"This prospectus is made under the provisions of the Universities Act, the Postgraduate Institute of Medicine Ordinance, and the General By-Laws No. 1 of 2016 and By-Laws No. 2 of 2016 for Degree of Doctor of Medicine(MD) and Board Certification as a Specialist"

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

PROSPECTUS

BOARD CERTIFICATION
IN
ADULT CARDIOLOGY

2013

SPECIALTY BOARD IN CARDIOLOGY

BOARD OF STUDY IN MEDICINE

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PROSPECTUS – BOARD CERTIFICATION IN ADULT CARDIOLOGY

1. Background

Training in Adult Cardiology will be offered to those who have demonstrated competence in Adult General Medicine as evidenced by success at the MD (Medicine) examination. This will ensure that the adult cardiologists will be competent in delivering total medical care to cardiac patients, the majority of whom will need screening and management of non cardiac general medical problems.This curriculum has been based on the corresponding training programme prepared by the British Society of Cardiology and the Core Curriculum of the European Society of Cardiology. Much of the material from these documents has been included here with only minor adjustments (necessitated in view of the local conditions and priorities). The Specialty Board in Cardiology wishes to acknowledge its indebtedness to the BCS and ESC documents, in preparing this curriculum.

2. Entry criteria, Selection Process and Intake

2.1 Entry Criteria

MD Medicine – Applicants should have passed the MD (Medicine) Part II examination

The candidates should not be already Board Certified in any medical field or have already applied to be enrolled in the training programme in any other subspecialty.

2.2 Selection process and intake

Available training opportunities will be indicated by the PGIM in the public circular for the MD examination in Medicine. The number of candidates will be predetermined by the Specialty Board each year. Order of merit in the MD examination will be taken into consideration when selecting candidates.

3. Aim and Learning Outcome

3.1 Aim

The Aim of the programme is to produce fulltime specialists in adult cardiology.

3.2 Learning outcomes

The trainee eligible for Board Certification in (adult) cardiology should have:

3.2.1. Acquired a sound knowledge in the basic sciences as related to cardiology and the changes during the different phases of life.

3.2.2. Acquired an extensive knowledge of the patho physiological processes of the diseases of the cardio-vascular system.

3.2.3. Developed skills in the diagnosis and management of pathological states presenting inadult cardiology practice.

3.2.4. Developed correct attitudes for good clinical practice.

3.2.5. Developed the skills required for the organization of cardiology services and evaluate its outcome.

3.2.6. Developed the skills required to conduct audits and scientific research, with a view to contributing to the scientific knowledge in this field and participating in the task of improving the cardiology services in the community.

3.2.7. Developed the skills required to be a medical teacher / resource person in order to impart medical education to medical personnel and the public.

3.2.8. Developed the ability to critically appraise research publications and practice evidence based medicine

3.2.9. Developed the ability to maintain the highest standards of professionalism, moral and ethical conduct

3.2.10. Cultivated the commitment to engage in continuing professional development.

4. Curriculum, content areas and syllabus

Details of the curriculum and the content areas are given in **Annex 1.**

5. Training Programme and Learning Activities

5.1 Duration of Training

Four years of training after the MD Medicine examination.

A minimum of three years of local training

A minimum of one year of training in an overseas placement

5.2 Clinical training programme (local)

This will be 3 years as stated above. It will be hospital based in-service training under direct supervision of the consultants of the units approved for PG training.

5.2.1 Theoretical knowledge

The detailed curriculum in adult cardiology will be made available to candidates which will set out the areas of knowledge which will be essential for trainees to acquire. Suggested reading materialsare given to facilitate self acquisition of theoretical knowledge which will be supplemented by formal teaching seminars and discussion fora.

5.2.2 Clinical training

This will be divided into two components.

a) Acute cardiology- the trainee will be on call for cardiac casualty cases in the training centre and the draining areas thereof.
b) General clinical cardiology- this component will be covered by the trainee being in charge of in-ward patients for a period adequate to ensure continuity of care as well as conducting general/ special outpatient clinics.

   In all instances the trainee will be responsible for planning and delivering appropriate specialist cardiac care under the direct supervision of the consultant staff.

5.2.3 Special procedures

This component is detailed in the curriculum in adult cardiology under the following headings

a) Non invasive investigations
b) Cardiac catheterization and interventional procedures.
c) Cardiac pacing and electrophysiological procedures.

6. Portfolio

The trainee must compile a portfolio under the following headings

i) Log of special procedures
ii) Log of clinical services
iii) Log of academic activity
iv) Log of general professional conduct

See **Annex 2** for details of the Portfolio

7. Research Projectleading to a Dissertation

Successfully carrying out a research project is a **mandatory requirement** that needs to be fulfilled to be eligible to appear for the Pre-Board Certification Assessment (PBCA).

The Research Project should be undertaken at the commencement of training. It should be study which is either hospital based or community based and could be in the

fields of clinical, epidemiological, genetic or immunological areas of oncology. It may be observational or interventional in type.

All aspects of the study have to be assessed and deemed to be satisfactory by the SpBC**before embarking on the proposed study**. A comprehensive project proposal has to be submitted to the SpBC within three months following entering the training programme and approval obtained, prior to commencing the study.

The draft proposal (prepared according to **Annex 3)** should be all-inclusive and detailed with all relevant particulars being included. The supervisor would be the trainer where the work is to be carried out. The submitted proposal will be evaluated by an independent evaluator and comments submitted to the SpBC (**Annex 4)** Once approved, it should be commenced without any delay (within 2months). The SpBC shall appoint a supervisor to assist the trainee (Gidelines **to supervisor Annex 5)**

The supervisor should submit a progress report to the SpBC every six months using the form in **Annex 6.** All projects would need informed written consent and interventional studies have to be registered with the Sri Lanka Clinical Trials Registry.

The trainee should submit a dissertation based on the research prior to pre board certification assessment as per guidelines in **Annex 7**.

Three copies of the dissertation (Printed) should be submitted three months prior to the date of pre board certification in unbound form for evaluation. Upon evaluation the unbound copies will be returned to the candidate. The candidate should attend on any corrections and three copies in bound form should be submitted to the Director,Postgraduate Institute of Medicine prior to the pre board certification assessment. One copy will be returned to the trainee, one retained by the supervisor, and the third housed in the PGIM library.

The dissertation will be evaluated by two examiners appointed by the SpB in Cardiology, using a marking grid in **Annex 8** and a pass mark (50%)is required to be eligible to sit for the Pre Board Certification Assessment. Those candidates who have not passed the dissertation will be given a feedback to improve the document and re-submit the same prior to Pre Board Certification Assessment.

8. Clinical Audit

In addition to the research project it is a mandatory requirement for the trainee to do a comprehensive Clinical Audit and formally present it at the hospital where he or she is working. Documentary evidence of such an audit presentation must be provided to the Specialty Board in Cardiology. This activity is a form of training that would be most useful when such audits have to be carried out or supervised in the Sri Lankan setting after the trainee returns to Sri Lanka.

9. Monitoring Progress

9.1. Progress Reports

The trainees should note that progress reports would contain evaluation regarding

i) Theoretical knowledge
ii) Clinical skills
iii) Competence in non invasive procedures
iv) Competency in invasive/ interventional procedures.
v) Clinical judgment
vi) Attitudes
–reliability
-self motivation
-team leadership
-teaching commitment
-research commitment

The trainee should liaise with the trainers and make sure that the reports are received by the PGIM in time. This includes local as well as overseas training.

The progress reports for each year should be submitted by the trainer within 2 weeks after completion of the appointment.

The progress reports will be formatted as assessment schemata as given in **Annex 9**.

Suitable and appropriate action will be taken by the Specialty Board in Cardiology according to the General Regulations and Disciplinary Code of the PGIM in the event of the receipt of an unsatisfactory or adverse progress report at any stage of training.

Satisfactory Progress Reports are a mandatory requirement to qualify for the pre board certification assessment.

9.2. Peer Team Rating Forms

The trainee with the trainer should submit the Peer Team Rating (PTR) form (PTR) **(Annex 10)** every six months to SpBC.

9.3. Formative Assessments

There shall be a formative assessment at the end of each year of training which will be carried out by the trainer. The form in **Annex 11** to be used for this purpose.
The formative assessment report for each year should be submitted by the trainer within 2 weeks after completion of the appointment.

Suitable and appropriate action will be taken by the Specialty Board in Cardiology according to the General Regulations and Disciplinary Code of the PGIM in the event of the receipt of an unsatisfactory or adverse progress report at any stage of training.

Satisfactory formative assessment reports acceptable to the SpB is a mandatory requirement to qualify to sit for the Pre Board Certification assessment.

10. Trainers and Training Units

Cardiac departments which have the full range of non invasive and invasive diagnostic/therapeutic facilities will be accredited as training units by the PGIM once onsite inspection confirms that the unit undertakes a sufficient acute/ non acute case load which will give the trainees extensive exposure to all aspects of adult cardiology.The trainers will be the consultant cardiologist in charge of the training unit, provided he / she meets the general PGIM criteria for designation as a trainer.

11. Eligibility for Pre Board Certification Assessment

The trainee will be eligible to appear for a PBCA after having satisfactorily completed the following

1. The 3year local training programme with a minimum of 80% attendance. All appointments must be duly signed up as having been completed satisfactorily by the supervising consultant
2. The overseas training programme of 1 year in cardiology and satisfactory assessment from overseas supervisors
3. Submission and acceptance of the yearly progress reports
4. Submission and acceptance of the half yearly PTR reports
5. Satisfactory completion and acceptance of yearly formative assessments
6. Successful completion and acceptance of an audit approved by the specialty board in cardiology
7. Successful completion of the Research Project submission of a Dissertation and a Pass mark (50%) for the assessment

12. Pre Board Certification Assessment

This will be held at the completion of the training programme including the overseas training programme following completion of all above eligibility criteria.

12.1 Format of the PBCA

This will constitute of two components:

C.1. Knowledge Based Assessment (KBA)

Total number of questions will be 30 which will carry **50% of the total marks** of the PBCA. **There will be two question papers of 15 questions each. Each paper will be of 2 ½ hours duration.**

This will take the form of case scenarios reflecting common cardiac consults. The candidate will be expected to demonstrate his ability to arrive at a working diagnosis, plan a comprehensive management course and critically discuss the possible complications/problems/ uncertainties which could arise.

The breakdown of questions will be as follows:

I) History and clinical examination- (1)

II) Clinical cardiology (14)

III) Non invasive investigations (3)

IV) Invasive cardiology (3)

V) Critical care/ CPR (3)

VI) Pacing and electrophysiology(1)

VII) Adult congenital heart disease (1)

VIII) Primary prevention and rehabilitation(1)

IX) Pharmacology(3)

Each question shall be marked independently by two examiners appointed by the SpB/BOM/Senate. The final mark for each question shall be the average of the two marks.

C.2. Portfolio assessment at viva voce

This will carry 50% of the total marks of the PBCA.

12.3. Requirements to pass the PBCA

The trainee should obtain a minimum mark of 60% in each of the two components of the PBCA AND a minimum of 60% overall, in order to pass the PBCA.

12.4. Failed Candidate

Board certification shall be deferred if the candidate fails the PBCA. A failed candidate would need to follow a Counselling Session within 3 months of the failed examination and sit for the PBCA again within a period of one year. The candidate would need to repeat only the component/s in which he or she failed to achieve 60 per cent. In the repeat examination, the candidate should achieve a mark of 60 per cent, in the component in which he or she was earlier unsuccessful, to qualify.

On successful completion at the first attempt after counselling, the date of Board certification shall be backdated. If unsuccessful, the date of Board certification will be the date of passing the subsequent assessment following further training for a minimum period of six months in a unit allocated by the SpBC

13. Requirements to be eligible for Board Certification

In order to be eligible for Board Certification, a trainee is required to:

Pass the PBCA as stipulated in paragraph 12.3 above

AND

Make a presentation acceptable to the Speciality Board in Cardiology, indicating a self-evaluation of the training received and the trainee's vision for the future development of patient care services in Sri Lanka and further career development (if unsuccessful at the first presentation should present at a date or dates determined by the SpB until accepted by the SpB).

14. Board Certification

A trainee who has successfully completed the Pre-Board Certification Assessment is eligible for Board Certification as a Specialist in Adult Cardiology, on the recommendation of the Speciality Board in Cardiology and the Board of Study in Medicine.

15.Trainers

The current panel of Board Approved Trainers who are Board Certified Consultants with MS/MD or those with foreign qualifications and are eligible for Privileges of Board Certification with employment in the Ministry of Health or the Universities would carry out the training locally. Foreign training would be carried out by recognized Consultants in centres approved by the Board of Study in Medicine and SpBC/BOM/Senate. All trainers would provide an honorary service for which no payment will be made by the University or the PGIM.

Recommended Reading and Websites

- Braunwald's Heart Disease- Ed. Bonow et al
- Hurst's - The Heart- Ed. Fuster et al
- The ESC text book of Cardiovascular medicine- Ed. Camm et al
- Text book of Clinical Echocardiography- Otto
- Text book of Interventional Cardiology- Ed. Topol et al

Annex 1. Curriculum in Cardiology

Section I. History taking and clinical examination

1. History taking and clinical examination

Objectives	Knowledge	Skills	Behaviour and Attitude
• To obtain a history from the patient relevant to cardiovascular disorders: - The patient's spontaneous account of symptoms - Questions from the cardiologist focused on the presence or absence of possible cardiovascular symptoms - The past medical history - Symptoms of any co-morbidities - The social history - Current and past drug therapy - Family history	• To be able to describe the range of, and the meaning of, words used by patients to describe cardiovascular system. • To recognize classical symptoms of cardiovascular disease, that patients with cardiac chest pain may not present with classical symptoms and to recognize the characteristics of non-cardiac chest pain. • To recognize angina equivalents and common causes of non-cardiac chest pain – inflammation, anxiety • To recognize typical and atypical symptoms of cardiovascular disease. To recognize	• To analyze and integrate the information obtained by taking a history from a patient to contribute to the development of an overall assessment. • To be able to assess global cardiovascular risk (www.heartscore.org).	• To establish a relationship with the patient based on empathy and trust. • To allow the patient time to express his or her symptoms in their own words. • To be able to sympathetically direct open ended questions to the patient. • To take into account the importance of both co-morbidities and social circumstances in relation to cardiovascular disorders.

	cardiovascular risk factors from the patient's history. • To know the names and side effects of the drugs used. • To know the symptoms and treatments of the co-morbidities often associated with cardiovascular disease.		
• Clinical examination - To complement the subjective findings from the clinical history, with the objective findings on clinical examination of the cardiovascular system. - To perform a general examination of the patient searching for evidence of co-existing illness, as well as manifestations of cardiovascular disease. - To examine the peripheral, arterial and venous system. - To examine the heart.	• To be able to recognize the features on general examination caused by cardiovascular disease. • To know how to examine the arterial pulse at different arteries for rate, rhythm and haemodynamic profile, and how to measure arterial blood pressure. • To be able to examine the venous system and in particular to be able to clinically estimate the right atrial pressure. • To be able to examine the precordial impulse. To understand the	• To be able to make and record accurate observations about the clinical state of the patient with particular emphasis on the cardiovascular system. • To be able to use a stethoscope and blood pressure cuff to maximize the information to be gained about abnormalities of the heart and blood vessels. • To be able to obtain the ankle-brachial index as a sign of peripheral arterial disease.	• To examine the patient with due regard for the patients dignity. • To continually seek or correlate findings on examination with subsequent findings at echocardiography or surgery, thus emphasizing lifelong learning.

	physiology and patho-physiology of the cardiac cycle and therefore to understand how normal heart sounds and systolic and diastolic murmurs are generated and how to best auscultate. • To understand the patho-physiology of the clinical signs of under perfusion and fluid retention. • To understand the ankle-brachial index as a measure of peripheral arterial disease.		

