



UNIVERSITY | MEDICAL  
*of* NICOSIA | SCHOOL

**MED-501**  
**Cardiology, Cardiothoracic and**  
**Vascular Surgery Course Handbook**

**2023-2024**

**Year 5**  
**Doctor of Medicine (MD) Programme**

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## Course Handbook introduction by the Chair of Clinical Education

Dear Student,

Your course handbook is an invaluable resource. Reading it before starting your placement will make a huge difference to your learning experience. You will find outlines of the course, the objectives of your learning, the assessment requirements, learning resource suggestions, contact numbers and reporting structures.

You can use the learning outcomes and objective list to guide you through your learning of the subject and even to discuss with your tutors. The requirements, whether these are workplace - based assessments or tutorials, will allow smooth running of your clinical block and avoid unnecessary last-minute hardship.

The medical school has a course lead in place, with knowledge of the specific block, including its learning, revision, and assessment. And the department of clinical education ensures smooth running and delivery of the clinical training, through a number of Curriculum Leads (one for each main specialty) who work with the course leads and the local teams at the placement, to ensure the curriculum is delivered as planned.

The nature of clinical learning is such that, whilst your experiences will be comparable, it is not possible to have identical clinical exposure across all students; a case of disease X may be available today, whereas when the next student comes along it may be disease Y. It is desirable that we see all cases as far as possible but your handbook with its checklist of conditions and objectives will allow you to not fall behind and fill any gaps that may appear during your clinical exposure, and help guide your preparation for assessments.

If there are academic or administrative problems, if you need help and if you need to report anything back to your medical school, the reporting structures ensure that you should not feel even for one minute that you do not have someone to go to when needed. Please contact the team if you need any help, we are all here with our contact details available if you need us.

Please ensure that you are present and available for learning, opportunities will come when you least expect them, the amount we can learn from patients is huge and endless and therefore sitting with, talking to and examining patients is one of your strongest tools.

I hope you gain a lot of knowledge and clinical experience.

Enjoy the next few weeks!

Professor Joseph Joseph  
Chair of Clinical Education

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## 1. Welcome

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The **MED-501 Cardiology, Cardiothoracic and Vascular Surgery course/ clinical rotation** offers students the opportunity to develop an understanding of the presentation, signs and symptoms, physical examination findings, investigations, diagnosis, treatment (medical and/or surgical as appropriate) and management plan for common cardiovascular diseases.

Every effort has been made to provide a structured and well organised learning experience that will ensure adequate exposure to the diagnostic and therapeutic approaches that take place in a large Academic Hospital.

On behalf of all the clinicians, nurses and administrative staff of the Cardiology, Cardiothoracic and Vascular Surgery departments, I would like to warmly welcome you as an integral part of our team and wish you an effective and pleasant learning experience. Our education team stands ready to assist you with any questions you may have.

Kind Regards,

Dr Constantinos Kyriakou

**Course Lead for MED-501 Cardiology, Cardiothoracic and Vascular Surgery**

## 2. MED-501 Cardiology, Cardiothoracic and Vascular Surgery course/ Clinical rotation Course Outline

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<b>Course Code</b> MED-501	<b>Course Title</b> Cardiology, Cardiothoracic and Vascular Surgery	<b>ECTS Credits</b> 6
<b>School</b> Medical School	<b>Semester</b> Fall (Semester 9)	<b>Prerequisites</b> None
<b>Type of Course</b> Required	<b>Field</b> Medicine	<b>Language of Instruction</b> English
<b>Level of Course</b> Undergraduate	<b>Year of Study</b> 5 <sup>th</sup>	<b>Course Lead:</b> Dr Constantinos Kyriakou
<b>Mode of Delivery</b> Face-to-face	<b>Clinical Placement in Hospitals</b>	<b>Co-requisites</b> None

### Objectives of the Course:

The main objectives of the last two years of the six-year medical programme are to provide students with extensive experience in the clinical environment, mainly in hospitals but also in the community, so that they can utilise their learning over the previous 4 years to practise their clinical, communication, diagnostic and reasoning skills on real patients, and to learn about the management of patients, from a medical, therapeutic, surgical, psychosocial and caring perspective.

In this course, students will spend four weeks working primarily with patients with heart conditions. They will develop an understanding of the presentation, signs and symptoms, physical examination findings, investigations, diagnosis, treatment (medical and/or surgical as appropriate) and management plan for common cardiovascular diseases.

The students will learn how to take detailed histories from, carry out systematic clinical examination of, and interpret laboratory and imaging data on patients with disorders of the cardiovascular system. They will also spend time in theatre observing cardiothoracic surgery.



## Learning Outcomes:

After the completion of the course the students should be able to:

1. Demonstrate active participation and effective learning.
2. Demonstrate effective history taking and information giving and perform relevant clinical examinations.
3. Formulate appropriate differential diagnoses.
4. Create a diagnostic plan (including the interpretation of the ordered tests).
5. Define the most probable diagnosis and form a management plan.
6. Recognise a patient requiring emergency care and initiate evaluation and management.
7. Directly observe/ perform clinical procedures appropriate to the stage of training/
8. Create a patient centered management plan.
9. Prescribe drugs and initiate medications (under direct supervision- prescription to be signed by the attending physician).

### Detailed description of clinical learning objectives:

#### Clinical learning objective 1: Demonstrate active participation and effective learning.

Students should:

- Clerk as many patients as possible.
- Participate in all relevant activities (morning rounds, organized lectures and multidisciplinary meetings).
- Augment their knowledge and skills by utilizing self-directed learning and covering at a minimum the conditions indicated as A and B in the focused list of conditions as well as all the procedures/skills indicated with two asterisks (**see Focused list of conditions and procedures/skills in the Course Contents section**).

#### Clinical learning objective 2: Demonstrate effective history taking and information giving, and perform the relevant clinical examinations.

Students should be able to perform a complete cardiovascular assessment including:

- Full medical history
- Palpate for thrills
- Examination of peripheral pulses for rate, quality and rhythm
- Measure blood pressure
- Locate the apex beat
- Observe of the JVP
- Record an ECG and identify significant abnormalities
- Identify the first and second heart sounds during auscultation
- Recognize mitral, aortic, pulmonary and tricuspid murmurs and quantify intensity
- Recognize the components of pre and post-operative monitoring

### Clinical learning objective 3: Formulate appropriate differential diagnoses.

Students should be able to form a differential diagnosis for the corresponding clinical presentations:

#### Cardiology and Cardiothoracic Surgery

- Arrhythmias
- Central cyanosis
- Chest pain
- Dyspnoea
- Heart murmurs
- Hypertension
- Infective endocarditis
- Palpitations
- Peripheral oedema
- Pleuritic pain
- Syncope episodes

#### Vascular Surgery

- Differential blood pressure measurement between upper limbs
- Intermittent claudication
- Lower limb oedema
- Radio-radial delay
- Vasculopathy

### Clinical learning objective 4: Create a diagnostic plan (including the interpretation of the ordered tests).

Students should be able to create a diagnostic plan by choosing the investigations needed to narrow the differential diagnosis:

