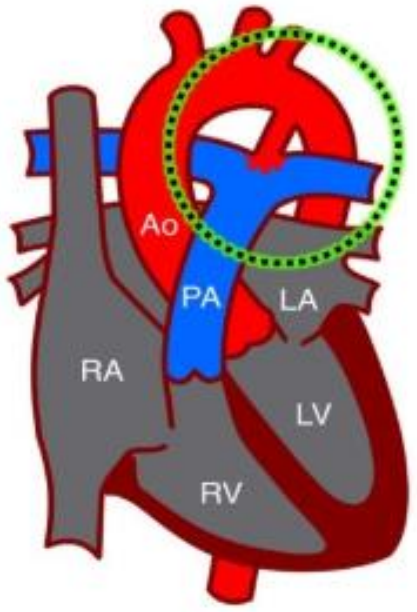
Mucous membranes



Cyanosis

- Blueish tinge to mucous membranes or skin
- Generally indicates respiratory compromise

- Cardiac causes:
  - Pulmonary oedema, pleural effusion
  - Right to left PDA
    - Differential cyanosis
  - Pulmonic stenosis or pulmonary hypertension with ASD or VSD (i.e. Tetralogy of Fallot)
    - Generalised cyanosis



Systemic veins

- Jugular vein most commonly assessed
- Distension
  - Hepatojugular reflux
  - Increased filling pressures (often right sided CHF)
  - Thrombosis or extramural pressure
- Pulsation
  - Tricuspid valve insufficiency
  - Cardiac tamponade
  - Pulmonary hypertension
- Other signs of ↑ right sided pressures?

Precordial palpation

- ‘Precordial thump’
  - Feel the heart hitting the body wall
- ‘Precordial thrill’
  - Vibration associated with turbulent blood flow
  - Auscultation will reveal a murmur

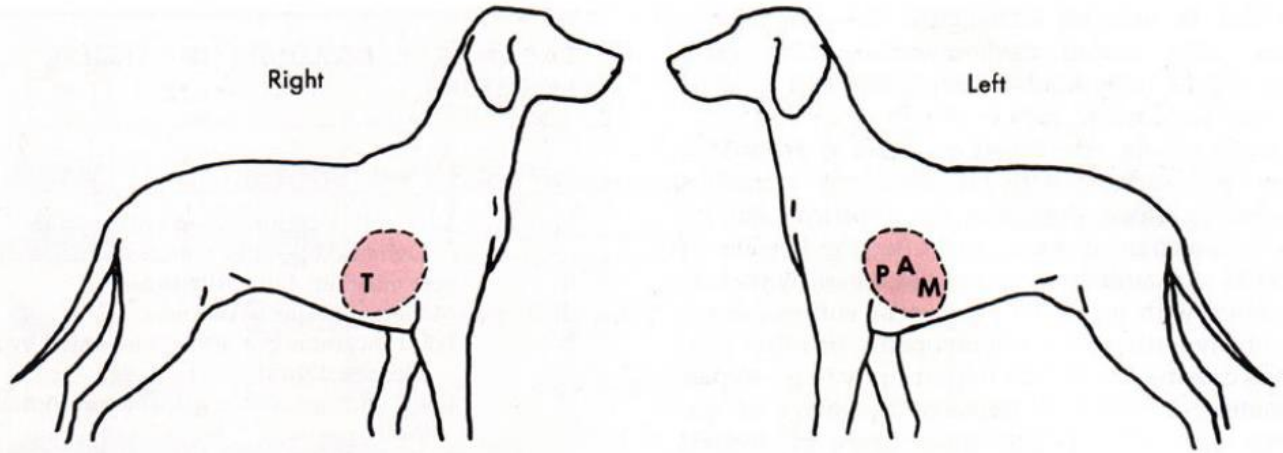


FIGURE 1-1. Approximate locations of various valve areas on chest wall. *T*, Tricuspid; *P*, pulmonic; *A*, aortic; *M*, mitral.