Syllabus of clinical examination of the cardiovascular system

A. Cervical veins
   1. Anatomy
   2. Physiology
   3. Examination technique
   4. Patient position
   5. Lighting
   6. Timing
   7. Separating venous and arterial pulsation
   8. Normal findings
   9. Increased pressure
   10. Prominent *a Waves*
   11. Prominent *v Waves*
   12. Cannon *a Waves*
   13. Constrictive pericarditis
   14. Hepatojugular reflux test

B. Arterial pulses

15. Anatomy
16. Physiology
17. Examination technique
18. Normal findings
19. Differences in peripheral pulses
20. Hyperkinetic pulse
21. Pulses Bisferiens
22. Hypokinetic pulse
23. Pulses Parvus et Tardus
24. Dicrotic pulse
25. Pulses Alternans
26. Pulses paradoxes
27. Arrhythmias
28. Special tests
    (i). Allen's test
    (ii). Valsalva's maneuver
    (iii). Ankle-brachial test

C. Inspection of thorax

D. Palpation

1. Area 1: Sternoclavicular
2. Area 2: Aortic
3. Area 3: Pulmonic
4. Area 4: Left parasternal – right ventricular or tricuspid
5. Area 5: Apical
6. Diastolic event: palpable third heart sound
7. Diastolic event: palpable fourth heart sound
8. Area 6: Epigastric
9. Area 7: Ectopic
10. Characteristic precordial abnormalities in:-
    (i). Coronary artery disease
    (ii). Dilated cardiomyopathy
    (iii). Hypertrophic cardiomyopathy
    (iv). Aortic stenosis
    (v). Aortic regurgitation
    (vi). Chronic mitral regurgitation
    (vii). Mitral stenosis
    (viii). Atrial septal defects

E. Auscultation

1. The stethoscope
2. Examination of the patient
3. Heart sounds
4. The first heart sound
5. Splitting
6. Intensity

7. Systolic ejection sounds
8. Nonejection systolic sounds
9. The second heart sound
10. Haemodynamic correlates of heart sounds
11. Normal physiologic splitting
12. Abnormal splitting
13. Wide physiologic splitting
14. Reversed splitting
15. Narrow physiologic splitting
16. Single second heart sound
17. Opening snaps
18. Third and forth heart sounds
19. The third heart sound
20. Physiologic third heart sound
21. Pathologic third heart sound
22. Pericardial knock
23. The fourth heart sound
24. Extracardiac sounds
25. Pericardial friction rubs
26. Mediastinal crunch: Hamman's sign
27. Pacemaker sounds
28. Heart murmurs
    a) Systolic murmurs
        (i). Systolic ejection murmurs
        (ii). Pansystolicregurgitant murmurs
        (iii). Variations of the pansystolicregurgitant murmur
        (iv). Murmurs of hypertrophic obstructive cardiomyopathy
    b) Diastolic murmurs
        (i). Mitral stenosis
        (ii). Tricuspid stenosis
        (iii). Diastolic rumbles due to high flow across the atrioventricular valve
        (iv). Austin Flint murmur
        (v). Diastolic regurgitant murmurs
    c) Continuous murmurs
        (i). Continuous murmurs due to rapid blood flow
        (ii). Continuous murmurs due to high pressure shunts
        (iii). Continuous murmurs secondary to a localized arterial obstruction
    d) Response of murmurs to physiological maneuvers
        (i). Squatting
        (ii). Standing
        (iii). Valsalva

Section II. Clinical Cardiology

1. Chest Pain

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with chest pain.	Define the causes of chest pain. Define the indications, limitations, risks and predictive value of non-invasive and invasive investigations.	Be able to take a relevant history and perform a reliable and appropriate examination. Be able to select and use investigations appropriately.	Appreciate the importance of the history in evaluating chest pain. Take a non-judgemental and nonstereotyping approach to patients. Appreciate the anxiety and concerns of patients and relatives with chest pain. Appreciate the contribution of nonmedical and non-cardiological disciplines have to play in the treatment of patients with chest pain. Understand the associated psychological factors of patients with chest pain.

2. Stable angina

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with stable angina.	Define the pathogenesis of atheroma and the importance of risk factors. Define the natural history, pathophysiology, and presentations of coronary artery disease. Define the pharmacology of drugs currently used in the treatment of stable angina. Define the indications, limitations, risks and predictive value of non-invasive and invasive investigations. Define which patients should be investigated further and referred for intervention.	Be able to diagnose angina accurately. Be able to take a relevant history and perform a reliable and appropriate examination. Be able to select and use investigations appropriately. Be able to present the risks and benefits of an intervention to a patient in a way that they understand. Be able to perform and interpret coronary angiogram.	Recognise the role of cardiac nurse specialists and cardiac rehabilitation team. Appreciate the interaction of symptoms with the patient's life style. Appreciate the concerns and anxiety of patients and relatives with coronary heart disease. Advise patients regarding life style and long-term risk factor management. Educate patients and relatives. Discuss sexual issues including impotence and use of drugs, with the patient and their partner in a sensitive manner.

3. Acute coronary syndromes and myocardial infarction

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients presenting with acute coronary syndromes and myocardial infarction.	Define the pathogenesis of acute coronary syndromes and the importance of risk factors. Define the natural history, pathophysiology, and acute presentations of coronary artery disease. Define the pharmacology of drugs currently used in the treatment of acute coronary syndromes. Define the indications, limitations, risks and predictive value of non-invasive and invasive investigations. Define which patients should be investigated further and referred for intervention.	Be able to diagnose acute coronary syndromes and myocardial infarction accurately. Be able to take a relevant history and perform a reliable and appropriate examination. Be able to select and use investigations appropriately. Be able to present the risks and benefits of an intervention to a patient in a way that they understand. Be able to perform and interpret coronary angiogram.	Recognise the role of cardiac nurse specialists and cardiac rehabilitation. Appreciate the interaction of symptoms with the patient's life style including occupation and leisure. Appreciate the concerns and anxiety of patients and relatives with coronary heart disease. Advise patients regarding life style and long-term risk factor management. Educate patients and relatives. Discuss sexual issues including impotence and use of drugs, with the patient and their partner in a sensitive manner.

4. Acute breathlessness

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with acute breathlessness.	Define the causes of acute breathlessness. Define the management of cardiac and non-cardiac diseases presenting with breathlessness. Define the indications for CPAP, non-invasive and invasive ventilation.	Be able to take a relevant history and perform an appropriate examination. Be able to select and use investigations appropriately.	Appreciate the importance of other specialists e.g. respiratory physicians and intensivists.

5. Chronic breathlessness

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with chronic breathlessness.	Define the causes of chronic breathlessness. Define the management of patients with chronic shortness of breath.	Be able to take a relevant history and perform an appropriate examination. Be able to select and use investigations appropriately.	Appreciate the involvement of other specialists e.g. respiratory physicians. Appreciate the importance of other professionals involved in the management. Appreciate the importance of lifestyle, exercise and weight loss.

6. Hypertension

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with hypertension. Trainees are encouraged to attend specialist hypertension clinics during the training period.	Define how to investigate and manage patients with systemic hypertension (both primary and secondary). Define the causes of hypertension Define how to assess patients with hypertension for end organ damage. Define how to investigate a patient for secondary hypertension. Define the pharmacology of drugs currently used in the treatment of hypertension. Define how to manage a patient with resistant hypertension.	Be familiar with protocols and management plans for hypertension. Be able to manage patients with hypertensive emergencies. Interpretation of appropriate biochemical investigations and imaging modalities in the diagnosis and assessment of hypertension.	Appreciate the racial variation in hypertension and the varying response to pharmacological treatment. Make active efforts to encourage patients to adopt a healthier lifestyle with specific emphasis on risk factors. Support general practitioners with the long term management of patients with risk factors for coronary heart disease.

7. Lipid Disorders

Objective	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with lipid abnormalities. Trainees are encouraged to conduct special lipid clinics during the training period.	Define how to investigate and manage patients with lipid disorders. Define the pharmacology of drugs currently used in the treatment of lipid disorders. Define the current evidence for pharmacological intervention in both primary and secondary prevention.	Be able to interpret lipid results relevant to individual patients.	Make active efforts to encourage patients to adopt a healthier lifestyle with specific emphasis on risk factors. Appreciate the importance of other specialists such as dieticians, diabetologists and nurse specialists.

8. Management of critically ill patients with haemodynamic disturbances

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients who are critically ill with haemodynamic disturbances.	Define the pathogenesis, presentation and natural history of critical illnesses. Define the indications and complications of intra-aortic balloon pump counterpulsation. Define when to consider patients for ventricular assist devices. Define indications for and haemodynamic consequences of positive pressure ventilation.	Be able to assess manage and give advice on the critically ill patient. Specifically be able to recognise and manage acute conditions including: • pulmonary embolism • acute pericarditis • myocarditis • cardiac tamponade • aortic dissection • cardiac rupture • cardiogenic shock • post infarction ventricular septal defect and mitral regurgitation • circulatory collapse. Be able to select and use investigations appropriately to assess haemodynamics. • Echocardiography • Pulmonary artery catheterisation and wedge pressure. Define the indications and limitations of inotropic drugs. Be able to undertake pericardiocentesis	The importance of cooperation with anaesthetists/ intensivists and other specialties. Awareness of legal/ ethical issues surrounding care, nutrition and ventilation of the unconscious patient. Have sufficient communication skills to sensitively discuss problems of the critically ill with relatives. Be able to break bad news.

9. Heart Failure

Objectives	Knowledge	Skills	Attitudes
To be able to function as a specialist in the diagnosis of heart failure. To be able to undertake specialist investigation of the underlying cause/causes of heart failure.	Describe the clinical presentation, causes and natural history of heart failure. Define a comprehensive knowledge of national and international guidelines. Be able to identify all possible underlying causes of heart failure.	Be able to perform a relevant history and examination and refer the patient for an appropriate diagnostic test to define the nature of their cardiac dysfunction. Perform and interpret transthoracic echocardiograms. Be able to interpret radionuclide ventriculograms Perform and analyse angiographic ventriculography. Selection and interpretation of appropriate investigations to establish an aetiology. Interpretation of the 12 lead ECG. The ability to interpret echocardiograms. Interpretation of exercise tests. Interpretation of stress nuclear tests. Interpretation of CMR scans. Ability to perform and report coronary angiograms. Be able to perform right heart catheterisation. Interpretation of 24 hour Holter monitors.	Recognise the pivotal role of an accurate diagnosis in planning future investigation and therapy. Recognise the importance of establishing an underlying cause with the least invasive test necessary at each stage. Be able to use the tests cost effectively.

Objectives	Knowledge	Skills	Attitudes
To be able to provide specialist treatment of the underlying aetiologies of heart failure. To be able to deliver specialist medical treatment of heart failure. To be able to advise device treatment of heart failure.	Outline a comprehensive knowledge of the management and prevention of coronary heart disease, hypertension, valve disease, adult congenital heart disease (ACHD) and pericardial disease. Describe in detail the current treatment guidelines (NICE/SIGN, ESC and ACC/AHA). Identify evidence-based pharmacotherapy for heart failure including efficacy, effects on morbidity and mortality, side-effects and contraindications. Appropriate selection of patients for both cardiac\ resynchronization and defibrillator therapy based on evidence-based medicine and knowledge of	Selection of patients for revascularisation based on accurate interpretation of invasive and non invasive testing. Detection of patients requiring valve surgery or other corrective procedures. Discuss the complicated therapy regimes with the patient. Outline the plan for therapy. Ability to understand the issues relevant to patients with a chronic disease. Be able to manage complex in-patients with acute/decompensated heart failure and those in cardiogenic shock. Be able to investigate and manage important	Appreciation of the need to consult with and discuss optimum management with other health care professionals, in particular with cardiac surgeons, interventional cardiologists, obstetricians and ACHD specialists. Interaction with the multidisciplinary team to deliver the therapy, uptitrate drugs and monitor for side effects. In particular close communication with specialist heart failure nurses, pharmacists, general medicine, care of the elderly (COTE) and primary care physicians. Ability to communicate and liaise with other health care professionals, in particular

	international and local guidelines.	co-morbidities (renal dysfunction and anaemia). Interpretation of complex echocardiography to define the presence of dysynchrony. Interpretation of 24 hour Holter monitoring and other arrhythmia screening tools. Some may wish to perform the implantation of devices according to local needs (see EP curriculum).	electrophysiologists.
To be able to select patients for advanced heart failure therapies (cardiac transplantation and left ventricular assist devices).	Be able to define adverse prognostic markers in heart failure. Be conversant with the relative prognoses of patients treated by medical therapy and transplantation/device therapy in those with advanced heart failure with ongoing symptoms despite optimisation of therapy.	Interpretation of metabolic exercise testing. Performance of the heart failure survival score. Interpretation of nuclear scans. Performance and accurate analysis of right heart haemodynamic measurements and knowledge of their	Identify patients who need to be considered for the above therapies because of an adverse prognosis. Have effective communication and referral strategies to regional centres. Communicate to patients the risks involved with these therapies.

To be able to function as part of and manage a multiprofessional team	Be able to define a multidisciplinary service/network and be aware of the evidence base underpinning their pivotal role in heart failure management. Familiarity with international, national and local guidelines for heart failure management.	significance. Be able to set up and function as part of a multidisciplinary team. Be able to set up and run a heart failure clinic. Be able to write and amend guidelines for local heart failure management. Be able to construct business cases for service developments in heart failure. Be able to function as a clinical lead for heart failure within the local consultant cardiology body. Be able to set up, organize and run continuing educational development programmes in heart failure for the local team.	Ability to communicate and interact with other members of the multidisciplinary team: heart failure nurses, COTE and general physicians, primary care physicians, palliative care services and pharmacists.