Radiology	Commonly ordered blood tests
Chest X-ray	Full blood count Diagnosis of: anaemia, leucocytosis, leukopenia, thrombocytopenia, thrombocytosis
Abdominal X-ray	INR/PT/activated partial thromboplastin time
CT angiography	Direct microscopy
Classical angiography	Blood film
Coronary angiography	Lipid profile
Vascular ultrasound/echocardiography	CRP/liver biochemistry (AST,ALT, $\gamma$ -GT)
Ultrasound vs CT	ABG
<b>Other tests</b>	Urea, creatinine, electrolytes
ECG	Blood glucose
Urinalysis, Microscopy	Troponin
Blood cultures	CK MB

**Clinical learning objective 5: Define the most probable diagnosis and form a management plan.**

Relevant conditions that may be encountered include:

**Cardiology and Cardiothoracic Surgery**

- Acute circulatory failure / shock
- Acute coronary syndrome/ Myocardial infarction
- Angina
- Arrhythmias and conduction defects (atrial fibrillation/flutter, complete heart block, ventricular tachycardia)
- Arterial aneurysms
- Atrial and ventricular septal defects
- Cardiac Failure
- Cardiac valve defects
- Cardiomyopathy
- Cardiorespiratory arrest
- Coarctation of the aorta
- Fallot's tetralogy
- Hypertension
- Infective endocarditis
- Myocarditis
- Patent ductus arteriosus
- Pericardial disease
- Rheumatic fever and rheumatic heart disease

**Vascular Surgery**

- Acute & chronic limb ischaemia
- Deep Venous Thrombosis
- Limb ulceration and gangrene
- Varicose Veins
- Vascular disease in other sites (renal, mesenteric, carotid)

**Clinical learning objective 6: Identify a patient requiring emergency care.**

Examples of such conditions include:

- Acute Circulatory Failure / Shock after surgical intervention
- Acute Coronary Symptoms
- Angina Pectoris
- Arrhythmias and Conduction Defects (atrial fibrillation, atrial flutter, complete heart block, ventricular tachycardia)
- Cardiac Tamponade
- Cardiorespiratory arrest
- Endocarditis
- Life Threatening Arrhythmias (VT, VF, Torsades de Pointes)
- Limb ulceration and gangrene
- Myocarditis
- Ruptured/unstable aortic aneurysms

**Clinical learning objective 7: Directly observe/perform clinical procedures appropriate to the stage of training.**

Examples of procedures to be observed:

- Coronary angiography lab
- Echocardiography
- Neurophysiology lab
- Observation during cardiothoracic surgery
- Pacemaker monitoring
- Pacemaker placement
- Stress echo
- Treadmill stress test

Examples of procedures to be performed (under supervision):

- ABG
- Ankle brachial index calculation
- BP measurement
- ECG
- Venepuncture

**Clinical learning objective 8: Create a patient centred management plan.**

**Key competencies:**

- Propose a diagnostic and therapeutic management plan.
- Describe an evidence-based clinical management for all the components of the focused list of conditions (**see Focused list of conditions and procedures/skills in the Course Contents section**).
- Develop prescribing skills (prescription to be signed by the attending physician).

**Clinical learning objective 9: Prescribe drugs and initiate medications (under direct supervision-prescription to be signed by the attending physician).**

**The prescription of medications is a key competency for junior doctors. In this context students should pursue all relevant learning opportunities including:**

1. Direct observation during ward rounds.
2. Interaction with clinical pharmacists.
3. Observation of drug preparation by the nurses/physicians.
4. Administration (under supervision) IM/SC medications.
5. Familiarisation with the most commonly prescribed medication and study their indications, contraindications, side effects.
6. Use of the corresponding national formulary to learn about the dosing schemes and the adjustments needed depending on renal/liver function.

**Course Contents:**

<b>Focused list of conditions and procedures/skills</b>
<b>1 = Good knowledge of these conditions and corresponding therapeutic options is expected</b>
<b>2 = Some knowledge of these conditions as well as appropriate clinical judgement to seek help is expected</b>
<b>3 = Be aware of the existence of these conditions and know where to refer</b>
<b>* Emergency and/or life-threatening conditions. Initiation of management and/or appropriate referral is expected at an F1 level</b>
<b>**Procedures which the students must be able to perform</b>
<b>***Procedures/tests which the students should know when to request</b>

	<b>Cardiology</b>		<b>Relevant procedure/skill</b>
1	Acute Coronary Symptoms	1*	**Performing an ECG **Administer oxygen with venturi/non rebreathing mask **Venepuncture for troponin, CK MB measurement
2	Angina Pectoris	1*	**Performing an ECG
3	Cardiorespiratory arrest	1*	**ABCD approach **ILS/ALS
4	Endocarditis	1*	***Request echocardiography ** Venepuncture for labs and blood cultures **Prescribing antibiotics (under supervision-signed by the attending physician)
5	Life Threatening Arrhythmias (VT,VF, Torsades de Pointes)	1*	**Performing an ECG
6	Angina	1	**Performing an ECG
7	Cardiac Insufficiency	1	**Performing an ECG ***Request echocardiography
8	Cardiogenic Pulmonary oedema	1	**Performing an ECG **Administer oxygen with venturi/non rebreathing mask ***Request CXR
9	Hypertension	1	**Performing an ECG **Blood pressure measurement
10	Conduction Defects	2	**Performing an ECG **Recognise grossly abnormal ECG
11	Hypertension	2	**Performing an ECG **Blood pressure measurement
12	Other arrhythmias (Atrial fibrillation, Atrial flutter etc)	2	**Performing an ECG **Recognise grossly abnormal ECG
13	Myocarditis	2	**Performing an ECG **Venepuncture for troponin, CK MB measurement
14	Pericardial disease	2	**Performing an ECG **Detect muffled cardiac tones, increased JVP, other clinical findings ***Request echocardiography
15	Significant valvular stenosis or insufficiency	2	**Detect heart murmur ***Request echocardiography
16	Cardiomyopathy	3	**Performing an ECG **Recognize clinical signs of heart failure ***Request echocardiography

<b>Cardiothoracic Surgery</b>			
17	Acute Circulatory Failure / Shock after surgical intervention	1*	**Recognize signs of shock **BP measurement **Apply basic principles of fluid administration under supervision
18	Ruptured/unstable aortic aneurysms	1*	***Request ultrasonography/CT angiography
19	Cardiac Tamponade	2*	**Performing an ECG **Detect muffled cardiac tones, increased JVP, other clinical findings ***Request echocardiography
20	Atrial and ventricular septal defects	2	**Recognise murmurs/clinical findings
21	Cardiac Valve Defects	2	**Recognise murmurs/clinical findings
22	Patent ductus arteriosus	2	**Recognise murmurs/clinical findings
23	Coarctation of the aorta	3	**Blood pressure measurement **Detect radio-radial delay
24	Congenital Cardiovascular Disease	3	**Detect central cyanosis
25	Eisenmenger's syndrome	3	N/A
26	Fallot's tetralogy	3	**Performing an ECG
<b>Vascular Surgery</b>			
27	Limb ulceration and gangrene	1*	**Perform peripheral vascular examination **Calculate ankle brachial index **Request Doppler ultrasonography
28	Deep Venous Thrombosis	1	**Detect positive Homans' sign **Calculate Wells' Criteria for DVT ***Detect Doppler examination
29	Acute & chronic limb ischaemia	2	**Perform peripheral vascular examination **Calculate ankle brachial index **Request Doppler ultrasonography
30	Vascular Disease in Other Sites (renal, mesenteric, carotid)	2	**Recognise clinical findings
31	Varicose Veins	3	**Detect relevant clinical signs

**Lecture List:**

Cardiology – Heart Failure
Cardiology – Acute Coronary Syndromes
Cardiology – Arrhythmias
Deep Venous Thrombosis and Limb Ischaemia

## Pharmacology learning objectives:

### General pharmacology learning objectives for year 5:

- 1) Define prescribing.
- 2) Describe how to use hospital charts.
- 3) Define national formularies and describe how to use them (emphasise on BNF).
- 4) Describe students' formulary and its use.
- 5) Describe principles of safe and effective prescribing.
- 6) Define therapeutic drug monitoring and describe drugs whose levels are monitored.
- 7) Describe principles of prescribing at hospital admission.
- 8) Describe principles of prescribing on call in the hospital.
- 9) Describe principles of prescribing at hospital discharge.
- 10) Describe principles of IV fluids prescribing.