Arterial pulses

- Palpation simultaneous with auscultation
- Pulse pressure = systolic pressure – diastolic pressure
  - Bounding pulse
    - Quick decay diastolic pressure
      - PDA
      - Aortic valve insufficiency
  - Weak pulse
    - Ejection impedance
      - Myocardial failure
      - Cardiac tamponade
      - Shock (cardiovascular collapse)
      - Aortic stenosis
  - Pulse deficit?

Cardiac auscultation

- Patient preparation important
  - Quiet
  - Still, standing
  - Not panting or purring
  - Forelimb held/placed forward

- Thorough auscultation over entire precordium

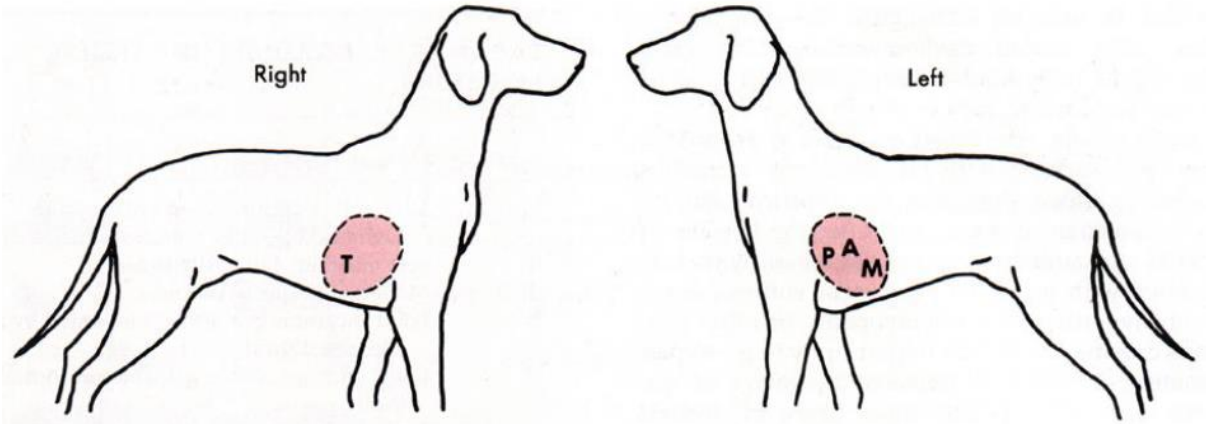
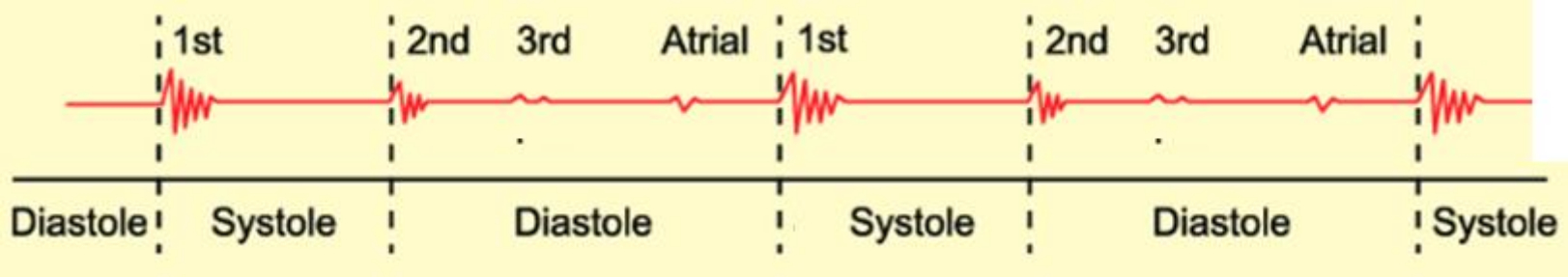