10. Patients with valvular heart disease

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with cardiac murmurs.	Define the pathological processes that are responsible for valvular heart disease. Define the natural history of valve disorders. Define the indications, limitations, risks and predictive value of non-invasive and invasive investigations. Define the indications for surgical intervention. Define the different types of prosthetic valves available for clinical use. Define the anticoagulation regimes appropriate for patients with valve disease and valve prostheses. Define which patients need regular follow up. Define endocarditis prophylaxis protocols.	Be able to take a relevant history and perform an appropriate examination. Be able to select and use investigations appropriately. Be able to perform an echocardiogram.	Be able to discuss the advantages and disadvantages of medical versus surgical management in a way that patients can understand. Be able to discuss the advantages and disadvantages of different valve prostheses with patients. Appreciate the importance of educating patients about endocarditis prophylaxis and the natural history of valvular heart disease.

11. The prevention and management of endocarditis

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with endocarditis or who are at risk of endocarditis.	Define the pathogenesis, presentation and natural history of endocarditis. Define the common pathogens involved. Define how to diagnosis, investigate, treat and monitoring patients with endocarditis. Define the indications and limitations of echocardiography and other investigations in the diagnosis and management of endocarditis. Define the possible complications of endocarditis. Define the indications for surgical intervention. Define the current guidelines for endocarditis prophylaxis.	Be able to take a relevant history and perform an appropriate examination. Be able to select and use investigations appropriately. Be able to manage patients with endocarditis. Be able to integrate information and advice from microbiologists and cardiac surgeons.	Emphasise the Importance of lifelong antibiotic prophylaxis. Appreciate the importance of patient education. Consult with Microbiologists and Cardiac Surgeons.

12. Arrhythmias

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with arrhythmias.	Define the: • Genetics, pathogenesis, natural history and prognosis of arrhythmias. • Methods of presentation of arrhythmias, their aetiology, recognition and management. • Normal electrophysiology of the heart and the basis of arrhythmogenesis. • Pharmacology of drugs currently used in the treatment of arrhythmias including thromboprophylaxis. • Indications for temporary and permanent pacemakers. • Indications for electrophysiological studies and the use of radio-frequency ablation. • Indications for implantable cardioverter defibrillators and cardiac resynchronisation therapy. • Current recommendations concerning fitness to drive.	Be able to take a relevant history, including family history, and perform an appropriate examination. Be able to select and use investigations appropriately. Be able to select appropriate drugs.	Appreciate the anxiety patients suffer with arrhythmias and with some methods of management. e.g. ICD

13. Atrial fibrillation

Objectives	Knowledge	Skills	Attitudes
• To be able to carry out specialist assessment and treatment of patients with AF.	• Epidemiology and prognosis • Pathophysiology • Classification • Diagnosis, clinical features and impact on quality of life • Associated conditions • Diagnostic procedures: - Minimum evaluation - Additional Investigation • Embolic complications • Management: - anticoagulant therapy - rhythm vs. rate control - conversion to sinus rhythm - prevention of recurrences - control of ventricular rate - pacemaker-defibrillator therapy - catheter ablation - surgery	• Take a relevant history and perform an appropriate clinical examination. • Perform or interpret: ECG, echocardiogram, transoesophageal echocardiogram, prolonged ECG monitoring exercise testing. • Develop appropriate antithrombotic strategies. • Select patients appropriately for cardioversion. • Institute rhythm or rate control therapy. • Select and refer patients for - electrophysiological studies - atrial catheter ablation - RFA or surgical ablation - pacemaker and defibrillator implantation	• Appreciate the anxiety patients suffer with AF and with some methods of management, e.g. catheter ablation and pacing. • Recognise the importance of coexisting structural heart diseases for the outcome and management of AF. • Appreciate the limitations and potential risk of antiarrhythmic drug therapy of AF. • Appreciate the importance of anticoagulant therapy. • Appreciate the palliative nature and potential adverse effects of non-pharmacological therapies. • Appreciate newer methods for treating Atrial Fibrillation and how to refer patients for specialist

			treatment when • Appropriate, such as transvenous or surgical ablation.

The following arrhythmias too should be studied as given for atrial fibrillation.

1. Atrial ectopic
2. (i) Atrial tachycardia
   (ii) Multifocal atrial tachycardia
3. Atrial flutter
4. Supra ventricular tachycardia
5. Ventricular ectopic
6. Ventricular tachycardia
7. Ventricular fibrillation
8. Torsade de pointes
9. Sinus bradycardia
10. Sick sinus syndrome
11. A-V nodal block
12. Wandering atrial pacemaker
13. AIVR
14. Nodal rhythms
15. Parasystolic rhythms

14. Pre-syncope and syncope

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with pre-syncope and syncope.	Define the causes of syncope and pre-syncope. Define the indications, limitations, risks and predictive value of non-invasive and invasive investigations. Define the indications for tilt table testing. Define the current recommendations concerning fitness to drive in patients with pre-syncope and syncope.	Be able to take a relevant history and perform an appropriate examination including carotid sinus massage and tilt table tests. Be able to select and use investigations appropriately. Develop a management plan for syncopal patients.	Appreciate the importance of other specialists such as ENT and neurologists. Appreciate the importance of the history from relatives and witnesses. Appreciate problems specific to the elderly and address their social and medical needs. Appreciate the impact of syncope on patients' lifestyle.

15. Myocardial disease

Objectives	Knowledge	Skills	Attitudes
• To be able to perform specialist assessment and treatment of patients with cardiomyopathy and myocarditis.	• Define and describe the epidemiology of dilated, hypertrophic, restrictive, infiltrative cardiomyopathies and obliterativeendomyocardial disease. • Describe the pathophysiology including genetics, clinical features and diagnostic criteria of	• Take a relevant history and perform an appropriate clinical examination. • To be able to interpret diagnostic data (ECG, ambulatory	• To establish cooperation with medical professionals in other specialties (immunology, bacteriology, genetics, cardiac surgery, interventional cardiolog, imaging) for

	cardiomyopathies. • Elaborate the medical and invasive (surgical, electrophysiological, and interventional) management of cardiomyopathies: indications, contraindications, possible adverse effects. • Identify prognostic factors. **Myocarditis** • Define myocarditis and describe its aetiology. • Describe the clinical features, pathology and diagnostic criteria of infective and non-infective myocarditis, in particular the typical features of different forms of myocarditis on magnetic resonance imaging. • Recall the treatment of patients with myocarditis and its complications.	ECG, Echo, exercise testing, chest X-ray, cardiac catheterization, coronary angiography, magnetic resonance, endomyocardial biopsy, genetic assessment). • To be able to select appropriate treatment and support modalities (medical, interventional, surgical, ICD/CRT, assist devices, balloon pumping or other treatment). • To be able to assess individual prognosis in relation to the need for transplantation. • Evaluate patients for endomyocardial biopsy recognizing diagnostic yield and potential risk of this procedure.	timely differential diagnosis of myocardial disease and further treatment. • To be able to counsel patients with cardiomyopathies and their relatives about associated risks.

16. Adult Congenital Heart Disease

Objectives	Knowledge	Skills	Attitudes
To be able to carry out, under supervision, specialist assessment and treatment of adolescent and adult patients with congenital heart disease.	Define the anatomy of the heart and great vessels and have a basic understanding of cardiac embryology and development. Define simple and complex congenital defects and the important aspects of their management. Define the natural history of simple and complex congenital conditions. Have an understanding of genetics and prenatal diagnosis. Know that congenital cardiac lesions and previous surgery may be associated with specific arrhythmias. Understand that arrhythmia is the commonest emergency in patients with AACHD. Know that pulmonary hypertension complicating congenital heart disease increases the risk of iatrogenic complications. Define when to seek specialist advice.	Be able to take a relevant history and perform an appropriate examination. Be able to select and use investigations appropriately Be able to manage acutely presenting AACHD patients with arrhythmias. Be able to recognise the arrhythmias that are peculiar to some forms of CHD and require specialist advice. Be able to manage patients with congenital heart disease under supervision and liaise with specialists in congenital heart disease.	Appreciate the importance of genetic counselling. Understand the importance of referring patients for a specialist opinion. Have appropriate selfconfidence and recognition of limitations. Appreciate the social and emotional difficulties encountered by patients with congenital heart disease.

To achieve the objectives trainees should attend specialist paediatric clinics in congenital heart disease. In order to achieve competence, it is envisaged that trainees are likely to need to attend a minimum of 10 specialist clinics and /or ward rounds.

17. Pulmonary Arterial Hypertension (PAH)

Objectives	Knowledge	Skills	Behaviours and Attitudes
To be able to diagnose pulmonary arterial hypertension (PAH). To be able to provide optimal management of patients with PAH. To be able to distinguish between the different causes of pulmonary hypertension.	Definition and functional classification of pulmonary hypertension. Epidemiology of PAH (incidence, prevalence, aetiology, genetics, high-risk groups). Pathology and pathophysiology of PAH. Aetiology Clinical features of PAH. Diagnostic criteria of PAH. Prognostic markers. Management of PAH. (medical, surgical and interventional includingballoon atrial septostomy, indications,	Take a relevant history and perform an appropriate clinical examination. Recognise clinical signs consistent with PAH. Differentiate between primary, secondary pulmonary hypertension and other diseases with similar symptoms. Perform and interpret adequate medical assessment (using laboratory analyses including arterial blood gases; pulmonary function test, ECG, Echocardiography, cardiopulmonary stresstesting, ventilation-perfusion lung scan, spiral CT, magnetic resonance imaging, cardiac catheterisation and pulmonary angiography, lung biopsy) Prescribe adequate medical or invasive (surgical,	Establish cooperation with family physicians and other health care professionals for early recognition of primary pulmonary hypertension; Make collaborative efforts with other medical specialists (family medicine, thoracic surgery, invasive cardiology, imaging) for differential diagnosis of pulmonary hypertension and timely referral to surgical treatment; Maintain long-term involvement of patients and their

	contraindications and possible adverse effects).	interventional) management. Evaluate clinical and haemodynamic prognostic markers.	family members in supportive activities for healthy life-style adherence and treatment compliance. Appreciate the increased risk of PAH in other medical conditions, such as scleroderma.

18. Heart disease in pregnancy

Objectives	Knowledge	Skills	Attitudes
1. To be able to carry out appropriate assessment and treatment of women with chronic cardiac disease who are or who are planning to become pregnant • Corrected and uncorrected congenital heart disease • Ventricular dysfunction • Pulmonary hypertension • Rheumatic heart disease • Ischaemic heart disease • Marfan's syndrome • Artificial heart valves • Arrythmias - 2. To be able to carry out appropriate assessment of, and provide contraceptive advice to, women with cardiac disease	To describe how pregnancy, delivery and the post partum period may affect cardiac function in normal women and in those with pre-existing cardiac disease. Define the risks of pregnancy for the mother and fetus for different cardiac disorders. Define the risks of recurrence of congenital heart disease in the fetus of mothers with congenital heart disease. To list the possible adverse effects of drug treatment on both the woman and her fetus. Define the implications of anticoagulation during pregnancy. Know which contraceptive methods are safe and effective in women with different	Be able to take a relevant history and perform an appropriate examination. Be able to assess cardiac patients' risk of becoming pregnant. To be able to explain the increased risks of pregnancy in women with heart disease. To explain the increased risk of CHD in the fetuses of women with ACHD. Be able to offer ante-natal care, e.g. in the setting of a joint obstetric clinic and as part of a multispecialty team, be able to manage women with heart disease throughout pregnancy, delivery and the post-natal period. Be able to counsel and	Appreciate the increased anxiety experienced by pregnant women with cardiac disease. To recognize the role of cardiologists in the management of women preconception, during pregnancy and post partum. To recognize the role of multidisciplinary care of women with heart disease and in particular liaison with obstetricians, midwives, haematologists, obstetric anaesthetists and intensivists. To understand the importance of formulating an agreed flexible management plan for delivery.

	cardiac disorders Know the risk factors for and presenting features of peripartum cardiomyopathy.	manage women who require anticoagulation throughout pregnancy and the puerperium.	
3. To be able to carry out appropriate assessment and treatment of women with pregnancy induced cardiac disease	Know the risk of recurrence of peripartum cardiomyopathy in subsequent pregnancies Know the presenting features, investigation and management of cardiovascular emergencies during pregnancy including pulmonary embolism, aortic dissection and myocardial infarction.	To be able to provide appropriate contraceptive advice to women with cardiac disease. Initiate investigations to explore the differential diagnosis of peripartum cardiomyopathy and be able to explain the diagnosis and prognosis to the patient and her relatives. To be able to investigate and treat appropriately cardiovascular emergencies in pregnancy.	Recognise the need to address and offer contraceptive advice to women with heart disease. Recognize the need for urgent joint assessment between multispecialty teams.

19. Diabetic heart disease

Objectives	Knowledge	Skills	Attitudes
• Diagnosis and treat cardiovascular complications in the diabetic patient, appreciating the continuum	• Define diabetes mellitus. • Describe the role of diabetes in coronary heart disease in the following areas - Epidemiology - Pathophysiology of cardiovascular	• Take a relevant history and perform an appropriate clinical examination. • Manage the prevention,	• Understand the multi disciplinary approach to the patient with diabetes. • Be aware of the

ranging from impaired fasting glucose to insulin dependent diabetes and its complications.	complications - Role of risk factor intervention - Screening for diabetes in CAD (oral glucose tolerance testing) • Describe the pathophysiology of diabetes and its non-cardiac and cardiac complications (CAD, diabetic cardiomyopathy, autonomic neuropathy and its cardiovascular effects). • Outline treatments including diet, exercise, hypoglycemic drugs and insulin, • Explain current thinking regarding the thinking of the metabolic syndrome.	diagnosis and treatment of diabetes and its associated cardiovascular complications. • Actively participate in a multidisciplinary network of physicians and assistant medical personnel in order to treat patients with diabetes adequately according to disease state and complications.	importance of recognizing the continuum that extends from primary prevention to treatment of end organ damage. • Appreciate the importance of treating asymptomatic patients in order to improve prognosis. • Recognize the dustering of factors that include diabetes in order to formulate a holistic approach to patient management.

20. Thromboembolic venous disease

Objectives	Knowledge	Skills	Attitudes
• To be able to diagnose treat and prevent: - Deep venous thrombosis - Pulmonary embolism	• Describe the epidemiology and risk factors for deep venous thrombosis in the clinical settings of: recovery from major surgery or trauma, prolonged immobility, oral contraceptive pill use, pregnancy and air travel. • Explain increased pulmonary vascular resistance and ventilation perfusion mismatch.	• Take a relevant history and perform an appropriate clinical examination. • Interpret ECG, echocardiography, spiral CT, ventilation-perfusion scanning, and signs of	• Appreciate the difficulties in diagnosing pulmonary embolism on the basis of symptoms and signs. • Collaborate with other imaging specialists including

	• Describe the clinical presentation of deep venous thrombosis and pulmonary embolism. • Outline the diagnosis by: - Biomarkers: D-dimer and troponins - ECG - Echocardiography - Ultrasound and Doppler of leg and pelvis veins - MDCT - Ventilation perfusion scan - MR-angiography - Pulmonary angiography • Describe treatment: Heparins, Vitamin K antagonists, new anticoagulants, Thrombolysis, Embolectomy and fragmentation. • Describe preventive measures: compression stockings, heparins. • Describe management of chronic pulmonary hypertension, including thrombendarterectomy.	pulmonary hypertension or pulmonary thromboembolism. • Select appropriate therapy for acute pulmonary embolism. • Diagnose and manage acute and chronic deep venous thrombosis. • Decide upon the duration of anticoagulation therapy for patients with thromboembolic venous disease.	radiologists and nuclear imaging specialists. • Ensure patient understanding of the disease, the importance of compliance and appropriate precautions required during long term anticoagulant therapy.