Learning objective for MED-501 Cardiology, Cardiothoracic and Vascular Surgery course/  
clinical rotation

- 1) Describe how to prescribe drugs/medications for patients suffering from cardiovascular diseases.

### Learning Activities and Teaching Methods:

The course is delivered by clinical placements, lectures, tutorials, case studies and group discussions.

### Assessment Methods:

End of Year Exams (EYES) and OSCE.

### Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN / E-book
Punit Ramrakha and Jonathan Hill	Oxford Handbook of Cardiology, 2 <sup>nd</sup> ed.	OUP Oxford	2012	978-0199643219 <a href="#">E-book</a>
Brian P Griffin	Manual of Cardiovascular Medicine, 5 <sup>th</sup> ed.	Lippincott Williams and Wilkins	2018	978-1496312600 <a href="#">E-book</a>
Neil Herring, David J. Paterson.	Levick's introduction to cardiovascular physiology, 6 <sup>th</sup> ed.	CRC Press	2018	978-1498739849

### E-book resources for MD YR 5 Clinical Placements:

<https://libguides.unic.ac.cy/mdplacementresources>



### 3. MED-501 Cardiology, Cardiothoracic and Vascular Surgery Course/ Clinical Rotation Requirements

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Please take note of the following assessments that students will need to complete and submit via **'MyProgress Health'**, **no later than one week** after the completion of the MED-501 Cardiology, Cardiothoracic and Vascular Surgery course/ clinical rotation. You must also cross-reference the above with the Year 5 DAP assessment domain handbook, which takes precedence to any other handbook.

#### Required DAP Assessments

<b>1 x Clinical Placement and Professionalism Certificate (CPPC)</b>
<b>2 x Mini Clinical Education Exercise (Mini-CEX) - 2 Cardio or 1 Cardio + 1 Vascular</b>
<b>2 x Case Based Discussion (CBD) - 2 Cardio or 1 Cardio + 1 Vascular</b>
<b>2 x ECSA (1 Drug initiation and 1 Wells' score calculation)</b>
<b>Daily Attendance Logbook (submitted via 'MyProgress Health' by uploading the attendance weekly sheets)</b>
<b>1 x Learning Outcomes Record (LOR)</b>
<b>Evidence of completing online student feedback survey</b>

#### Floating WPBA and On-line Feedback Survey

Submit the above forms together with any floating WPBAs completed during the MED-501 Cardiology, Cardiothoracic and Vascular Surgery course/clinical rotation. You also need to ensure that you have completed the online feedback survey and submit evidence of this via E-mail to the DAP administrator.

#### Logbook

The logbook should be completed on a daily basis and submitted at the end of your course/ clinical rotation by uploaded on **'MyProgress Health'**.

#### Attachment sign-off process

**PLEASE NOTE: It is your responsibility to ensure that your tutor completes your Clinical Practice Portfolio Certificate (CPPC) as well as WPBA forms for you.**

#### You should follow these steps:

- You should contact your Clinical Lead in advance to agree a mutually convenient date to conduct the completion and sign-off of the **CLINICAL PLACEMENT & PROFESSIONALISM CERTIFICATE (CPPC)** using the final week of your attachment. It may take around 15-20 minutes so please bear that in mind when arranging a suitable time slot. You should check in advance if the Clinical Lead will be absent at any time towards the end of the attachment.

- Your CPPC must be completed by the relevant tutor/lead clinician no later than one week after the completion of the attachment (recommended to be completed by the last day of the clinical attachment). Your tutor will be able to access all the WPBAs you have completed on your device during the attachment, as well as your logbooks and other evidence of your attendance.
- If you have not been told who will be signing you off you should contact your local administrator for guidance.
- Attend the meeting with your clinical tutor and bring your device to present all required WPBA forms and logbooks, as well as any other evidence of your attendance.
- It is your responsibility to ensure that the CPPC certificate and all WPBA forms are properly completed prior to their submission. In addition, you are required to use your logbooks to record activities and attendance and ask for a signature from your supervisor prior to submitting these.

#### **DON'T FORGET:**

- You should use the diaries to record activities and attendance and ask for a signature from supervising Consultant or Registrar each week. If you are using your tablet for daily electronic sign-off please make sure the signature of the Assessor is clear as it would have been on paper.
- You need to achieve submission of all assessment forms and attendance logbook/diaries via 'MyProgress Health' within one week of completing an attachment. If you are using the 'E-mail to Assessor to complete later' function it is your responsibility to chase up the clinician and have your WPBAs completed and submitted by the deadline. **If you anticipate any delays please always inform the DAP administrator. No communication and late submissions are considered serious and recorded under Professional Behaviour of the DAP domain.**
- You must check that all section of WPBA forms have been completed appropriately and fully before you submit. Otherwise, your forms will not be accepted by the system.
- If you are marked with a 'Fail' on the CPPC form for any of the elements, the assessor must give specific detailed feedback explaining reasons for the grade. Feedback should be focused and specific. In such cases or in cases where you fail to complete the required number of WPBAs, you will normally be required to redo part or the whole of the course/clinical rotation (after discussion with your local DAP Domain Lead). **Once remediation is complete a new CPPC form needs to be completed and signed off by the Clinical Lead or the remediation supervisor or the remediation supervisor along with a new Logbook that shows remediation dates.**
- Check that your course/clinical rotation specific and floating WPBAs have been supervised and signed off by the correct assessor level. If you are unsure, please check before you undertake the WPBA to avoid your forms being rejected and having to return to your placement to repeat the WPBA with the correct assessor.
- Ensure you have completed the online feedback survey and submit evidence of this via E-mail to the DAP administrator.

 **Note that late submissions will be recorded under DAP Professional Behaviour Element.**

Your clinical site administrator is here to help!

If you are unclear or unsure about any aspect of the  
DAP Domain please ask your clinical site administrator



**In case of illness or absence**

Students must notify their clinical site administrators via E-mail, and their Clinical Tutor prior or on the day of absence.

## 4. Cardiovascular History Taking

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### Presenting complaints

#### Chest pain

- S site
- O onset
- C character
- R radiation
- A alleviating factors
- T tempo
- E exacerbating factors
- S symptoms associated

Remember angina can present as heavy/stabbing/burning/aching chest pain, shoulder pain, epigastric pain, isolated neck/jaw/arm pain, or without pain.