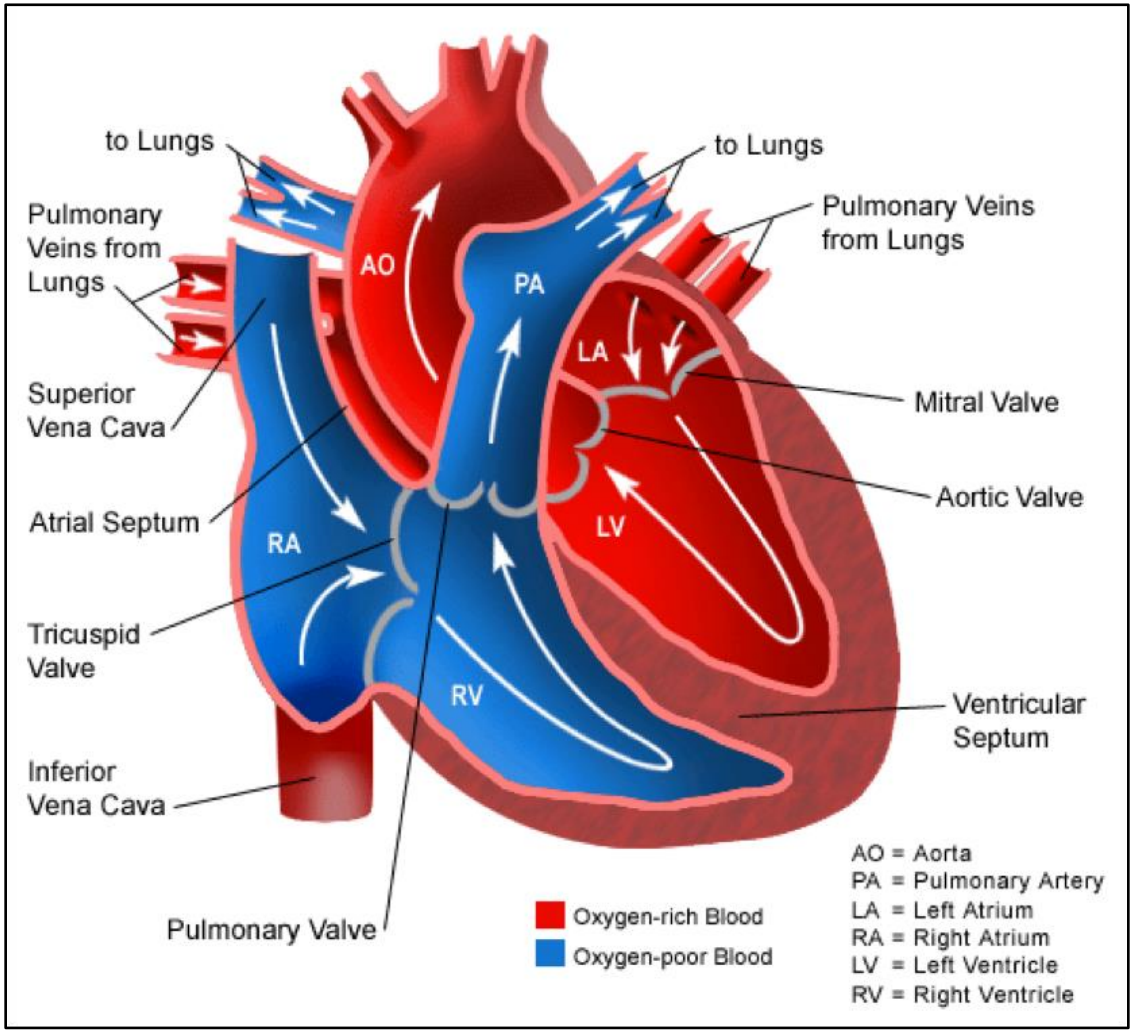
FIGURE 1-1. Approximate locations of various valve areas on chest wall. *T*, Tricuspid; *P*, pulmonic; *A*, aortic; *M*, mitral.