21. Diseases of the Aorta

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients who have diseases of the aorta.	Define the pathogenesis, presentation and natural history of aortic dissection and aortic aneurysms. Define the indications, limitations and benefits of noninvasive and	Be able to take a relevant history and perform an appropriate examination. Be able to select appropriately noninvasive imaging.	Appreciate the importance of cooperation with cardiac surgeons. Recognise the urgency of management required of patients with aortic dissection

	invasive investigations used in the assessment of aortic diseases. Define the medical therapy of diseases of the aorta. Define the indications for surgical intervention.	Be able to assess manage and give advice on patients with acute aortic dissection. Define the indications and limitations of anti-hypertensive drugs.	

22. Pericardial Disease

Objectives	Knowledge	Skills	Attitudes
• To be able to perform specialist assessment and treatment of patients with pericardial disease.	• Classify and define - Acute pericarditis (infective, idiopathic or neoplastic) - Chronic pericarditis - Constrictive pericarditis. • Describe for each the epidemiology, pathophysiology and aetiology (including infective, inflammatory and neoplastic disorders). • Describe relevant investigations: non-invasive and invasive. • Explain and outline the differential diagnosis of the constrictive pericarditis from restrictive cardiomyopathy. • Describe the management of pericarditis. • Recall related complications: pericardial effusion, cardiac tamponade and constriction.	• Take a relevant history and perform an appropriate clinical examination. • Demonstrate knowledge of the ECG abnormalities in acute pericarditis. • Select and use the different non-invasive imaging modalities: echo, CMR, CT as well as invasive pressure measurements to diagnose pericardial disease. • Evaluate haemodynamic status: • Determine the aetiology of pericardial effusion. Be able to clinically differentiate pericarditis from myocardial ischaemia. • Assist in an ideally perform percardiocentesis on appropriately selected patients.	• Consider pericardial disease within the differential diagnosis of a patient presenting with cardiovascular disease. • Be aware of the different diagnostic and therapeutic strategies required for each individual case. • To work closely with radiologists, cardiac surgeons and oncologists.

23. Cardiac tumours

Objectives	Knowledge	Skills	Behaviour and Attitudes
• To be able to perform specialist assessment and treatment of patients with cardiac tumours.	• Classify and describe the epidemiology, Pathophysiology, pathology and clinical manifestations of primary cardiac tumours and metastatic cardiac tumours, including lymphoma. • Describe effect of tumour size and location. • Outline clinical features including - Impairment of cardiac function - Systemic manifestations - Systemic and pulmonary emboli - Signs of physical obstruction to blood flow (e.g. atrial myxoma) - Pericardial involvement – constriction and tamponade • Identify appropriate diagnostic procedures - Echocardiography, computed tomodraphy, magnetic resonance imaging • Describe operative management (tumour removal, heart transplantation, palliative management)	• Take a relevant history and perform and appropriate clinical examination. • Select and use appropriate imaging modalities. • Consider a differential diagnosis of primary or secondary neoplastic involvement of the heart. • Recognise other cardiac masses including thrombi or vegetations.	• Collaborate effectively with cardiovascular surgeons and with other specialists dealing with neoplastic disease. • Understand the importance of support and counselling for the patient and family.

24. Primary and secondary prevention of cardiovascular disease

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients with risk factors for vascular disease.	Define how to investigate and manage patients with systemic hypertension (both primary and secondary), lipid disorders, diabetes, smoking and family history of cardiovascular disease. Define how to calculate an individual patient's absolute risk of cardiovascular disease on the basis of standard risk factors. Define the difference between relative and absolute risk. Define the epidemiology of ischaemic heart disease.	Be able to assess the prevalence of coronary heart disease in the community in which you work. Be able to manage risk factors appropriately for individual patients.	Appreciate the importance of risk factor management. Appreciate racial and regional variation in cardiovascular risk factor distribution. Emphasize the central role of patient education. Offer advice and support to family members with familial disease. Make active efforts to encourage patients to adopt a healthier lifestyle with specific emphasis on risk factors. Appreciate the importance of other specialists such as dieticians, diabetologists and nurse specialists.

25. Cardiac rehabilitation

Objectives	Knowledge	Skills	Attitudes
To be able to provide rehabilitation to patients with cardio-vascular disease. Specifically: • Post myocardial infarction • Angina • Post cardiac surgery • Heart failure Trainees are required to spend a one month working with a cardiac rehabilitation team.	Define the principles of cardiac rehabilitation and exercise training. Define the use of rehabilitation for secondary prevention.	Be an active member of a multidisciplinary rehabilitation team. Be able to anticipate and address patient concerns regarding work, exercise and sex. Be able to discuss sensitive issues, such as sex, in an understanding manner.	Appreciate the importance of rehabilitation for return to work, driving and sex. Appreciate the importance of patient education. Appreciate the interplay of physiological and psychological aspects of heart disease. Appreciate the role of other professionals including nurse specialists, physiotherapists, dieticians and general practitioners in cardiac rehabilitation.

26. Assessment of patients with cardiovascular disease prior to non-cardiac surgery

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment of patients with cardiovascular disease prior to non-	Define how to assess risk prior to non-cardiac surgery for patients with cardiac disease and give	Be able to assess risk of anaesthesia and surgery for individual patients.	Be able to discuss suitability for non-cardiac surgery and the risks involved with anaesthetist,

cardiac surgery.	advice and management plans accordingly. Define how to optimise a patient's condition in order to minimize the risk of non-cardiac surgery.	Be able to select and use investigations appropriately Be able to give valid and useful advice to patients, anaesthetists and surgeons.	surgeons, patients and relatives.

27. Assessment of patients prior to cardiac surgery

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and referral for patients requiring cardiac surgery.	Define how to assess and investigate cardiac and noncardiac factors prior to cardiac surgery. Define the general and specific risks and benefits of cardiac surgical interventions for coronary, valvular and congenital heart disease.	Be able to assess patient's symptoms and clinical signs in conjunction with results of specialist investigations to make appropriate surgical referrals. Investigate and optimise general medical conditions pre-operatively.	Liaise and discuss with cardiac surgeons directly. Appreciate the concerns and pressure on cardiac surgeons and anaesthetists. Appreciate surgical concerns relating to neurological, respiratory and renal complications. Have a multi-disciplinary approach to pre-operative assessment. Involve other specialists if indicated. Appreciate the technical potential and limitations of surgery.

28. Care of patients following cardiac surgery

Objectives	Knowledge	Skills	Attitudes
To be able to carry out specialist assessment and treatment of patients who have had cardiac surgery.	Define the potential problems and complications of cardiac surgery whilst on ITU. Define how to approach postoperative rehabilitation.	Be able to assess patients on ITU and give advice to intensivists and surgeons. Be able to participate in the management of patients in the early post-operative period and long term. Be able to select and use investigations appropriately.	Appreciate the importance of good communication and collaboration between surgeon, anaesthetist and intensivist. Appreciate the anxiety of relatives whilst patients are on ITU. Appreciate the importance of rehabilitation after cardiac surgery.

29. Community Cardiology

Objectives	Knowledge	Skills	Attitudes
To be aware of the structures and systems for the delivery of medical care to local populations.	Define the policies and strategies underpinning local provision of cardiac care. Define the interactions of local stakeholders in the implementation of policies and strategies. Know how to access community support for patients and carers. Understand the role of patient support groups and the voluntary sector.	To be able to interact appropriately with other individuals and organisations participating in the care of patients with cardiovascular disorders.	Appreciate the differing roles and perspectives of individuals and organisations at different points on the patient pathway.

30. Genetics

Objectives	Knowledge	Skills	Attitudes
• To be able to perform general cardiological assessment and treatment of patients with inherited	• Describe the incidence and prevalence of inherited cardiovascular disorders in the local community. • State the basic knowledge of cardiac embryology and major gene families involved in cardiogenesis. • Described the principles of Mendelian inheritance. • Describe the principles of polygenic cardiovascular diseases (such as hypertension, diabetes and	• Take a relevant history and perform an appropriate clinical examination . Evaluate relevant family history and	• Cooperate with clinical genetics • Develop systematic method of approaching a family with a potentially

or familial cardiovascular disease.	dyslipidaemia). • Recall knowledge of maonogenic cardiovascular diseases; hypertrophic cardiomyopathy, familial aortopathies such as such as the Marfan syndrome, Ehlers Danlos syndrome and William's syndrome; familial dilated cardiomyopathies;familialchannelopathies; familial disorders of septation; familial basis of conotruncal anomalies; trisomies; in particular trisomy 21; familial dyslipidaemias in particular disorders of the low density lipoprotein receptor. • Explain the familial basis of inherited cardiac tumours.	construct a family pedigree. • Distinguish autosomal dominant, autosomal recessive, X-linked and mitochondrial patterns of inheritance. • Demonstrate how to counsel index cases, family members at risk on the probability of being affected by a genetic cardiovascular disorder. • Recognise problems with pedigree interpretation such as incomplete penetrance, variable expressivity, and age related patterns of expressivity.	inherited cardiovascular disease. • Adopt appropriate counselling skills to explain, educate and inform patients fully of the nature of their disease, the diagnostic tests used to make a diagnosis and the inherent strengths and weaknesses of such diagnostic tests in individuals at risk. • Consult with patients and their family members improving recognition and management of familial cardiovascular disease. • Consult with medical profession

			als of their specialities on patients with genetic disorders.

31. The cardiac consult

Objectives	Knowledge	Skills	Behaviours and Attitudes
Per-operative cardiac consult for non-cardiac surgery • To select appropriate pr-operative imaging techniques from the following four imaging modalities for cardiac risk evaluation - Resting/stress echocardiography - Resting/stress nuclear perfusion imaging - Cardiac computed tomography(CT) - Cardiovascular magnetic resonance (CMR) • To integrate information regarding the estimated effects of surgical stress during operation. • To integrate information on the long-term impact of cardiac disease on outcome in patients should they live long enough to enjoy the benefits of surgery.	• Understand that preoperative tests should only be done if they will influence pre-operative or long-term cardiac treatment and risk management, without delaying surgery if test results will not change the management. • Apply the imaging techniques to assess - Left ventricular ejection fraction at rest - Valve abnormalities (stenosis / insufficiency) - Calculation of valve stenosis gradient - Estimation of valvular regurgitation fraction. - Coronary artery disease, new wall motion abnormalities during stress. The severity, extent and ischaemic heart rate threshold during stress testing. - Intraoperative cardiac monitoring for volume and ischaemia status. - Non-invasive coronary	• Consider heart valve replacement in patients with severe stenosis following surgery. • Consider coronary revascularizatio n in selected patients with extensive stress induced ischemia prior to surgery. • Consider immediate coronary revascularizatio n in patients with intraoperative haemodynamic instability. ST-segment changes and new wall motion abnormalities.	• Communicate to patients the implications of the results of preoperative tests on preoperative management. Indicate the potential complications of delaying the index surgical procedure and the benefits of additional (invasive) cardiac therapy. • Communicate with other specialties involved in perioperative care. (anesthesiologis t, surgeon, and intensivist) to individualized the patient care. • Recognize strengths and limitations of each imaging modality.

	angiogram		
Cardiac consult in the patient with ischemic neurologic symptoms • Search potential sources of cardiac embolism, and advice proper management. • Search for other cardiovascular manifestations of atherosclerosis, in particular coronary heart disease and peripheral arterial disease, and advice proper management.	• Understand the mechanism, like hood and potential treatment options of cardiac and aortic sources of embolism. • Be aware of the frequency of concomitant coronary and other arterial disease n the presence of ischaemic neurologic disease.	• Use echocardiography including transoesophageal echocardiography, and other techniques to search for potential sources of embolism. • Propose a diagnostic work-up of the patient for other atherosclerotic manifestations, and device proper therapy and risk management.	• Appreciate that potential sources of embolism are frequently of low probability (in particular, patent foramen ovale) and commonly co-exist. • Understand the importance of diagnosing and treating co-existing cardiovascular atherosclerotic disease.
Cardiac consult in other situations	• Realize the frequency of cardiac symptoms, problems and considerations in other diseases, (e.g. pulmonary disease, connective tissue disorders) and be able to provide proper management advice.	• Anticipate cardiovascular problems accompanying primarily non-cardiac diseases.	• Cooperate closely with other disciplines and offer prompt support for their needs and questions.

Syllabus of special areas in cardiac consult

Cardiological problems in	The elderly
	Pregnancy
	Sports medicine
	Endocrinology
	Cancer
	Renal failure
	Bleeding disorders
	Thrombophilia syndrome
	Psychiatry
	Strokes

Section III. Non-invasive investigations

1. Selection of Basic investigations

Objectives	Knowledge	Skills	Attitudes
Be able to perform competently and/or select appropriately and interpret correctly the following investigations for the diagnosis and assessment of patients with cardiac disease. Electrocardiograms Ambulatory ECG Exercise Testing CXR	Define the indications for, and be able to report and interpret the results of: Electrocardiograms (including high resolution) Ambulatory ECG Exercise testing CXR Define the physiology of exercise	Be able to supervise and analyse exercise tests.	Appreciate the limitations of non-invasive Investigations Appreciate the sensitivity, specificity and predictive accuracy of exercise tests

2. The electrocardiogram: standard ECG, ambulatory ECG, exercise ECG

Objectives	Knowledge	Skills	Attitudes
• To select perform and interpret each of the three non-invasive ECG techniques.	• Use these modalities to identify the normal ECG and ECG abnormalities in particular: - Arrhythmias - Bundle branch blocks - Hypertrophy - Acute and chronic ischaemia - QT abnormalities - Pericarditis	• Choose the appropriate techniques for specific clinical situations including a thorough understanding of the Bayesian approach. • Choose techniques modalities and	•

	- Electrolyte abnormalities - Pacemaker dysfunctions	protocols in a clinical useful and cost-effective way, avoiding over- and under-utilisation of tests. • Integrate data from different electrocardiographic techniques, as well as from other non-invasive and invasive techniques.	
• ECG	• Describe the physiology and anatomy of the conduction system. • Describe the cellular and molecular mechanisms involved in the electrical activity of the heart. • Describe the basic principles of ECG. Understand the normal evolution of the electrical vectors during the cardiac cycle. • Recognize the normal ECG, and explain how it is formed. • Describe and explain the ECG characteristics of atrial and ventricular hypertrophies, bundle branch blocks and other conduction blocks, tachycardias, bradycardias, acute and chronic myocardial ischaemia, pericarditis and myocarditis, electrolyte abnormalities, preexcitation, QT abnormalities, pacemaker dysfunction	• Perform and interpret ECG in the clinical context • Demonstrate proficiency in selecting the following ECG techniques necessary for the patient's management.	• Recognise the strengths and weaknesses of ECG in a clinical situation. • Cooperate with interventional cardiologists, electrophysiologists, anaesthetists, cardiac surgeons, as well as with other doctors involved in emergency medicine and intensive care. • Recognise that the diagnosis and treatment of some arrhythmias need sometimes a multidisciplinary approach. • Explain to patients and their family the implications of the results of the electrocardiogram.