Canadian Cardiovascular Society functional classification angina

- Class I No angina with normal activity (strenuous exertion)
- Class II Slight limitation of normal activity (walking up-stairs briskly)
- Class III Marked limitation of normal activity (walking up-stairs)
- Class IV Angina on minimal exertion or at rest

#### SOB

- Precipitants: exertion, lying flat
- Relieving factors: rest, GTN, inhalers (to differentiate from respiratory cause)
- Associated symptoms

New York Heart Association functional classification heart failure

- Class I No SOB with normal activity
- Class II Slight limitation with normal activity
- Class III Marked limitation of normal activity
- Class IV SOB with minimal exertion or at rest

#### Palpitations

- Onset: gradual or sudden
- Rhythm: fast, slow, regular or irregular (patient can tap out rhythm)
- Precipitants: exertion, alcohol
- Associated symptoms: particularly SOB, dizziness or collapse
- Relieving factors (many patients learn vagal manoeuvres to control a SVT)

#### Dizziness / syncope

- Differentiate from vertigo
- Onset: exertional, postural
- Associated symptoms: palpitations, SOB
- Recovery time and state (may help differentiate from neurological cause)

## **Past Medical History**

### **'Angina'**

- Who made the diagnosis: GP, hospital doctor, cardiologist
- Regular clinic follow-up: with whom, where, next appointment, planned interventions
- Usual pattern of symptoms: how does this presentation differ

(This to be used for every diagnosis the patient says they have been given.)

### **Myocardial infarction**

To clarify past history it is essential to ask about admission, length of inpatient stay, intervention, investigation and planned follow-up.

### **Cardiac surgery**

Details are important when planning further investigation and intervention, so ask when, where and who operated. Also ask about angiograms or angioplasty.

### **IHD risk factors**

- Diabetes mellitus
- Smoking history
- Family history (1<sup>st</sup> degree relative age <60yrs is significant)
- Hypertension/previous IHD
- Cholesterol
- Obesity

### **Valve lesions**

- Past history of rheumatic fever
- If suspect endocarditis enquire about risk factors (i.e. recent dental or invasive procedure, IVDU)

### **Medication**

- Current medication

Not every patient brings a list, but do not accept 'I can't remember Doc' and run through some possible names. Think of all the drugs a patient ideally should be on (i.e. post MI: ACE inhibitor, statin, aspirin, and beta-blocker)

- OTC and herbal remedies
- Allergies: what was the reaction?

### **Family History**

Ask about premature coronary disease

Enquire if any unexplained sudden death

### **Social History**

- Alcohol
- Illicit drug use: cocaine can cause coronary artery spasm
- Work: MI and arrhythmias will affect driving licences (taxi, bus, HGV)
- Housing and support: cardiac symptoms can severely limit mobility

## Review of Symptoms

Respiratory	SOB can be respiratory in origin. What limits patients' mobility more: their COAD or angina.
Gastro-intestinal	Heartburn symptoms may be confused with angina. GORD, peptic ulcer disease and GI bleeds are important to identify in the context of the anticoagulation a patient receives (aspirin, clopidogrel, heparin, thrombolysis.)
Musculo-skeletal	Arthritic patients make take NSAIDs, which worsen fluid retention and cause gastric irritation. What limits patients' mobility more: their arthritis or angina.
Neurology	TIA /CVA secondary to embolism or carotid atherosclerosis. History of haemorrhagic stroke is important in planning anticoagulation.
Psychiatric	Anxiety, fear of loss of independence and depression can occur post-MI.

## 5. Cardiovascular Examination

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### As with all examinations:

- Introduce yourself.
- Explain what you will do.
- Gain consent.
- Position patient – maximal exposure ideally, 45°
- One step back- general inspection:
  - Comfortable/ distressed, cyanosed, scars, mechanical sounds, de Musset's sign, oxygen, GTN, cardiac monitor, Marfan's
  - (Scars:- median sternotomy, lateral thoracotomy, mid-CAB, vein + artery harvest)**

### Next to the hands:

- Ask about pain before touching patient
- Look at **both** hands together
- Clubbing:
  - *proliferation + increased vascularity of nail bed*
  - *Loss of angle, boggy & fluctuant, increased curvature in all directions, expansion of end of digit (drumstick)*
  - **Cardiac causes:**           **Subacute** (not acute) endocarditis (SBE)  
cyanotic heart disease (e.g. Fallot's)  
atrial myxoma (polypoid, gelatinous, pedunculated)
- Tar staining (Rothman's sign)
- Peripheral cyanosis- due to central cyanosis or peripheral vasoconstriction
- Splinter haemorrhages: due to trauma/ SBE.
- Janeway lesions: erythematous non-tender blanching macules, mainly on thenar & hypothenar eminences. Due to SBE.
- Osler's nodes: hard, painful papules (subcut swellings) in fingers, toes, palms, soles. Due to SBE.  
*(N.B. macule = change in colour; papule = change in contour)*

### The arms:

- Radial pulses: *Do both together (radio-radial delay + equality)*
  - Rate (count for 15s)
  - Rhythm (regular, regularly irregular, irregularly irregular)
  - Vessel wall
- Waterhammer pulse: *Named after Victorian toy*
  - Feel brachial pulse with 4 fingers with arm hanging down
  - Ask about pain in shoulder + lift arm up
  - When above level of heart, pulse felt travelling up and down fingers
  - Due to AR, PDA or high cardiac output states*

- Tendon xanthomas (hyperlipidaemia)
- Say you would do the BP *at this point*.  
Remember: *pulse pressure = systolic bp – diastolic bp*  
*Narrow pulse pressure in AS*  
*Wide pulse pressure in AR, PDA*

### The face:

- Eyes: Arcus senilis- sign of hyperlipidaemia if under age 60  
Anaemia seen in the palpebral conjunctiva  
Xanthelasma- yellowish plaques around the eyes (hyperlipidaemia)
- Malar flush: *most commonly linked with mitral stenosis*  
Does not bridge nose (cf butterfly rash)
- Mouth: Poor dentition- source of endocarditis  
Central cyanosis: *“Stick your tongue up to the roof”*  
5 g/dl deoxy-Hb  
Circulatory/ resp pathology  
More likely in polycythaemia (more Hb)  
**N.B. lips are peripheral, not central**

### The neck:

- Jugular venous pressure (JVP):  
*“Look away from me”*. Make sure neck relaxed.  
Use **internal** jugular vein (no valves, passes through less planes)  
Measured as **vertical** distance from manubriosternal joint (angle of Louis)  
<3cm H<sub>2</sub>O normally  
Differentiate from carotid pulse: Double pulse  
Fills from above  
Obliterated with pressure  
Hepatojugular **reflux**  
Hepatojugular reflux- abdominal pressure (ask about pain)  
Temporary rise in venous return  
Causes JVP to temporarily rise  
Use to exclude v. high JVP

“a” wave (**atrial** systole), “c” wave (RV contraction before tricuspid valve **closes**) and “v” wave (atrial filling by **venous** return against closed tricuspid valve)

Large a waves- resistance to ventricular filling  
Pulmonary hypertension, pulmonary stenosis  
Rare in tricuspid stenosis (as usually AF)



Cannon waves- atria/ ventricles contracting together  
Complete heart block, VT

Giant v waves-vent contraction not stopped by tricuspid valve  
Tricuspid regurgitation

Raised JVP- fluid overload or **right** heart failure (not LVF)

- Carotid pulse- **Never palpate both together**  
Palpate with thumb (rest of hand on chest)  
Feel for **character** mainly (& volume):