Heart sounds

Sound	Aetiology
S1 **“<u>lub</u>** dub**”**	Closure of the AV valves
S2 **“**lub **<u>dub</u>”**	Closure of the semilunar valves
S3 **“**lub dub-**<u>da</u>”**	Rapid early ventricular filling
S4 **“<u>ba</u>**-lub dub**”**	Atrial contraction

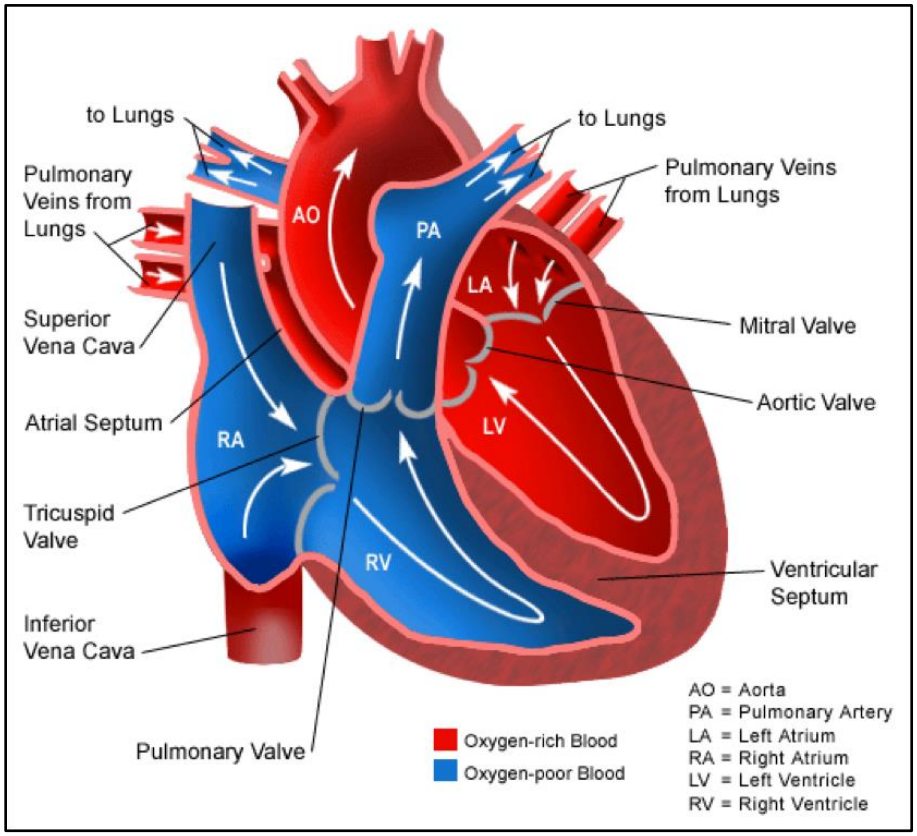


Cardiac auscultation



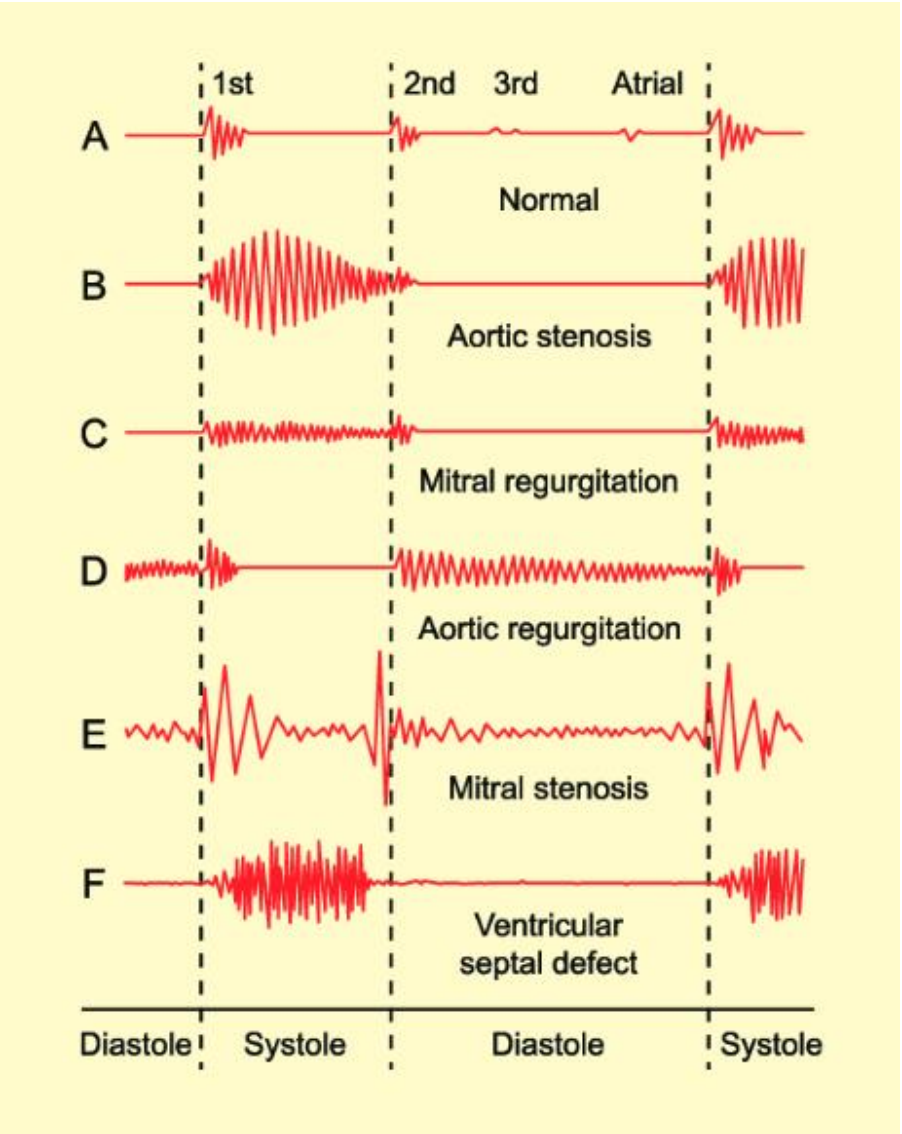
Heart murmurs

- Abnormal sounds – turbulent blood flow
- Described by:
  - Timing
  - Intensity
  - Point of maximal intensity
  - Radiation
  - Quality/character



Heart murmurs: Timing

- Systolic murmur
  - Holosystolic
  - Pansystolic
  - Examples?
- Diastolic murmur
  - Examples?
- Continuous murmur
  - Example?
- To and fro murmur
  - Two separate problems