• Long-term ambulatory ECG and ECG • Loop recording	• Identify the indications • Recognize the limitations	• Perform and interpret ambulatory ECGs/loop recorder ECGs in the clinical context (a documented indicative number being 200) to achieve level III competence.	• Recognize the strengths and weaknesses of ambulatory ECGs/loop recorder ECGs in a clinical situation. • Explain to patients and their family the implications of the results obtained from ambulatory ECGs/loop recorder ECGs.
• Exercise ECG testing	• Know the main indications: - Evaluation of ischaemia - Evaluation of valvular disorders - Evaluation of hypertrophic cardiomyopathy - Evaluation of treatment response - Evaluation of functional capacity - Evaluation of inducible arrhythmias. - Identify the contraindications • Recognize the main limitations: - Identify the criteria for stopping the testing - Identify the complications and their treatment	• Perform and interpret exercise ECG testing in the clinical context (a documented indicative number being 300) to achieve level III competence. • Manage complications in a proper and timely way.	• Recognize strengths and weaknesses of exercise ECG testing in a clinical situation. • Explain to patients and their family the importance of the results of the electrocardiogram.

Syllabus of non-invasive electrocardiography

1. **Fundamentals of electrocardiography**
   - 1.1 The anatomy of the conducting tissue
   - 1.2 Blood supply of different parts of the heart
   - 1.3 Principles of electrocardiography

1.4 Components of the normal electrocardiogram
1.5 Normal intervals and segments
1.6 Age related changes in ECG
1.7 Normal ECG values and deviations from the normal

2. Atrio-ventricular block (AV)

2.1 Anatomy and physiology
2.2 First degree AV block
2.3 Second degree AV block type I
2.4 Second degree AV block type II
2.5 Third degree (compleate) AV block
2.6 Congenital AV block
2.7 AV dissociation
2.8 Bundle-Branch Block and hemi block
2.9 Right Bundle-Branch block
2.10 Left Bundle-Bundle block
2.11 Anterior hemi block
2.12 Posterior hemi block
2.13 Trifascicular block

3. The arrhythmias

3.1 Genesis of cardiac arrhythmia
3.2 Classifications of cardiac arrhythmia
3.3 Sinus tachycardia
3.4 Sinus bradycardia
3.5 Sinus arrhythmia
3.6 SA block
3.7 Sinus arrest
3.8 Sick Sinus Syndrome
3.9 Paroxysmal sinus tachycardia resulting from SA node re-entry
3.10 Supraventricular ectopics
3.11 Premature atrial ectopics
3.12 Atrial tachycardia
3.13 Chaotic atrial tachycardia
3.14 Atrial flutter
3.15 Atrial fibrillation
3.16 Wandering pacemaker
3.17 Junctional ectopic mechanisms: premature and escape junctional beats (PJCs)
3.18 Accelerated idiojunctional rhythm
3.19 Junnctional tachycardia

3.20 Paroxysmal supraventricular tachycardia PSVT resulting from AV nodal re-entry
3.21 Atrial fusion complexes
3.22 Atrial parasystole
3.23 Ventricular ectopics
3.24 Premature ventricular complexes (PVCs)
3.25 Ventricular tachycardia
3.26 Ventricular fibrillation
3.27 Torsade de Pointes
3.28 Accelerated idioventricular rhythm
3.29 Ventricular fusion complexes
3.30 Ventricular parasystole
3.31 Ventricular flutter and fibrillation
3.32 Ventricular escape

4. **The Sick Sinus Syndrome (SSS)**Anatomy and electrophysiology of sinus node
   4.2 Electrocardiographic manifestations
   4.3 Diagnostic approach

5. **Aberrancy vsEctopy**

   5.1 Morphology of the QRS
   5.2 Variation of aberrant ventricular conduction

6. **Accessory pathways**

   6.1 Wolff-Parkinson-White syndrome
   6.2 Lown-Ganong-Levine syndrome
   6.3 Mahaimfibres

7. **Wolff-Parkinson-White syndrome**

   7.1 Diagnosis in WPW syndrome
   7.2 Electrocardiographic parameters
   7.3 Vectorcardiogram (VCG) in WPW syndrome
   7.4 His bundle electrocardiography in WPW syndrome
   7.5 Classification of WPW syndrome
   7.6 Types of cardiac arrhythmia in WPW syndrome
   7.7 Differential diagnosis in WPW syndrome
   7.8 Congenital and acquired cardiac defects associated with WPW syndrome

8. **Exercise Stress testing**

   8.1 Indications for exercise testing
   8.2 Physiology of stress testing

8.3 Preparation of the patient
8.4 ST depression
8.5 Exercise-induced ST segment elevation
8.6 Exercise-induced arrhythmias
8.7 Exercise-induced angina
8.8 Blood pressure response to exercise
8.9 False positive results
8.10 Safety precautions required in conducting exercise test
8.11 Equipment and supplies for the management of complications
8.12 Prognostic value of stress test
8.13 Myocardial perfusion scintigraphy after exercise
8.14 Exercise testing in children
8.15 Contraindication of stress test
8.16 Stress test in asymptomatic subjects
8.17 Stress testing in old myocardial infarction patients
8.18 Role of exercise ST/HR slope and ST/HR index in the detection of coronary artery disease

9. Transoesophageal atrial pacing in the diagnosis of ischaemic heart disease

9.1 Technique of oesophageal Pill electrode atrial pacing
9.2 Indications for the use of oesophageal leads
I. Detection or confirmation of an apparent atrial activity
II. Record specific posterior cardiac structures (low atrial septum of left atrium)
III. Temporary pacing
9.3 Clinical application of oesophagealelectrogram

10. Cardiac chamber enlargement

10.1 Left ventricular hypertrophy
10.2 Summary of possible ECG findings of LVH
10.3 Right ventricular hypertrophy
10.4 Summary of possible ECG findings of RVH
10.5 Overload of ventricles
10.6 Left atrial enlargement
10.7 Right atrial enlargement

11. Holter monitor electrocardiography

11.1 Recording techniques
11.2 How to analyse and scan the record
11.3 Duration of record
11.4 ST-T recordings

11.5 Artefacts and errors
11.6 Clinical applications of Holter monitor system
11.7 New developments in Holter technology
11.8 Patient protection
11.9 Central processing
11.10 Navigational aid
11.11 Rhythm monitoring (Holter) and event recording

12. Signal averaged electrocardiography (SAECG) and heart rate variability

12.1 Late potentials analysis
12.2 Heart rate variability (HRV)
12.3 Principles of techniques of assessment
12.4 Clinical applications
12.5 Future directions
12.6 Heart rate variability and baroreceptor sensitivity

13. Myocardial infarction

13.1 Pathophysiology and mechanism
13.2 ECG features of different types of MI
13.3 Q waves resulting from causes other than MI
13.4 ST-T changes not resulting from myocardial ischemia
13.5 Unstable angina pectoris
13.6 T wave inversions resulting from causes other than ischaemia
13.7 Treatment (initial management)
13.8 Wellen's syndrome

14. Chamber localization

14.1 When heart lies on the right side of the chest
14.2 Clinical classification cardiac transpositions
14.3 Electrocardiographic features of dextrocardia with situs inverses
14.4 When heart lies on the left side of the chest
14.5 Congenital corrected transpositions of the great vessels

15. Electrocardiographic features in common heart ailments

15.1 Congenital heart disease
15.2 Acquired heart disease

3. Echocardiography (core)

Objectives	Knowledge	Skills	Attitudes
To understand the role of echocardiography in the management of patients with cardiac disease and to be able to satisfactorily carry out, interpret and report transthoracic echocardiography for the diagnosis and assessment of adult patients.	BASIC PRINCIPLES Ethics and sensitivities of patient care. Principles of ultrasound imaging, spectral and colour flow Doppler. Indications for echocardiography. Basic instrumentation and scanning. LEFT VENTRICLE Coronary anatomy and correlation with 2D views of left ventricle, wall motion and segmentation of left ventricle. Measurements global systolic function. Doppler mitral valve filling patterns. Complications of myocardial infarction. Features of dilated and hypertrophic cardiomyopathy, athletic heart, hypertensive heart disease. MITRAL VALVE DISEASE	Can use basic instrumentation and can care for machine appropriately. Can use appropriate echo probes, machines and software to obtain standard views and measurements, can optimise controls. Can use colour flow in at least two planes for all valves and can obtain pulsed Doppler. Can recognise normal variants. Can differentiate normal from abnormal LV systolic function. Can recognise and describe large wall motion abnormalities. Can obtain measures of systolic function & can differentiate diastolic filling patterns. Can detect and recognise complications after	Interacts appropriately with patients. Appreciate the limitations of echocardiography. Demonstrate ability to work with and where appropriate educate cardiac physiologists.

	Normal anatomy of the mitral valve, and the subvalvular apparatus and their relationship with LV function Causes of mitral stenosis and regurgitation.	myocardial infarction. Can recognise features associated with hypertrophic cardiomyopathy. Can recognise rheumatic disease, mitral prolapse, functional mitral regurgitation Can assess mitral stenosis and can assess severity of regurgitation.	
	AORTIC VALVE DISEASE and AORTA Causes of aortic valve disease and causes of aortic disease. Methods of assessment of aortic stenosis and regurgitation. Basic criteria for surgery to understand reasons for making measurements. Echocardiographic signs of aortic dissection. RIGHT HEART Causes of tricuspid and pulmonary valve disease, RV dysfunction and pulmonary hypertension. The imaging features of pulmonary hypertension.	Can recognise bicuspid, rheumatic, and degenerative disease. Can measure CW from multiple sites. Can derive peak & mean gradients using continuous wave Doppler. Can assess the grade of aortic regurgitation Can recognise aortic dilatation. Recognises right ventricular dilatation. Can estimate PA systolic pressure.	

	The estimation of pulmonary pressures. REPLACEMENT HEART VALVES Types of valve replacement and criteria of Normality. Signs of failure and indications for TOE. INFECTIVE ENDOCARDITIS Duke criteria for diagnosing endocarditis Echocardiographic features of endocarditis Criteria for TOE. INTRACARDIAC MASSES Types of mass found in the heart. Differentiation of normal from abnormal, features of a myxoma and differentiation of an atrial mass.	Can recognise broad types of replacement valve. Can diagnose severe paraprosthetic regurgitation. Can recognise prosthetic obstruction. Can recognise typical vegetations. Can recognise an abscess. Can recognise a LA myxoma.	

	PERICARDIAL DISEASE Anatomy of normal pericardium. Features of tamponade, pericardial constriction and restrictive cardiomyopathy. ADVANCED ECHOCARDIOGRAPHY Indications for and limitations of transoesophageal echocardiography. Indications for and limitations of stress echocardiography. Indications for and limitations of intraoperative echocardiography.	Can differentiate a pleural and pericardial effusion. Can recognise the features of tamponade. Can judge the route for pericardiocentesis. Has seen at least five of each type of advanced study.	

4. Transoesophageal echocardiography

Objectives	Knowledge	Skills	Attitudes
To perform and interpret transoesophageal studies (TOE).	Indications and contraindications for TOE. Limitations of TOE including blind-spots. Principle of	To assess anaesthetic risk and plan the procedure appropriately. To intubate safely in unsedated, sedated and anaesthetised patients.	Explain the procedure to the patient and maintain trust. To explain the results adequately. Demonstrate the ability to work with sonographers, cardiac

	disinfection. Principles of assessment of anaesthetic risk. Other techniques including CT and CMR and comparisons with transthoracic echo. Cardiac anatomy from TOE windows. The effects of anaesthesia and cardiopulmonary bypass on the heart.	To monitor the patient throughout the procedure. To clean and store the probe. Be able to assess valve disease including post-repair. To determine suitability for mitral valve repair. To detect and assess aortic dissection. To detect and quantify a patent foramen ovale. To detect ASDs including sinus venous defects. To detect intracardiac Thrombus. To assess wall motion abnormalities. To recognise an underfilled heart.	surgeons, anaesthetists and interventional cardiologists. Demonstrate the ability to integrate the results of TOE with the clinical context to produce recommendations. Demonstrate the ability to collaborate with specialists in other imaging modalities. Demonstrate the ability to think reflectively. Demonstrate the ability to audit results.

5. Transthoracic echocardiography

Objectives	Knowledge	Skills	Attitudes
To be able to carry out complex	Advanced instrument settings.	To optimise instrument settings. Identify pericardial	Demonstrate the ability to collaborate with specialists in other

transthoracic studies	The role of intravascular contrast agents for opacification of the left ventricular cavity and assessment of wall motion. Types, normal function and abnormalities of prosthetic heart valves. The effect of valve disease on left ventricular function. Normal venous flow patterns. Quantitative Doppler techniques including PISA , resistance, regurgitant fractions. The principles of 3D techniques. The principles of Doppler tissue imaging including strain rate imaging. Advanced calculation of LV mass and volume including abnormal geometry	constriction and differentiate it from restrictive cardiomyopathy. To differentiate moderate and severe valve disease in the presence of left ventricular dysfunction. To detect prosthetic valve obstruction and early dysfunction in biological replacement valves. To assess cardiac shunts. To detect complex congenital heart disease. To detect minor wall motion abnormalities. To determine abnormalities of left ventricular geometry. To determine suitability for balloon mitral valvotomy and mitral valve repair. To determine suitability for cardiac resynchronisation and optimise A-V and VV settings in DDD and biventricular pacemakers. To determine suitability for LV reconstructive	imaging modalities. Demonstrate the ability to think reflectively. Demonstrate the ability to judge a test result in the clinical context. Demonstrate the ability to train and educate in echocardiography.

	with normal mass. The prognostic importance of LV geometry	surgery. To detect arrhythmogenic RV dysplasia. To detect infiltrative cardiomyopathies	

6. Stress echo

Objectives	Knowledge	Skills	Attitudes
To perform stress echocardiography	The principles, indications and clinical role of stress echo. The pathophysiology and biochemical and mechanical changes associated with hibernation, infarction and ischaemia. Different stressors including dobutamine, exercise, pacing, atropine, adenosine and dipyridamole. The physical properties and side-effects of intravascular contrast agents for opacification of the LV cavity and myocardial perfusion. The effects of flow on the left ventricle, the heart valves and the right heart in patients with valve disease. The methods of reporting a stress	To prepare and administer pharmacological stressors safely To prepare and administer contrast agents safely To be capable of managing complications including allergic reactions and arrhythmias and to be able to resuscitate in the event of cardiac arrest To set up an echocardiography machine appropriately for stress echocardiography To record echocardiograms during a stress study To recognise subtle abnormalities of	To explain the procedure to a patient and maintain trust. To explain the results appropriately. Demonstrate the ability to work with sonographers, cardiac surgeons and interventional cardiologists. Demonstrate the ability to collaborate with specialists in other imaging modalities. Demonstrate the ability to integrate the stress study with the clinical context to produce recommendations. Demonstrate the ability to think reflectively.# Demonstrate the

	echocardiogram including wall motion analysis, contrast assessment and long axis function. The evidence for stress echocardiography in the detection of coronary disease, coronary risk stratification, and the detection of viable myocardium. The use of stress echocardiography in valve disease. The cost-effectiveness of stress echocardiography. The comparison of echocardiography with other techniques. The principles of myocardial contrast.	wall-motion and differentiate wall thickening and wall motion To analyse a stress study using split screen analysis To perform stress studies in patients with valve disease	ability to audit results. Demonstrate the ability to compare different techniques including cardiac magnetic resonance and nuclear perfusion imaging. To integrate results from a variety of techniques including coronary angiography to produce an appropriate synthesis.