Collapsing: wide pulse pressure  
AR, PDA & high output states  
May be *visible* as pulsation of the neck  
(Corrigan's sign) or head nodding  
(de Musset's sign)

Slow-rising: Also known as "plateau", "anacrotic"  
Aortic stenosis

Pulsus alternans: Regular, but alternate weak then strong beats  
Due to poor cardiac function

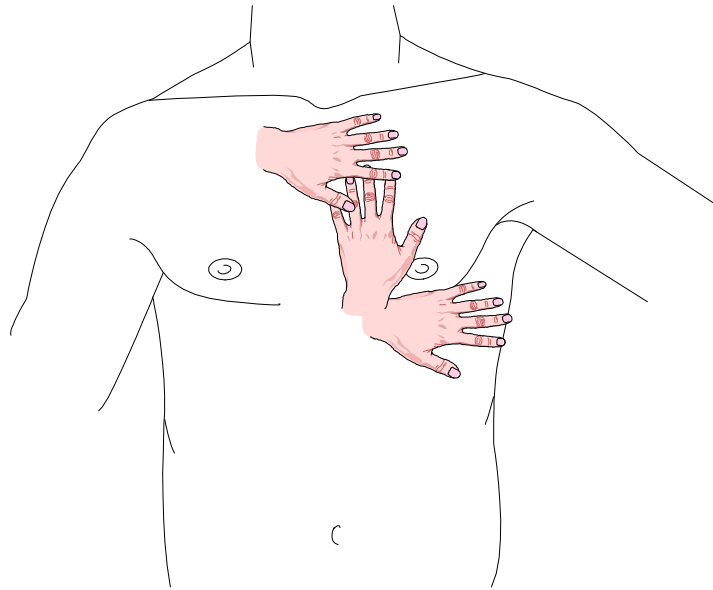
Pulsus bigeminus: Irregular. Two beats then a pause, repeated.  
Due to ectopic after every normal beat

Pulsus bisferiens: Double-headed pulse  
"Feels how a JVP looks"  
HOCM or mixed aortic valve disease

### Finally onto the praecordium:

- Inspect initially, especially for: Lateral thoracotomy  
Visible heaves  
Audible prosthetic valves
- Palpate **apex beat** (most inferior & lateral point at which the heart beat may be felt)  
Start laterally and move medially  
When located, note location (inferiorly from manubriosternal joint (2<sup>nd</sup> intercostal space), and in which vertical plane e.g. mid-clavicular, anterior axillary, posterior axillary, mid-axillary).  
Normal site is 5<sup>th</sup> intercostal space, mid-clavicular line (5ICS MCL)
- Feel for heaves and thrills (Z manouvre)  
Heave- hand lifted off chest wall by strenuous ventricular activity.

Thrill-palpable component of a murmur. A vibrating sensation.



*The Z manouvre*

- No percussion in CVS exam
- **Auscultation:** the aim is to move the patient and change between bell and diaphragm *as little* as possible.
  - Bell- for low pitched sounds (mitral stenosis, 3<sup>rd</sup> and 4<sup>th</sup> heart sounds) and auscultating on irregular surfaces (e.g. neck)
  - Diaphragm- for high pitched sounds (pretty much everything else)
  - Normal sounds- First heart sound (lub) then second (dub)  
(Ventricular) systole is between heart sounds 1 & 2  
The carotid pulse is felt between heart sounds 1 & 2
  - The four areas- Mitral area @ apex  
Tricuspid @ lower left sternal edge (LLSE)  
Pulmonary @ 2<sup>nd</sup> intercostal space left sternal edge  
Aortic @ 2<sup>nd</sup> intercostal space right sternal edge
  - Respiration- **In inspiration**, you suck air + blood into chest (negative pressure)  
More blood returns to R heart. Therefore, more flow/ turbulence  
Therefore R-sided murmurs louder in inspiration  
  
**In expiration**, positive pressure in chest  
Pulmonary vessels squeezed- more blood pushed into left heart  
Therefore, in expiration, L-sided murmurs louder

Order-

Feel carotid pulse while listening (tells you when systole is)

**Bell @ apex.** *“Deep breath in.. and out.. and stop breathing”*. For mitral stenosis & extra heart sounds.

**Turn patient to left lateral position.** Repalpate apex and listen over with bell.

**Diaphragm @ apex.** Listen in expiration for mitral regurgitation

**Diaphragm in axilla.** For radiation of MR

**Diaphragm @ tricuspid area.** In inspiration for TS/TR

**Diaphragm @ pulmonary area.** In inspiration for PS/PR

**Diaphragm @ aortic area.** In expiration for AS (note not AR)

**Bell @ both carotids.** *“Deep breath in.. and out.. and stop breathing”*. For radiation of AS or carotid bruits.

**Sit patient forward**

**Diaphragm @ tricuspid area.** *“Deep breath in.. and out.. and stop breathing”*. For aortic regurgitation (note, we are listening in the tricuspid area)