Heart murmurs: Intensity

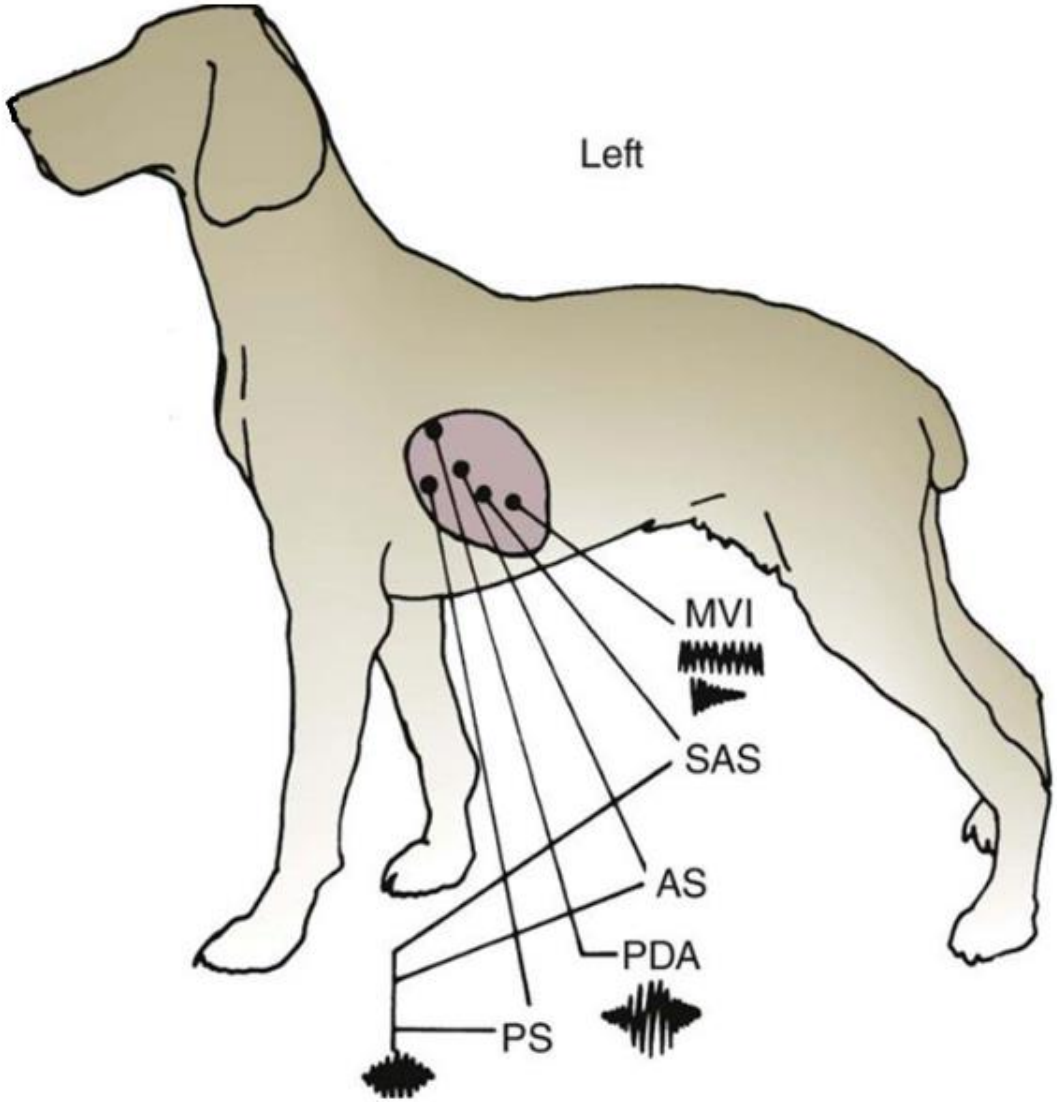
Grading system: I-VI

Grade	Description
1	Just detectable after prolonged auscultation; very localized
2	Quite a localized murmur that is heard immediately once the stethoscope is placed over the point of maximum intensity
3	Moderately loud; easily heard
4	Loud murmur heard over a wide area with **no** palpable thrill