Syllabus of echocardiography

Instrumentation

1. Physical properties of ultrasound
2. Tranducers and production of ultrasound beams
3. Principles of M-mode and Two-dimensional echocardiography
4. Variables involved in real-time sector scanning
5. Signal processing
6. Echocardiographic imaging controls
7. Factors influencing resolution
8. Potential artefacts

- Side lobes
- Reverberations
- Shadowing
- Near field clutter

9. Principles of Doppler echocardiography
10. Doppler display
11. Physiologic information obtained with Doppler echocardiography
12. Doppler controls
13. Technical limitations of Doppler flow imaging
14. Transthoracic transducers
15. Transoesophageal transducers
16. Other transducers
17. Constant echocardiography
18. Digital echocardiography
19. Computer manipulation of echocardiographic recordings
20. Tissue identification using ultrasound
21. Three dimensional echocardiography
22. Biologic effects of ultrasound

The echocardiographic examination

1. Selection of transducers
2. Position of the patient
3. Placement of the transducer
4. Two-dimensional examination
   - Normal variants
   - Terminology for Two-dimensional echocardiography
   - Orientation of Two-dimensional images
   - Identification of myocardial wall segments
5. M-mode examination
6. Doppler echocardiography
7. Doppler flow imaging
8. Transoesophageal echocardiography
   - Transoesophageal echocardiographic views
9. Intravascular ultrasonic examination of the heart
10. Intraoperative echocardiography
    - Echocardiographic monitoring of invasive procedures
11. Digital echocardiography
12. Stress echocardiography
13. Contrast echocardiography

14. Principles of echocardiographic measurements

Echocardiographic evaluation of cardiac chambers

1. Left ventricle
   - Intracavitatory dimensions, areas and volumes
   - Global systolic functions
   - Regional systolic function
   - Wall thickness, mass and stress
2. Right ventricle
   - Right ventricular dimensions, areas and volumes
   - Global systolic function
   - Echocardiographic findings with right ventricular overload
   - Diastolic function
3. Left atrium
   - Left atrial dimensions, areas and volumes
   - Left atrial function
4. Right atrium

Haemodynamic information derived from echocardiography

1. Echocardiographic determination of blood flow
   - Aortic flow
   - Pulmonary artery flow
   - Mitral valve flow
   - Left atrial flow
   - Tricuspid valve flow
   - Cardiac output
   - Regurgitant fraction
   - Shunt ratios
   - Echocardiographic detection of stagnant blood
2. Modified Bernoulli Equation and intravascular pressure
3. Other echocardiographic findings with altered intravascular pressure
   - Elevated left ventricular diastolic pressure
   - Left atrial pressure
   - Pulmonary hypertension
   - Right ventricular pressure
   - Right atrial pressure

Echocardiographic findings with altered electrical activation

1. Abnormal ventricular depolarization
   - Bundle branch block
   - Wolff-Parkinson-White (WPW) syndrome
2. Ectopic rhythm
   - Ventricular ectopy
   - Supraventricular ectopy
3. Abnormal ventricular conduction
4. Pacemaker

Acquired valvular heart disease

1. Mitral valve disease
   - Mitral stenosis
   - Balloon mitral valvotomy
   - Mitral regurgitation
   - Mitral valve prolapse
   - Papillary muscle dysfunction
   - Flail mitral valve
2. Aortic valve disease
   - Aortic stenosis
   - Aortic regurgitation
3. Tricuspid valve disease
   - Tricuspid stenosis
   - Tricuspid regurgitation
4. Pulmonary valve disease
5. Prosthetic valves
   - Normal function
   - Stenosis
   - Regurgitation
   - complications
6. Endocarditis
7. Calcified mitral annulus

Congenital heart disease

1. The echocardiographic examination: A segmental approach to anatomy
   - Cardiac situs
   - Ventricular morphology
   - Great artery connections
2. Abnormalities of right ventricular inflow
   - Right atrium
   - Right ventricular inflow

3. Abnormalities of left ventricular inflow
   - Pulmonary veins
   - Left atrium
   - Mitral valve
4. Abnormalities of right ventricular outflow
   - Right ventricle
   - Pulmonary valve
   - Pulmonary artery
5. Abnormalities of left ventricular outflow
   - Subvalvualr obstruction
   - Valvular aortic stenosis
   - Supravalvular aortic stenosis
   - Coarctation of the aorta
6. Abnormalities of the cardiac septation
   - Atrial septal defects
   - Ventricular septal defects
   - Endocardial cushion defects
7. Abnormal vascular connections and structures
   - Patent ductusarteriosus
   - Abnormal systematic venous connections
   - Abnormal pulmonary venous connections
   - Abnormalities of the coronary circulation
8. Conotruncal abnormalities
   - Tetrology of Fallot
   - Transposition of the great arteries
   - Double-outlet right ventricle
   - Persistent truncusarteriosus
9. Abnormalities of ventricular development
   - Hypoplastic left heart syndrome
   - Single ventricle
   - Tricuspid atresia
10. Echocardiographic evaluation during and after surgery
    - Systemic artery to pulmonary artery shunts
    - Pulmonary artery bands
    - The Fontan procedure
    - Left ventricular apex to descending aorta conduits
    - Right ventricle to pulmonary artery conduits
11. Foetal echocardiography

Coronary artery disease

1. Detection of ischaemic muscle

- Segmental wall motion abnormalities
- Relationship of wall motion and wall thickening abnormalities to coronary artery perfusion
- Quantitation of ischaemic muscle

2. Assessment of overall performance of the ischaemic left ventricle
3. Detection of reversible ischaemia
   - Stress echocardiography
   - Coronary artery spasm
   - Coronary reperfusion
4. Myocardial infarction
   - Detecting and assessing myocardial infarction
   - Prognosis following myocardial infarction
5. Complications of myocardial infarction
   - Infarct extension and expansion
   - Ventricular aneurysm
   - Ventricular pseudoaneurysm
   - Ventricular septal defects
   - Mitral thrombi
   - Mitral regurgitation
   - Right ventricular infarction
6. Examination of the coronary arteries
   - Coronary atherosclerosis
   - Kawasaki disease
   - Congenital anomalies of the coronary arteries
7. Myocardial perfusion using contrast echocardiography

Diseases of the myocardium

1. Hypertrophic cardiomyopathy
   - Asymmetric hypertrophy
   - Left ventricular outflow obstruction
   - Evaluation of therapy
2. Idiopathic dilated cardiomyopathy
3. Restrictive cardiomyopathy
4. Infiltrative cardiomyopathy
5. Fibroplastic cardiomyopathy
6. Myocardial disease associated with neuromuscular disorders
7. Cardiac abnormalities and infectious agents
8. Myocardial dysfunction and toxic agents
9. Cardiac abnormalities resulting from trauma
10. Effect of systemic illnesses on the heart

11. Cardiac transplantation

Pericardial disease

1. Pericardial effusion
   - Detection of pericardial fluid
   - Differentiation between pericardial and pleural effusions
   - Quantitation of pericardial fluid
   - Cardiac tamponade
   - Cardiac motion with pericardial effusion
   - Aetiology of pericardial effusion
   - Pericardiocentesis
2. Acute pericarditis
3. Thickened pericardium
4. Constrictive pericarditis
5. Pericardial cysts
6. Absent pericardium

Cardiac masses

1. Normal variants
2. Masses of questionable clinical significance
3. Primary cardiac neoplasms
4. Noncardiac neoplasms invading the heart
5. Extracardiac masses
6. Intracardiac thrombi
7. Other masses
8. Ultrasonic tissue typing of cardiac masses
9. Manmade objects in the heart
10. Probe patent foramen ovale

Diseases of the aorta

1. Aortic dilatation and aneurysm
2. Aortic dissection
3. Aortic false aneurysm
4. Sinus of valsalva aneurysm
5. Traumatic damage to the aorta
6. Infections of the aorta
7. Aorta left ventricular tunnel
8. Aortic atherosclerosis

7. Non-invasive imaging – CMR, cardiac CT and Nuclear techniques

Objectives	Knowledge	Skills	Attitudes
Cardiovascular Magnetic resonance (CMR)	• Techniques - 2D mode - Perfusion imaging - Late enhancement • Indication - Volumes - Ejection fraction - LV mass - Shunts • Modalities - Cine-MR - MR angiography - TI imaging	• Select the appropriate CMR indications for patients with known cardiovascular disease and evaluate CMR examinations in the clinical context. Level II competence requires a documented involvement in 50 cases and a suggested attachment of 1 month consisting of four 35 hour weeks supervised by a level III expert.	• Cooperate with radiologistsamd CMR and radiology technician.
Cardiac computed tomography	• Techniques - 2D - 3D • Indication - Calcium score - Coronary artery disease (CAD) (including grafts and stents) • Modalities - Ultra-fast CT - Coronary angiogram	• Evaluate CT examinations in the clinical context (a documented indicative number being 50 cases and suggested exposure of 8 half day sessions, to achieve level II competence).	• Cooperate with radiologists and radiology technicians.
Nuclear imaging	• Techniques - Planar angiography - SPECT - Gated SPECT - Gated blood pool SPECT - PET • Tracers - Thallium - Technetium-labelled tracers - Fluorodeoxyglucose • Indication	• Evaluate cardiac nuclear examinations in the clinical context and with reference to other noninvasive and invasive approaches .level II competence required a documented indicative number of 50 cases and	• Choose the appropriate stress modality for a particular patient. • Cooperate with nuclear medicine physicians and technicians. • Recognize the risk of ionizing radiation for patient and personal.

	- Myocardial perfusion - Viability - RV and LV volumes - Ejection fraction - Diastolic function - Phase analysis for cardiac asynchronic shunt • Modalities - Rest metabolism - Stress protocols (exercise or pharmacological)	suggested exposure of 20 half day sessions. • Stress testing	

Section IV. Cardiac catheterization and interventions

1. Invasive imaging – cardiac catheterization and angiography

Objectives	Knowledge	Skills	Attitudes
• Coronary and left ventricular angiography: to be able to perform and interpret native coronary and surgical conduit angiograms and left ventricular angiograms. • Cardiac catheterization: to be able to perform and interpret right and left heart catheterization	• Describe the principles of fluoroscopic imaging, radiation physics and safety. • Describe the potential complications of cardiac catheterization and angiography (including hypotension, heart failure, arrhythmias, ischaemic neurologic damage, myocardial ischaemia, contrast reaction, cholesterol embolism, renal failure, vascular complications, retroperitoneal bleeding and cardiac tamponade). • Outline the radiological anatomy of the heart, aorta, large vessels and coronary arteries, as well as that of the femoral, radial and brachial arteries used for vascular access	• Demonstrate knowledge of catheterization lab equipments (physiological monitoring, transducers, blood gas analysers, power injector). • Obtain percutaneous arterial access (femoral, radial, brachial) and venous access and achieve haemostasis after catheterization. • Perform left heart catheterization including coronary angiography, ventriculography and angiography of coronary bypass graft: a documented minimum experience is required. • Demonstrate proficiency in managing life-threatening arrhythmias and other emergency situations in the cath lab, including	• To assume responsibility for ordering, performing and interpreting invasive tests by appropriately weighing up the risks and benefits of these procedures. • Select the appropriate treatment modality (medical, percutaneous or surgical) based on the data generated by cardiac catheterization, taking the clinical context into account. • Recognize the limitations and potential risks of invasive procedures and to inform patients accordingly. • Recognize the risks of ionizing radiation for the patient and clinical personnel. • Consult and liaise with nurse and technician personnel and specialized physicians such as interventionalists, electrophysiologists, or paediatric cardiologists as appropriate.

	during catheterization. • Recognize pressure waveforms obtained during cardiac catheterization. • Describe the routine collection of haemodynamic and oxymetric data, and how to calculate cardiac output, vascular resistance, valve areas and AV shunts from measurements. • Describe the different percutaneous and cut down techniques of catheterization. • Describe the different types of catheters used in coronary arteriography and cardiac catheterization. • Describe the equipment used and the technique of transeptal cardiac catheterization and discuss its applications.	resuscitation and life support measures. • Evaluate normal and pathological coronary angiograms, and pulmonary angiograms.	

2. Invasive and interventional cardiology (core)

Objectives	Knowledge	Skills	Attitudes
The trainee will be proficient at carrying out and interpreting, coronary arteriography and left and right heart catheterisation.	Define the cardiac anatomy, physiology and haemodynamics relevant to invasive cardiology. Define the indications and limitations of percutaneous interventions in cardiac disease. Define the various techniques and their complications.	Be able to perform coronary arteriography, including graft angiography, with right and left heart catheterisation in the assessment of cardiac disease. As a guide, it is likely that the trainee will need to undertake at least 250 cardiac catheterisations in order to gain sufficient experience of the procedure to complete a satisfactory DOPS and demonstrate competence as an independent operator. Be able to interpret the results of angiography and manage patients appropriately, including referral for PCI or cardiac surgery. Trainees should have observed and assisted with percutaneous coronary interventions. If available the trainee should have observed trans-septal puncture and myocardial biopsy.	The importance of liaising with, and requesting opinions from, cardiac surgeons. Appropriate self-confidence and recognition of limitations. The importance of team working with non-medical staff during invasive procedures. Appreciate the importance of radiation protection.