**Diaphragm @ lung bases.** For pulmonary oedema (LVF, fluid overload)

**Feel sacrum for oedema**

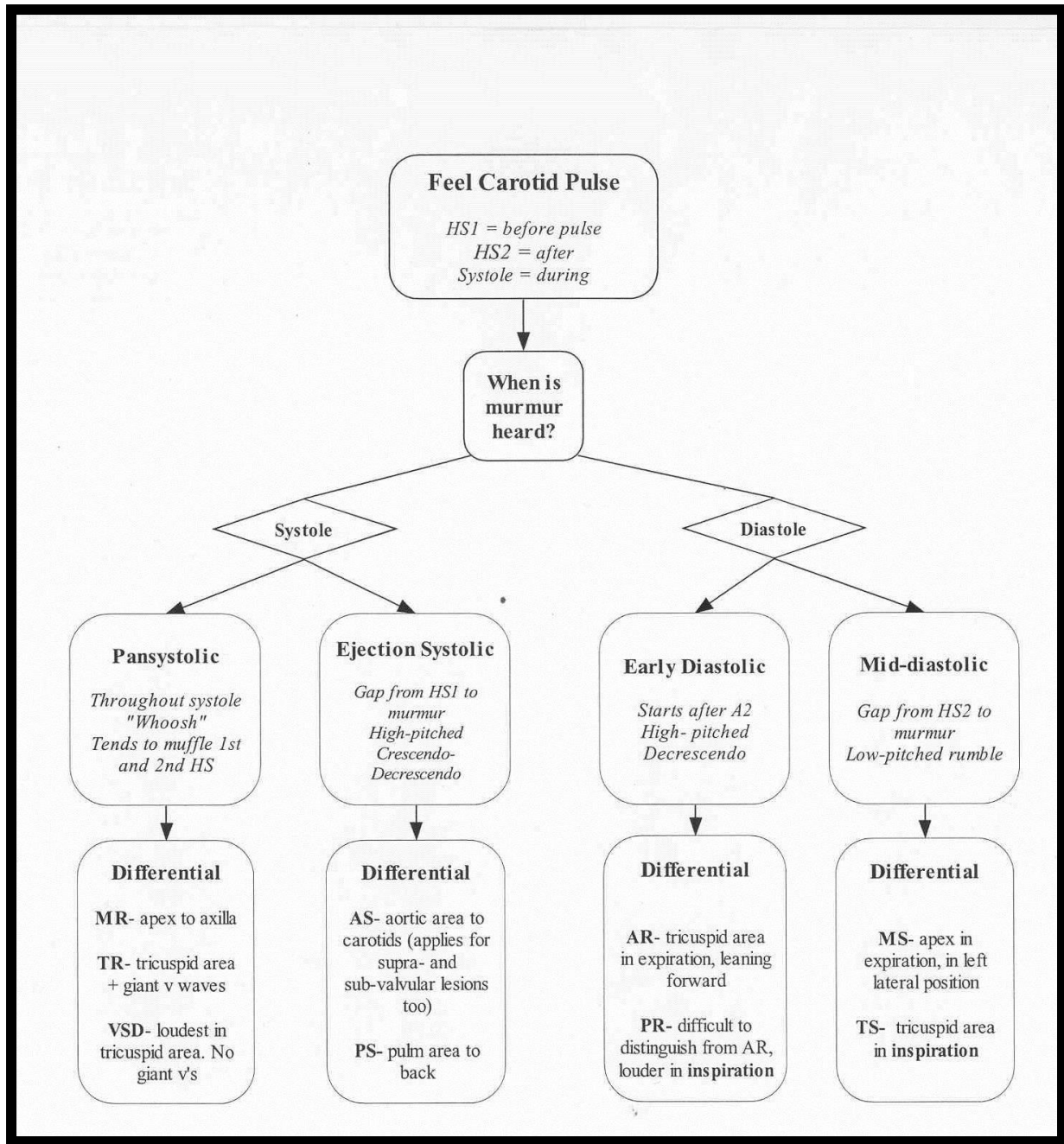
**Lie patient back**

**Feel for ankle oedema**

**To Finish:**

- Thank the patient
- Say you would also like to do the following:
  - Examine the peripheral pulses
  - Feel for hepatomegaly (RVF and TR) and splenomegaly (SBE)
  - Dip the urine for blood and look at a temperature chart (SBE)
  - Perform fundoscopy (Roth spots in SBE, hypertensive and diabetic changes)
- Present your patient

## 6. Murmur Interpretation



## 7. Heart Sounds and Valve Lesions

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### Normal Sounds

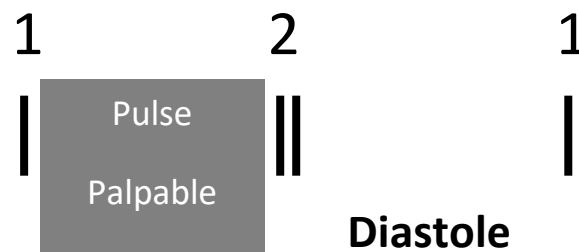
- Normal valves do not make opening sounds
- Heart sounds 1 + 2 are due to **closure** of valves.
  - 1 = mitral + tricuspid valves
  - 2 = aortic + pulmonary valves
- Heart sound 1 is not split.
- Heart sound 2 is split in inspiration-  $A_2$  occurs before  $P_2$  (see later)

### **Systole v diastole**

- Systole = contraction
- Diastole = relaxation

**Note: these terms usually refer to ventricular systole / diastole. If referring to atrial activity, they will make this apparent e.g. "atrial systole"**

- Systole occurs between heart sounds 1 and 2. The pulse is therefore also palpable between heart sounds 1 and 2.



- Whilst listening to the praecordium, feel the carotid (not radial, as too peripheral) pulse to orientate oneself in the cardiac cycle i.e. when you feel the pulse, this is systole, the preceding sound = 1, and the sound after the pulse = 2

### Blood Flow in the normal heart

- Blood returns from systemic circulation into venaw cavae
- Into right atrium (noValve)
- Into right ventricle (through Tricuspid valve)
- Info pulmonary artery (through pulmonary valve)
- Through lungs and into pulmonary veins (no Valve)
- Into left atrium (no valve)
- Into left ventricle (through mitral valve)
- Into aorta (through aortic valve)
- To rest of body

## The cardiac cycle in a normal heart

- **Diastole:**
  - Starts when aortic/ pulmonary valves shut
  - Ventricles relax
  - Mitral/ tricuspid valves open after very short period (when ventricular pressure has dropped sufficiently)
  - Blood then flows across mitral/ tricuspid valves from atria to ventricles
  - No flow across aortic/ pulmonary valves, as shut during systole
- **Systole:**
  - Starts when mitral/ tricuspid valves shut
  - Ventricles contract
  - Aortic/ pulmonary valves open after very short period (when ventricular pressure has risen sufficiently)
  - Blood then flows across aortic/ pulmonary valves from ventricles
  - No flow across mitral/ tricuspid valves, as shut during diastole

## When do murmurs occur?

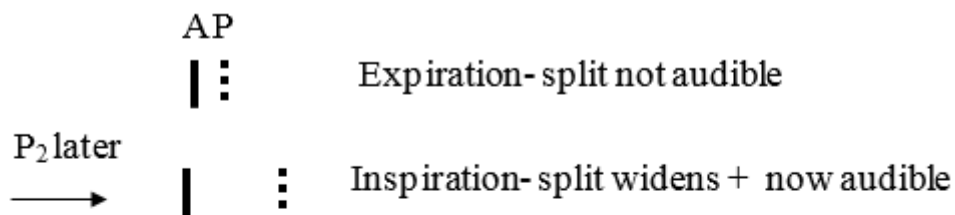
- Murmurs are due to turbulent flow
- Turbulence occurs when there is:
  - More blood/ faster flow
  - Obstruction to flow (stenosis)
  - Blood flowing in the wrong direction (regurgitation)
- **Stenotic** murmurs therefore occur in the part of the cycle where the valve is supposed to be open
- **Regurgitant** murmurs occur in the part of the cycle where the valve is supposed to be closed
- Endocarditis tends to cause **regurgitant** murmurs (the vegetations are usually not big enough to interfere with forward flow, but do not allow the valve to shut properly)

## Variations with respiration

- Blood enters right heart from vena cava
- Input to left heart is from pulmonary vessels
- **During inspiration:**
  - Negative pressure created in thorax to draw in air- also draws in blood from systemic circulation via vena cava (i.e. into right heart)
  - More blood in right heart = more turbulence. **Therefore right sided murmurs** (pulmonary/ tricuspid) get **louder in inspiration**
- **During expiration:**
  - Positive pressure created in thorax to push out air- this squeezes the pulmonary capacitance vessels, and the blood is pushed into the left heart
  - More blood in left heart = more turbulence. Therefore **left sided murmurs** (aortic/ mitral) get **louder in expiration**

- To summarise **RILEs (Right Inspiratory, Left Expiratory)**
- Heart sound 2 also varies with respiration. During expiration, it is not audibly split as P<sub>2</sub> closely follows A<sub>2</sub>. As stated above, the venous return to the right heart increases during inspiration- this delays right heart emptying, and therefore P<sub>2</sub> occurs later. This leads to an audible split in the second sound.