5	Very loud murmur with an associated precordial thrill
6	Very loud murmur with thrill; may be heard with stethoscope just off the skin surface

Grade not proportional to severity of disease

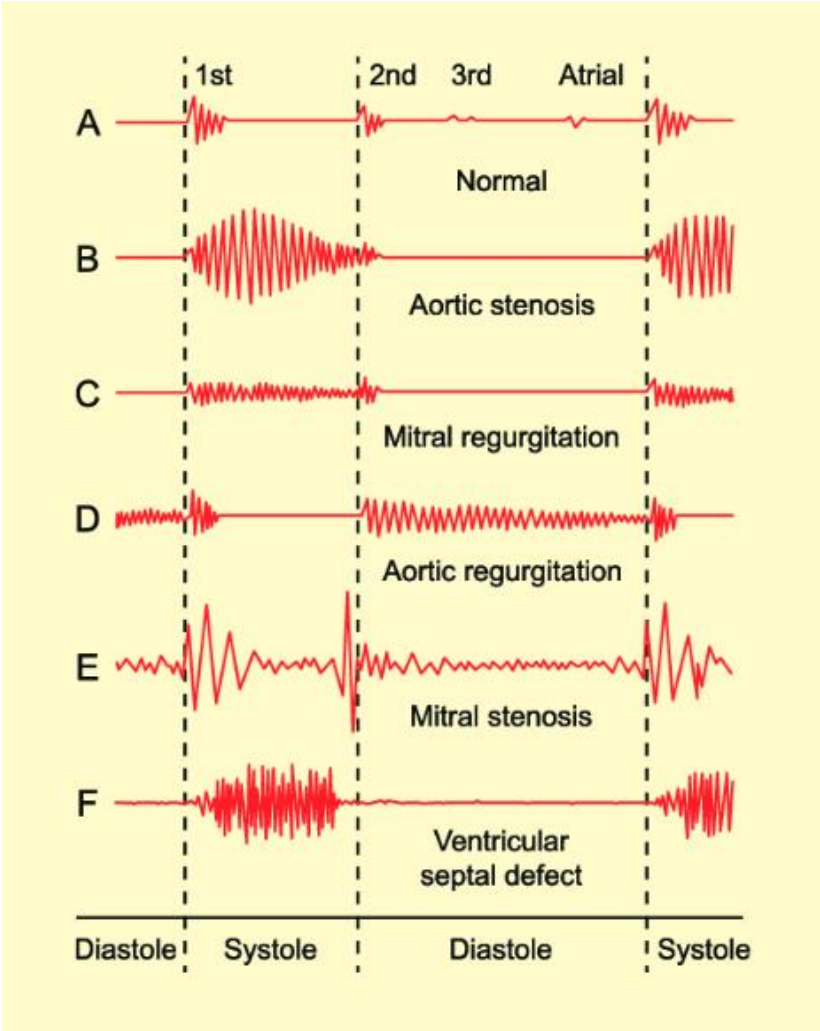
- Size and velocity of turbulent jet
  - e.g. smaller ventricular septal defect louder murmur
- Contact with heart wall
  - e.g. mitral regurgitation directed to middle of atrium vs. atrial wall