3. Clinical care of PCI patients

Objectives	Knowledge	Skills	Attitude
Understand indications for objective tests for ischaemia. Ability to explain results of tests, particularly angiogram, with patient and relatives. Understand principles of risk assessment and clinical features of high risk. Understand methods for minimising risk. To be able to anticipate, diagnose and treat complications appropriately. To be able to communicate risk of procedure with patient. To provide continuity of care to patients undergoing PCI.	Sound understanding of indications for, limitations of and relative benefits of exercise ECG, stress echo, myoview scans and MRI. Sound knowledge and understanding of indications for PCI, outcomes versus medical therapy and CABG, prognostic benefit in acute coronary syndromes. Sound knowledge and understanding of BCIS audit data for national PCI as well as local centre database. Sound understanding about common complications and how to avoid them, including renal impairment. Understanding of pathophysiology of atherosclerosis, angina, myocardial ischaemia and infarction, acute coronary syndromes and	To be able to apply theoretical evidence base to individual patient case. To be able to choose appropriate patients for PCI. To be able to consent a patient in an informed and informative manner including presentation of options, success and complication rates. To be able to apply risk stratification and to deploy methods to minimize and/or avoid risk.	To present a professional and caring attitude to PCI patients before, during and after the procedure. A sensitive approach to consent. A caring approach to the high risk patient and patients with important complications.

To maintain a database of clinical activity including outcome audit for PCI procedures.	the evidence base for their management.		

4. Basic PCI

Objectives	Knowledge	Skills	Attitude
To acquire skilful and robust interpretation of angiography, with particular attention to the need for tailored views of stenosis. To be able to employ techniques designed to assess angiographically equivocal lesions including pressure wire and IVUS. To undertake and learn the principles of PCI under supervision as primary and secondary operator in a variety of clinical settings. To have more than 1 arterial access option (ie femoral and radial). To apply appropriately adjuvant therapy including clopidogrel, glycoprotein IIb/IIIa inhibitors and	Sound understanding of assessment of lesion severity using angiography, pressure wire and intravascular ultrasound. Understanding of PCI equipment including guide catheters, guide wires, balloons, stents. To understand and experience other PCI equipment including distal protection, thrombectomy devices. Sound knowledge of indications for drug-eluting stents Sound knowledge of evidence base for clopidogrel, glycoprotein IIb/IIIa inhibitors, bivalirudin. Sound knowledge of	Be able to assess lesion severity. Be able to choose appropriate equipment for straight forward PCI and develop a strategy for the procedure itself. Be able to develop adjuvant therapy appropriately and in a manner that is justified by the current evidence base. Be able to insert and maintain an Intraaortic balloon pump. Be able to detect complications and adjust preprocedure strategy accordingly. To be able to perform radial as well as femoral angiography and	Assume a professional attitude to learning basic PCI techniques and demonstrate an ability to acquire knowledge both in an apprenticeship and independent manner. To treat each patient as an individual and tailor each intervention to the particular case. To foster good relationships with the multidisciplinary team. To maintain calm demeanour when a PCI goes badly or adverse events Occur.

bivalirubin. To be proficient in the application of an IABP.	the benefit of and evidence for intra-aortic balloon pump.	straightforward PCI.	

5. Advanced PCI

Objectives	Knowledge	Skills	Attitude
To be able to competently perform PCI on more complex lesions including bifurcations, vein grafts, total chronic occlusions, left main, ostial disease. To be able to perform PCI in high risk patients including acute MI, carcinogenic shock, rescue, advanced co-morbidities and inoperable patients. To be able to develop strategies for PCI in patients with multivessel disease. To be able to interact with other specialists in patients who need revascularisation prior to non-cardiac surgery such as patients with cancer, orthopaedic conditions and aortic aneurysms. To maintain keen interest in the evidence base and new technologies and to exhibit a pioneering interest in new developments. To engage cardiac surgical colleagues in discussion about potential "cover" for high	To have in depth knowledge of the evidence base as it defines risk: benefit in relation to more complex lesion and patient subsets. To maintain contemporary knowledge of devices and equipment that are available for high risk lesions and/or patients. To maintain contemporary knowledge of techniques that can be applied to complex lesion or patient subsets. To understand the pros and cons of PCI versus CABG therapy in complex lesion and patient subsets.	To be able to appropriately select patients with complex lesions. To be able to identify and define complex lesion subsets with accuracy and precision. To be able to communicate the nature of the potential PCI procedure with patients or relatives and to be able to tailor their informed consent to the complexity of the procedure. To be able to identify the correct time to stop a procedure when the initial strategy has not necessarily been completed if the circumstances dictate that it is in the patient's best interest.	To maintain a responsible attitude to the selection and application of PCI in complex lesion and patient subgroups. To maintain high quality care as to motivation behind complex PCI. To be prepared to be involved in properly planned and executed multicentre research to assess the benefit of such intervention. To involve other members of the multidisciplinary team in the strategy for complex PCI. To maintain calm demeanour during complex cases.

risk complex cases. To recognise the importance of concentrating specialist skills and to work in partnership with colleagues where necessary.		To be able to plan a "staged" strategy.	

6. Other interventions

Objectives	Knowledge	Skills	Attitude
To acquire competence in the performance of mitral balloon valvuloplasty. To acquire competence in the performance of rotablation. To acquire competence in the performance of complex PCI from the radial approach. To acquire competence in performance of carotid artery or renal stenting. To acquire competence in the closure of ASD or PFO. To acquire competence in the technique for alcohol septal ablation in HOCM	Acquire clear and in depth understanding of a specialised technique under the immediate supervision of a high volume and skilled operator. To understand the indications for specialised interventional techniques.	To be able to acquire these specialist skills with direct supervision until competent as a solo and independent operator.	To deploy these specialised techniques only in appropriate circumstances. To be ready to take over patients referred by colleagues in order to utilise these specialist skills.

7. Radiation use and safety

Objectives	Knowledge	Skills	Attitudes
Be able to use radiation equipment appropriately and safely for the diagnosis, assessment and treatment of patients with cardiac disease according to the regulations IRR 99 and IRMER 2000 or their successors.	Define the physics and hazards of ionising radiation to patients and staff. Define the current statutory requirements concerning the medical use of ionising radiation. Know how to operate the equipment involved in the use of ionising radiation. Define the factors that affect radiation exposure to both patients and staff. Know the important aspects of cardioradiology.	Be able to operate radiation equipment safely and effectively. Has successfully completed a period of practical supervised training in the use of radiation equipment.	Appreciate the risks and benefits to patients and staff of using ionising radiation.

Section V. Critical Care and CPR

DEFINITIONS OF LEVELS OF COMPETENCE

	Basic (Registrar)	**Intermediate (SR year 1)**	**Advanced (SR year 2 and 3)**
Overview	Basic level trainees would be expected to understand the general principles of intensive care medicine, to be familiar with the more common conditions and reasons for admission, to be able to identify patients at risk of organ system failures, and to resuscitate and stabilise critically ill patients. They will also know the degree of urgency required in summoning senior help. Intermediate level trainees will have developed these skills further, often in relation to their base speciality (anaesthesia, medicine, surgery, and accident & emergency medicine). SR year 1 and 2 level (CCST) trainees will have acquired broad knowledge of general and specialist aspects of ICU care. They will also have skills in management and service organisation, in teaching and audit, and well developed integrative skills.		
Knowledge	Presentation and treatment of common life-threatening emergencies.	Detailed knowledge of general aspects of critical care.	General and specialist aspects of critical care, including management of the service.
Skills	Manages initial assessment and stabilisation of emergencies safely. Provides continuing care under supervision.	Stabilisation, assessment, routine management and investigation of critically ill patients on a daily basis. Improving diagnostic skills.	Defines and supervises longterm collaborative management plans for larger numbers of patients. Leads whole ICU team effectively. Teaches and supervises junior colleagues. Integrates information.
Attitudes	Recognises limitations, refers and communicates promptly and effectively.	Proactive, able to coordinate and supervise care delivered by junior trainees. Recognises limits of expertise and summons help appropriately.	Ensures that critical care service functions effectively within wider environment. Supports service development and research. Plans personal professional development.

1. RESUSCITATION AND INITIAL STABILISATION

Overview	Knowledge	Skills	Attitudes
• All intensive care practitioners and trainees must be able to recognise, resuscitate and stabilise patients sustaining, or at risk of, cardiopulmonary arrest of other life-threatening disturbances in acute physiology. • Basic level trainees will achieve a level of competence equivalent to advanced life support (preferably with ALS certification), while higher level trainees should be able to identify and provide initial management of more complex problems including a difficult airway or vascular access, and would be expected to have ALS provider certification.	• Identification of the patient at risk of critical illness including cardiopulmonary arrest Immediate management of common medical emergencies (acute asthma, COPD, hypertension, myocardial infarction, ventricular failure, hypotension and shock, haemorrhage). • Understand common causes for admission to intensive and high dependency care Triage and management of competing priorities. • Methods of maintaining a clear airway. • Indications for and methods of tracheal intubation. • Appropriate use of drugs to facilitate airway control. Selection of tube type (oral, nasal, armouredetc), diameter and length. • Management of difficult intubation and failed intubation. • Methods of confirming correct placement of the endotracheal tube. • Insertion and use of oral airways, face masks and laryngeal mask airway.	• Life support skills to ALS provider level • Airway assessment and optimising the patient's position for airway management • Airway management with mask and oral/nasal airways • Support of ventilation using bag and mask • Introduction and checking correct placement of laryngeal mask airway. • Appropriate choice and passage of oral endotracheal tubes • Orotracheal intubation: (up to grade II Cormack-Lehane for SHOs) • Use of gum elastic bougie and stilette • Identifying correct/incorrect placement of tube (oesophagus, R main bronchus) • Interpretation of capnograph trace • Failed intubation drill • Rapid sequence induction/cricoid pressure • External cardiac massage • Percutaneous pericardial aspiration	• Safety first and knowing limitations • Always knowing the location of senior assistance • Being clear in explanations to patient and staff • Being reassuring to patients and relatives • Consideration of ethical issues: patient autonomy, appropriateness of ICU admission.

	• Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration. • Cricoid pressure. • Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock). • Indications for and methods of ventilatory support. • Recognition and emergency treatment of life-threatening disorders of cardiac rhythm. • External cardiac massage. • Drugs: pharmacology and dosages of hypnotics, analgesics and relaxants • Side effects of drugs used and their interactions. • Monitoring during sedation/induction of anaesthesia for endotracheal intubation. • Recognition and management of anaphylactic and anaphylactoid reactions. • Recognition and management of inadvertent intra-arterial injection of harmful substances. • Problems of the obese or immobilised patient. • Methods of securing adequate vascular access rapidly	(emergency) • Obtaining vascular access sufficient to manage acute haemorrhage • Fluid resuscitation and initial management of shock, including use of drugs • Use of emergency monitoring equipment • Safety checking of resuscitation equipment (see equipment section) • Management and avoidance of cardiovascular and respiratory changes during and after intubation	

2. CLINICAL ASSESSMENT

Overview	Knowledge	Skills	Attitudes
• Clinical skills are important in managing critically ill patients, particularly when assessing patients outside the ICU before admission or after discharge, and in the day-to-day review of the longer stay ICU patient. • Basic skills include the compassionate handling of sick patients during physical examination and the correct identification and interpretation of clinical signs.	• Importance of clinical history in making diagnosis • Relevance of prior health status in determining risk of critical illness and outcomes • Understanding of the impact of drug therapy on organ-system function • Physical signs associated with critical illness • The inflammatory response in relation to organ-system dysfunction • Infection and its relation to the inflammatory response • Methods of obtaining clinical information • Relative importance and interpretation of clinical signs • Pathogenesis of multiple organ dysfunction • Principles of prevention of multiple organ failure	• Obtain an accurate history of the current condition, co-morbidities and previous health status using appropriate sources of information. • Elicit and interpret symptoms and signs on clinical examination • Examination and care of the unconscious or confused patient • Obtain and interpret information from case records, charts and ICU chart • Document information in the case record in a structured and accessible manner • Link clinical with laboratory information to form a diagnosis • Establish a management plan • Recognition of impending organ system dysfunction	• Manage patients in a compassionate and considerate manner • Communicate effectively with other health care professionals to obtain accurate information and plan care

3. INVESTIGATION, DATA INTERPRETATION AND DIAGNOSIS

Overview	Knowledge	Skills	Attitudes
• Diagnostic accuracy determines therapeutic specificity. • Intensive care focuses so greatly on technology and organ system support that it is easy to forget the fundamental importance of making a diagnosis, and how difficult that can be. • Basic level trainees should be able to integrate clinical with laboratory information in order to diagnose the more common conditions encountered in intensive care, and to correct acute and life-threatening complicatio ns.	• Appropriate use of laboratory tests to confirm or refute a clinical diagnosis • Advantages and disadvantages of laboratory tests **Indications for, and basic interpretation of:** • Electrocardiographs of common dysrrhythmias, infarction, pulmonary hypertension/embolism , pericarditis, LVH • Echocardiography • Ultrasound examination • Cardiovascular physiological variables • Fluid balance charts • Blood gas measurement • Respiratory function tests • Chest radiographs: collapse, consolidation, infiltrates (including ALI/ARDS), pneumothorax, pleural effusion, • pericardial effusion, position of cannulae, tubes or foreign bodies, airway compression, cardiac silhouette, • mediastinal masses • X-rays of long bone, skull, vertebral and rib fractures • CT and MRI scans of head demonstrating fractures/ haemorrhage	• Bronchoscopicbroncho-alveolar lavage in an intubated patient (optional) • Diagnostic bronchoscopy in a non-intubated awake patient • Lumbar puncture and CSF sampling • Link clinical with laboratory information to form a diagnosis • Establish a management plan based on clinical and laboratory information • Document results of laboratory tests	• Communicate and collaborate effectively with all laboratory staff • Avoid unnecessary tests

	• Neck and thoracic inlet films • X-rays of abdominal fluid levels / free air • Microbiology: types of organisms; colonisationvs infection; appropriate antibiotic use • Haematology (including coagulation and sickle tests) • Blood grouping and X-matching • Urea, creatinine, electrolytes (Na, K, Ca, Mg) • Liver function tests • Drug levels in blood or plasma • Endocrine function: diabetes, thyroid disorders, adrenal failure		