- **Added Heart Sounds**



Heart sounds 3 & 4 occur after heart sound 2

- 3 is usually heard as a sound just after heart sound 2
- 4 is usually heard as a sound just before the next heart sound 1
- **Heart sound 3:**
  - Due to rapid filling of ventricle e.g. mitral regurgitation (large volume of blood in atrium (venous return + regurgitated blood) flows into ventricle)
- **Heart sound 4:**
  - Due to filling against a stiff ventricle e.g. hypertension and aortic stenosis cause LVH (stiffens ventricle)

**LVF v RVF**

- **LVF (left ventricular failure):**
  - Pulmonary oedema
- **RVF (right ventricular failure):**
  - Peripheral oedema (sacral if patient bed-bound, legs if mobile)
  - Hepatomegaly (due to hepatic vein congestion)
  - Raised JVP
- **CCF (congestive cardiac failure):**
  - LVF + RV

## Things to bear in mind

- Endocarditis tends to cause **regurgitant** murmurs.
- Mitral and tricuspid valve lesions can lead to atrial dilatation. This makes one prone to **atrial fibrillation**
- Pulse pressure and pulse character are influenced by **aortic** (and other left ventricular outflow) lesions only, unless the patient is compromised
- The JVP reflects **R-sided** failure or valve lesions. It will not be raised in left-sided lesions unless there is:
  - Fluid overload
  - Secondary R-sided failure (CCF)
  - Dual pathology (i.e. concurrent R lesion)
- The apex beat is only displaced if the ventricle is dilated, not hypertrophied (as hypertrophy only causes a small change in ventricular dimensions). Therefore, it **will be displaced in AR and MR** when the ventricle contains large volumes of blood, but **not in AS** when the volume is normal but the muscle has hypertrophied
- The apex beat reflects left ventricular activity. If the ventricle has to work hard, the apex beat becomes **hyperdynamic** (heaving or thrusting). A heaving apex is felt when the ventricle has to work against a constant resistance during systole (e.g. AS). A thrusting apex is felt when a large volume has to be expelled (e.g. AR, MR)
- Left ventricular overwork is felt as an apical heave. Right ventricular is felt as a parasternal heave (lower left sternal edge)
- Thrills are felt best at the site at which they are heard best
- **Stenotic** murmurs occur in the part of the cycle where the valve is supposed to be open
- **Regurgitant** murmurs occur in the part of the cycle where the valve is supposed to be closed
- Diastolic murmurs are much quieter than systolic murmurs. Therefore special manoeuvres are used to bring the murmur out (turn to L lateral for MS, sit forward for AR)
- Right sided murmurs are similar in timing to their equivalent L-sided murmur (e.g. TR + MR). The two are distinguished by:
  - Site at which best heard and radiation
  - R- sided murmurs louder in inspiration, L- sided louder in expiration (RILEs)
- Stenotic murmurs tend to occur a short while after the start of the systole or diastole (MDM, ESM) as they only begin when the valve opens. Regurgitant murmurs tend to happen earlier as the valves just don't shut properly (and so leak straight away) – the only exception is in prolapse as the valve is initially competent.
- Diastolic murmurs are much quieter than systolic murmurs. Therefore special manoeuvres are used to bring the murmur out (turn to L lateral for MS, sit forward for AR)
- Right Sided murmurs are similar in timing to their equivalent L-sided murmur (e.g. TR + MR). The two are distinguished by:



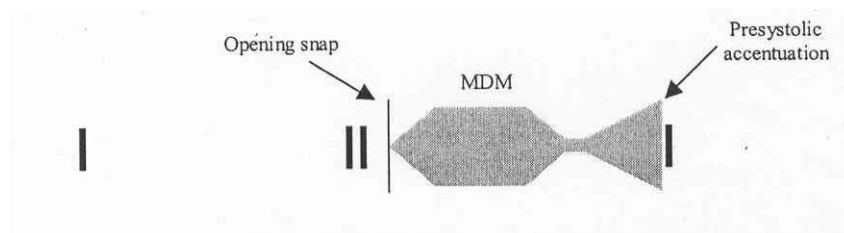
- Site at which best heard and radiation
- R- Sided murmurs louder in inspiration, L- sided louder in expiration (RILEs)

### Important Valve Lesions

- The following pages explain the findings in the most common valve lesions in finals exams
- Imagine that you are examining the patient- the findings are listed in such an order. For mitral stenosis, all findings (positive & negative) are listed. For the other lesions, only +ve findings are listed.
- Remember the rules stated in the previous section (“Things to bear in mind”) to make sense of the findings

### Mitral Stenosis

- *Rare to get this in finals unless obvious murmur*
- Hands: nil specific
- **Radial pulse:** AF (*this can be a big clue*) or SR
- BP: nil specific
- **Face:** malar flush (differentiate from butterfly rash as malar flush does not affect bridge of nose) *when pulmonary hypertension*
- JVP: nil specific (large a waves when pulmonary HT)
- Carotid pulse: nil specific
- **Apex:** Tapping (*palpable first heart sound*)  
Not displaced
- Auscultation:



Low rumbling mid-diastolic murmur (MDM i.e. valve opens a short while *after* the start of diastole- murmur then ensues)- heard best in expiration, L lateral position. No radiation

Loud first heart sound (as valve closes late)

Opening snap as abnormal valve opens

Pre-systolic accentuation (murmur loudens as atrial contraction occurs - not present if patient in AF (as no co-ordinated contraction))

Graham Steell murmur - pulmonary regurgitation due to build up of pressure behind the mitral stenosis causing pulmonary valve incompetence

Loud P<sub>2</sub> if pulmonary hypertension

Lung bases: creps if LVF only

Peripheral oedema: nil

- Aetiology: Majority due to rheumatic heart disease  
Rarely congenital  
Calcification! fibrosis in elderly

### **Mitral Regurgitation**

- Hands: Signs of endocarditis if underlying cause  
Arachnodactyly (Marfan's), hypermobility (Ehlers-Danlos)
- Pulse: AF (or SR)
- Eyes: Vasculitic lesions/ Roth spots if endocarditis
- Face: Malar flush if pulmonary HT
- Apex: Displaced thrusting {depending on severity}. Thrill if severe
- Auscultation:



Soft 1st heart sound (incomplete mitral closure)

Pansystolic murmur (starts at the beginning of systole as valve does not shut properly and leaks straight away) @ apex radiating to axilla

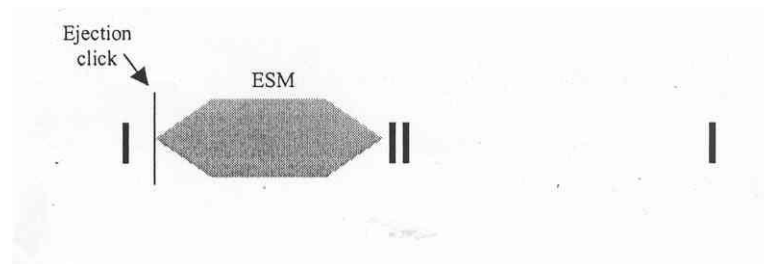
Third heart sound if severe

- Aetiology: Rheumatic heart disease (50%)  
Mitral valve prolapse (note, this causes mid-systolic murmur (after valve prolapses))

Functional (due to LV dilatation causing mitral valve ring stretching such that valve cusps no longer meet in the middle)  
 Post-MI (papillary muscle dysfunction or rupture of the chordae tendinae)  
 Infective endocarditis  
 Collagen disorders causing floppy valves (Marfan's, Ehlers-Danlos)  
 Degeneration of valve (age-related)  
 Failure of prosthetic valve

## Aortic Stenosis

- BP: narrow pulse pressure (narrower if more severe)
- Carotid: Small volume, slow-rising
- Apex: Heaving. Not displaced unless decompensated (failing heart)
- Palpation: Thrill in aortic area if severe
- Auscultation:



Ejection systolic murmur (ESM- begins once the valve opens) @,aortic area radiating to **both** carotids. It is crescendo- decrescendo in nature (i.e. gets louder, then softer- see diag).