Point of maximal intensity (PMI)



Heart murmurs: Quality/character

- Frequency/shape of sound
  - Ejection (crescendo-decrescendo)
  - Plateau (even)
  - Blowing (decrescendo)
  - Musical (high pitched vibration)



Heart murmurs

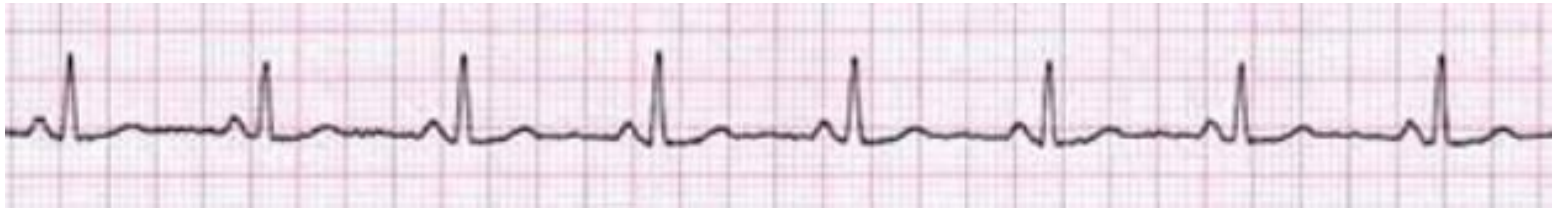
- Species variations
  - S3 and S4
    - Pathologic in dogs and cats (‘gallop’)
    - Can be heard in normal horses
  - Systolic ‘click’
    - Early pathology in dogs and cats
    - Can be heard in normal horses
  - Split S1 and S2
    - Closure of valves on left and right sides slightly offset
    - Occasionally heard in horses (slow heart rate)
  - ‘Physiological’ or ‘functional’ murmur
    - Normal turbulent high velocity blood flow through large diameter vessels of young fit horses

Cardiac auscultation

- Audibility
  - Increased
    - Hyperdynamic heart
    - Cardiac enlargement
  - Decreased
    - Pericardial effusion
    - Pleural effusion
    - Thoracic mass
    - Myocardial failure

Heart rhythm

- Normal – regular rhythm
  - ‘Regularly regular’



- Arrhythmia/dysrhythmia – irregular rhythm
  - ‘Regularly irregular’
  - ‘Irregularly irregular’

Pulmonary auscultation

- Normal sounds:
  - *Bronchovesicular sounds* – soft, breezy, low-pitched
- Abnormal sounds:
  - *Crackles* – Usually end-inspiratory, fine or coarse. May indicate small airways opening with alveolar oedema or pulmonary fibrosis.
  - *Wheezes* – Associated with airway obstruction, e.g. feline asthma or bronchial disease.
  - *Rhonchi* – Coarse rattling sounds.

Summary

- Lecture concepts reinforced in practical classes
- Refer to intended learning outcomes
- Practice your clinical examinations at every opportunity!
  - Learn normal
  - Recognise abnormal