Note, carotid bruit may be due to radiating aortic stenosis murmur or due to stenosis of the carotid artery itself- therefore check **both** carotids for bruits.

An ejection click due to opening of an abnormal valve (cf opening snap in mKral valve)

**Soft** second heart sound due to immobile valve (note compare this to *loud* heart sound 1 in mitral stenosis)

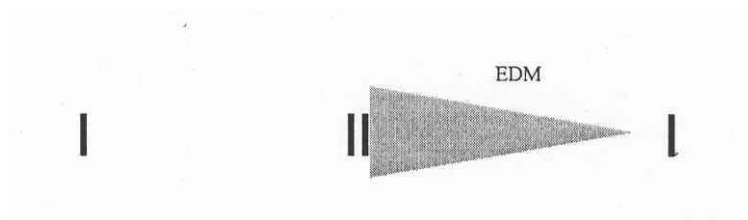
Fourth heart sound if severe

- Aetiology: Rheumatic heart disease  
 Congenital (usually bicuspid, and most are in men)  
 Age-related degeneration/ calcification

Note:- can also have supra- and subvalvular stenosis

### Aortic Regurgitation

- The lesion with a countless eponymous signs (all due to large pulse pressure)
- Hands: Signs of endocarditis/ Marfan's  
**Quincke's sign**- visible capillary pulsation in nail bed (push down on nail gently so that a border of red and white is seen- this border will move proximally/ distally with the pulse)
- **Waterhammer pulse**: aka Corrigan's pulse.
- BP: large pulse pressure
- Eyes: Signs of endocarditis  
**Becker's sign** (retinal artery pulsation)
- Mouth: **Muller's sign** (dancing uvula)
- Carotids: Collapsing pulse
- Neck: **Corrigan's sign** (visible gross carotid pulsation)  
**De Musset's sign** (head nodding due to v. large pulse pressure)
- Apex: Displaced thrusting (depending on severity).
- Auscultation:



High pitched early diastolic murmur (EDM- starts at the beginning of diastole as valve does not shut properly and leaks straight away) heard best in expiration, with patient leaning forward. No radiation.

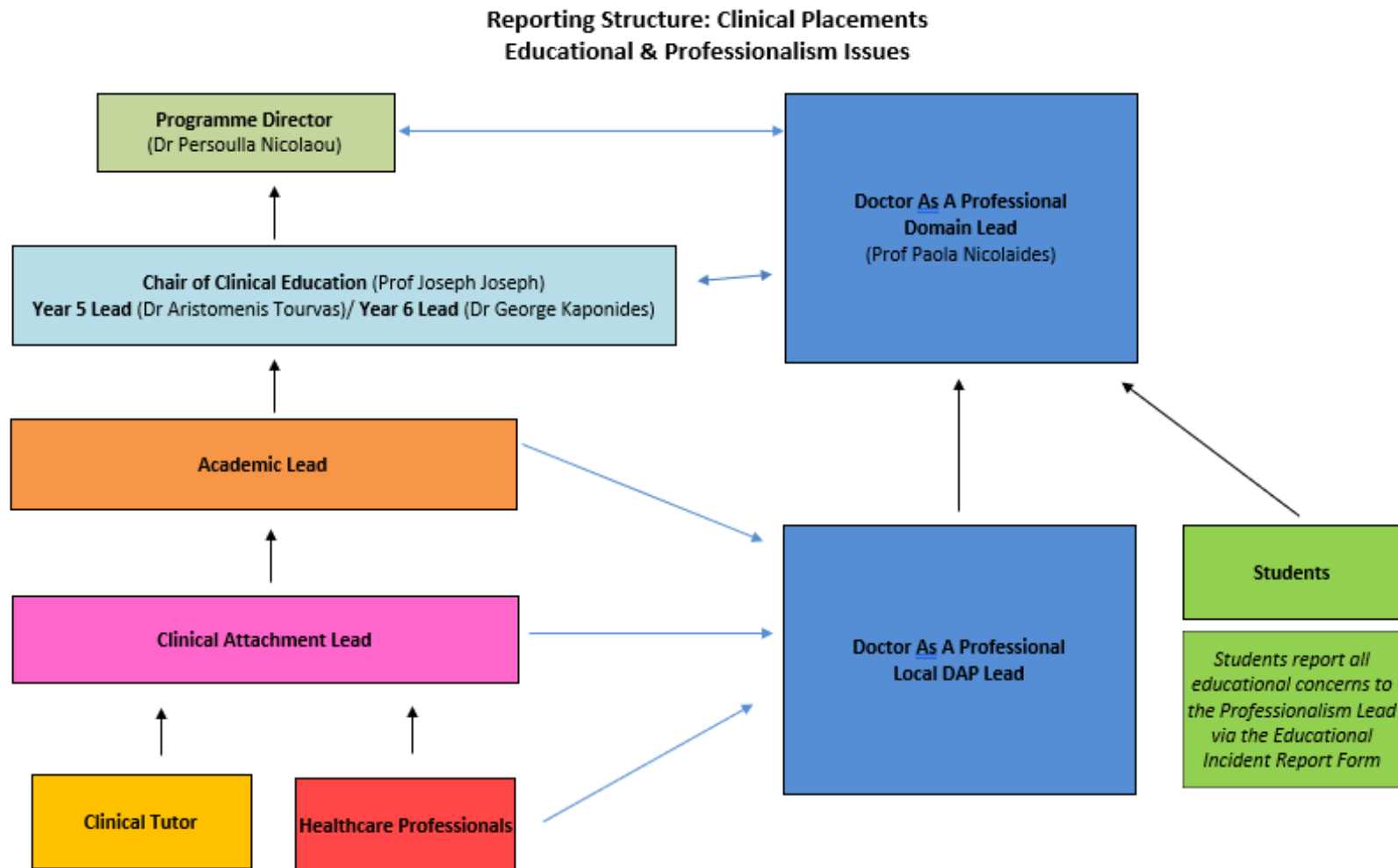
- Femorals: These would be sought at the end of the examination  
**Duroziez's sign** (diastolic bruit when stethoscope lightly applied to femoral artery)  
**Traube's sign** (aka pistol shot femoral- sharp bang over the femoral arteries in time with each heart beat)

- Aetiology: Rheumatic heart disease  
Infective endocarditis  
Syphilis  
Rheumatoid arthritis  
Seronegative arthritides (e.g. Reiter's)  
Collagen disorders (Marfan's and Ehlers-Danlos)  
Aortic dissection  
Failure of prosthetic valve  
Osteogenesis imperfecta

### **Tricuspid regurgitation**

- Similar to MR
- More common in IVDAs (R-sided endocarditis) + carcinoid syndrome
- Signs: AF  
Giant v waves  
RV (parasternal) heave  
Pan-systolic murmur  
Third heart sound if severe  
Pulsatile hepatomegaly
- Even if the patient is not in R-ventricular failure, they will have giant v waves +/- **pulsatile** hepatomegaly.

## 8. Reporting Structures



### Reporting Structure: Clinical Attachments Patient and Student Safety Issues