4. ORGAN SYSTEM SUPPORT AND RELATED PRACTICAL PROCEDURES

Overview	Knowledge	Skills	Attitudes
• Intensive care started with the co-ordinated provision of ventilatory support to polio victims. • Multiple organ failure and multiple organ system support are now a routine part of clinical practice. • Organ system support is not just equipment: it also includes drugs and the co-ordinated provision of multidisciplinary care. • Basic level trainees must be able to provide emergency resuscitation, and know the principles of management of commonly used modalities of organ system support. • No practitioner of whatever grade should undertake an elective	**Respiratory system** • Indications for and methods of tracheal intubation. • Appropriate use of drugs to facilitate airway control. • Tube types (oral, nasal, tracheostomy etc), diameter and length. • Management of difficult intubation and failed intubation. • Methods of confirming correct placement of the endotracheal tube. • Insertion and use of oral airways, face masks and laryngeal mask airway. • Indications and contraindications to tracheostomy and minitracheostomy. • Management of and complications associated with tracheostomy tubes. • Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration. • Cricoid pressure: indications and safe provision. • Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock, • cervical spine injury) • Indications for and methods of mechanical ventilation	• Maintenance of a clear airway using bag and mask • Orotracheal intubation • Naso-tracheal intubation • Percutaneous tracheostomy • Minitracheostomy or needle crico-thyoidotomy • Changing an orotracheal tube • Changing a tracheostomy tube electively • Manual bagging and tracheal suction • Institution and maintenance of controlled mechanical ventilation in a critically ill patient • Confirmation of adequate oxygenation and control of PaCO2 and pH • Aseptic insertion of a pleural chest drain and connect to a one-way seal device • Establish peripheral venous access sufficient to manage major haemorrhage • Aseptic insertion of central venous, pulmonary arterial, and arterial catheters • Aseptic insertion of tunnelled central venous catheter for parenteral nutrition	• Understand importance of ensuring physiological safety as a primary aim • Understand difference between organ system support and specific treatment • Appreciation of importance of timely institution of organ-system support • Call for senior/more experienced help when experiencing difficulties • Consideration of patient comfort in performance of practical procedures

practical procedure without due consideration for patient safety.	• Ventilatory modes: CMV, IRV, PRVC, SIMV, PS, CPAP, BiPAP, Non-invasive ventilation • Principles of extra-corporeal membrane oxygenation (ECMO) • Detection and management of complications of mechanical ventilation • Detection and management of pneumothorax (simple and tension) • Insertion and safe management of chest drains • Indications and methods of bronchoscopy via an endotracheal tube • Indications and methods of bronchoscopy in a conscious non-intubated patient • Principles of weaning from mechanical ventilation **Cardiovascular system** • Cardiopulmonary resuscitation to ALS provider level • Peripheral and central venous cannulation • Arterial catheterisation • Pulmonary arterial catheterisation, oesophageal Doppler, trans-oesophageal echo • Principles of trans-venous cardiac pacing • Use of inotropic, chronotropic, vasodilator and vasoconstrictor drugs	• Appropriate use of intravenous fluids • Appropriate use of infused vasoactive drugs • Measurement of cardiac output using pulmonary artery catheter or oesophageal Doppler • Identification and avoidance of factors contributing to impaired renal function • Urinary catheterisation: male and female • Nasogastric tube placement • Management of cardiorespiratory physiology to minimise rises in intracranial pressure • Recognition and temporary stabilisation of unstable cervical spine	

	• Use of intravenous fluids: crystalloids, colloids, blood and blood products • Principles of intra-aortic counterpulsation balloon pump **Renal system** • Safe urinary catheterisation • Methods of preventing renal failure • Investigation of impaired renal function • Knowledge of nephrotoxic drugs • Adjustment of drug doses in renal impairment / failure • Renal replacement therapies **Gastrointestinal system and nutrition** • Principles of adequate nutrition in the critically ill patient, including vitamins, trace elements, immunonutrition • Assessment of nutritional status (eg: skin-fold thickness, muscle wasting) • Selection of enteral or parenteral routes for nutrition (optional) • Nasogastric cannulation • Nasojejunal and percutaneous feeding tube insertion (optional) • Sengstaken tube insertion • Principles of support for the failing liver		

	• Prevention of stress ulceration • Techniques for preventing microbial translocation **Nervous system** (optional) • Principles of management of closed head injury • Principles of management of raised intracranial pressure • Principles of management of vasospasm • Indications for and use of information from intracranial pressure monitoring devices **Musculoskeletal system** • Prevention of pressure sores • Principles of management of fluid losses following burns • Short-term complications of fractures • Consequences of muscle wasting **Sepsis and infection** • Requirements for microbiological surveillance and clinical sampling • Relation between lab results and patient's condition • Appropriate use of antibiotics • Proper handling of invasive medical devices		

5. MONITORING AND CLINICAL MEASUREMENT

Overview	Knowledge	Skills	Attitudes
• Intensive care is synonymous with close observation, documentation, and interpretation of clinical information. • Routinely used methods for obtaining clinical information must be understood by all trainees. • Higher level trainees should develop skills at integrating information from several sources and interpreting them in a clinical context.	• The role of clinical assessment in monitoring • Physical principles underlying use of monitoring devices (see physics and measurement) • Indications for and contraindications to the use of monitoring devices • Interpretation of information from monitoring devices, and identification of common causes of error • Principles of 'minimal monitoring' • Complications associated with monitoring and monitoring devices • Methods for measuring temperature • Methods for assessing pain and sedation • One general method for measuring severity of illness (severity scoring systems) • Methods for severity scoring or case mix adjustment for trauma, burns, therapeutic intensity or costs • Glasgow Coma Scale • Drug levels monitoring	***Safe use of, and interpretation of data from:*** • Pulse oximetry • ECG (3- and 12-lead) • Non-invasive arterial blood pressure measurement • Invasive arterial blood pressure measurement • Central venous pressure measurement • Pulmonary artery catheters or oesophageal Doppler • Arterial blood gas sample handling • Inspired and expired gas monitoring for O2, CO2, and NOi • Spirometry and peak flow measurement • Ventilator alarms • Clinical assessment of pain • Scoring or scaling systems to assess degree of sedation • Collection of data for one general method for severity scoring or case mix adjustment	• Ensure safe use of monitoring equipment in an appropriate environment • Minimise patient discomfort in relation to monitoring devices • Support other staff in the correct use of devices • Review regularly the need for continued monitoring

6. SAFE USE OF EQUIPMENT

Overview	Knowledge	Skills	Attitudes
• Proper use of equipment is an essential component in the safe delivery of effective care. • Basic level trainees should know the indications, contraindications and safe use of those items of equipment that they are expected to use, particularly those required for organ system support. • They should also understand some of the physical principles underlying their operation (see physics section).	• Airways, tracheal tubes, tracheostomy tubes, emergency airways, laryngeal masks, fixed and variable • performance oxygen therapy equipment, self-inflating bags, • Humidification and nebulising devices • Modes of ventilation and method of operation of at least one positive pressure ventilator, one non-invasive • ventilator, and a constant positive airway pressure (CPAP) device • Principles of use of pressure regulators, flowmeters, vaporizers, breathing systems. • Principles of disconnection monitors. • Manufacture, storage and safe use of oxygen, nitric oxide (NOi), compressed air. • Pipeline and suction systems, gas cylinders • Non-invasive monitoring devices • Methods for	• Checking and setting the ventilator • Checking pipelines, checking and changing cylinders • Connecting and checking breathing systems • Setting alarm limits for monitoring equipment • Identifying and correcting ventilator miss-assembly and disconnections • Collecting data from monitors • Record keeping • Checking, assembling resuscitation equipment • Safe defibrillation • Preparing equipment for: • difficult and failed intubation • paediatric intubation set • aseptic vascular access • intravascular pressure monitoring • Choosing appropriate fluid balances using renal replacement therapies	• Shared responsibility for equipment with nursing and technical staff • Determination to maximise safety • Rapid response to acute changes in monitored variables

	checking ventilator, breathing systems and monitoring apparatus • Environmental control of temperature, humidity, air changes and scavenging systems for waste gases and • vapours • Sterilisation and cleaning of equipment. • Electrical safety • Characteristics and safe use of vascular access cannulae, spinal needles, epidural catheters, chest drains • Function and use of defibrillator and other resuscitation equipment, transfusion devices. • Function and use of continuous haemodiafiltration devices		

7. GENERAL MEDICAL CONDITIONS

Overview	Knowledge	Skills	Attitudes
• General medical patients requiring intensive care are almost exclusively emergency admissions, and many have complex or multiple problems. • Basic level trainees should be able to identify the main risk factors for critical illness in this population, and to consider some of the underlying diagnoses. • Higher level trainees will acquire greater depth and breadth of experience, which will allow them to manage more complex problems. • Safe investigation and management of these patients is expected; encyclopaedicknowledge of all details of every condition is not.	• Recognition and management of medical emergencies which may require admission to intensive or high dependency care, or complicate a patient's stay in the ICU, including the emergency presentation of the symptoms, signs and clinical conditions listed below: **Respiratory:** • Tachypnoea, dyspnoea, chest pain; the unprotected airway; pneumonia, collapse or consolidation, asthma, chronic obstructive airways disease, pulmonary oedema, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; pleural effusion, pneumothorax (simple and tension); upper and lower airway obstruction including epiglottitis. **Cardiovascular:** • Hypotension and hypertension; shock (cardiogenic, hypovolaemic, septic); crescendo or unstable angina; acute myocardial infarction; left ventricular failure; cardiomyopathies; pulmonary hypertension; right ventricular failure; corpulmonale; pulmonary	• Develop a limited differential diagnosis based on presenting clinical features • Develop a differential diagnosis to include less common or rare conditions • Recognise that diverse diseases share limited forms of acute physiological expression • Identify and integrate co-morbid diseases with the acute condition	• Communicate effectively to establish care plan with admitting clinicians, nursing staff and other professionals, • and with relatives and patient where appropriate

	embolus; malignant hypertension; cardiac tamponade; atrial tachycardias, ventricular tachycardias, conduction disturbances, atrial and ventricular fibrillation, pacing box failure. **Renal and genito-urinary:** • Oliguria and anuria; polyuria; urological sepsis; acute renal failure; chronic renal failure; renal manifestations of systemic disease including vasculitides; nephrotoxic drugs and monitoring; pyometra; septic abortion **Gastrointestinal:** • Abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea and vomiting; pancreatitis; jaundice; fulminant hepatic failure; paracetamol (acetaminophen)-induced liver injury; **Neurological:** • Confusion and coma; post-anoxic brain damage; Intracranial haemorrhage and infarction; convulsions and status epilepticus; meningitis and encephalitis; medical causes of raised intracranial pressure; neuromyopathies (e.g.: Guillain-Barre, myasthenia gravis, malignant hyperpyrexia) causing respiratory difficulty; critical illness polyneuropathy, motor		

	neuropathy, and myopathy **Sepsis and infection:** • Pyrexia and hypothermia; patients at risk; organ-specific signs of infection including haematogenous (venous catheter-related, endocarditis, meningococcal disease), urological, pulmonary, abdominal (peritonitis, diarrhoea), skeletal (septic arthritis) and neurological. Organisms causing specific infections: Gram positive and Gram negative bacteria, fungi, protozoa (e.g.: malaria), viruses (e.g.: influenza, RSV, Hepatitis A, B and C, HIV, CMV), use of antibiotics (see also infection control). **Haematology and oncology:** • The immunosuppressed or immunoincompetent patient; agranulocytosis and bone marrow transplant patients; severe anaemia; major blood transfusion; coagulation disorders; haemoglobinopathies **Metabolic, hormonal and toxicology:** • Diabetes; over- and under-activity of thyroid, adrenal and pituitary glands; electrolyte disorders; general principles of the treatment of poisoning, and the specific management of poisoning with aspirin, paracetamol/acetaminophe		

	n, paraquat, carbon monoxide, alcohol, tricyclic and quadricyclic antidepressants.		

8. PERIOPERATIVE CARE

Overview	Knowledge	Skills	Attitudes
• Substantial proportions of patients admitted to intensive care are postoperative admissions, or have surgical problems. • Basic level trainees should have a working knowledge of the problems encountered by general surgical patients. • Intermediate level trainees may, and advanced level trainees must also have experience of the main surgical specialities such as cardiothoracic and neurosurgery. • Specialist level trainees will have an understanding of transplantation. • All practitioners should	**General factors:** • Importance of preoperative health status on postoperative outcomes • Factors determining perioperative risk, and methods of optimising high-risk patients • Implications for postoperative care of type of surgery • The interpretation of relevant preoperative investigations • Effect of gastric contents, smoking, and dehydration on perioperative risk • Implications for postoperative care of common medical conditions (see section on general medical conditions) • Implications of current drug therapy. • Need for and methods of perioperative anti-thrombotic treatment • Assessment of post-operative analgesic needs • Management of cyanosis, hypo- and hypertension, shivering and stridor. • Assessment of pain and methods of pain management • Methods of treating of postoperative nausea and vomiting • Causes and management of post-operative confusion • Assessment of appropriate level of postoperative care: ICU, HDU, post-anaesthesia recovery • The importance of consent and the issues surrounding it **Respiratory:**	• Obtain information from sources other than the patient • Identify airway or intubation difficulties, preoperative health status and intercurrent disease, medications, allergies, nature of anaesthetic and surgery. • Assess conscious level, status of airway and cervical spine, and conduct careful systems review • Determine adequacy and route of administration of analgesia • Document, monitor and manage fluid balance, circulating volume, drains, systemic oxygen supply • Identify life-threatening cardiorespiratory complications, and manage hypovolaemia	• Establish a plan for postoperative management • Ensure the necessary resources are available for safe postoperative care • Communicate effectively to establish care plan with anaesthetist, surgeon, nursing staff and other professionals, and with relatives and patient where appropriate.

understand the nature of the surgical and anaesthetic procedures undertaken routinely on the patients under their care.	• Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient; the unprotected airway; upper and lower airway obstruction including epiglottitis; pneumonia, collapse or consolidation, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; pulmonary oedema; pleural effusion, pneumothorax (simple and tension); use of chest drains; factors affecting patients following thoracotomy, lung resection, oesophagectomy, cardiac surgery and thymectomy. **Cardiovascular:** • Interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; operative risk factors in patients with ischaemic heart disease; pulmonary embolus; cardiac tamponade; management of patients following cardiac surgery (coronary grafting, valve replacement) and aortic surgery (thoracic descending, abdominal); heart and heart-lung transplantation. **Renal:** • Causes of perioperative oliguria and anuria; prevention and management of acute renal failure; consequences of nephrectomy, ileal conduits. **Gastrointestinal:**	• Differentiate and manage tension pneumothorax, cardiac tamponade, pulmonary embolus	

	• Interpretation of abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea, vomiting and ileus; peritonitis; intestinal ischaemia; abdominal tamponade; pancreatitis; jaundice; management of the post-liver transplant patient; perioperative nutrition. **Neurological:** • Surgical causes of confusion, coma and raised intracranial pressure; determinants of cerebral perfusion and oxygenation; prevention of secondary brain injury; perioperative management of patients with neuropathies and myopathies (e.g.: thymectomy); intracranial pressure monitoring; intracerebralhaemorrhage; spinal cord and brachial plexus injury. **Sepsis and infection:** • Pyrexia and hypothermia; wound infections; necrotising fasciitis; prophylactic antibiotics; risk of infection in patients with indwelling medical devices including intravascular and urethral catheters and heart valves; peritonitis; intestinal ischaemia **Haematology and oncology:** • Care of the immunosuppressed or immunoincompetent patient; management of severe acute haemorrhage and blood		

	transfusion; coagulation disorders and haemoglobinopathies; Jehovah's Witness patients. **Metabolic and hormonal:** • Perioperative management of patients with diabetes; hypo- and hyperadrenalism, surgery to thyroid, adrenal and pituitary glands; perioperative electrolyte disorders; **Musculo-skeletal:** • Trauma patients (see trauma section); pressure area care; compartment syndromes; paralysed patients.		

9. TRANSPORT CARE

Overview	Knowledge	Skills	Attitudes
• Critically ill patients are frequently moved, either within the ICU to a different bedspace, or within hospital for diagnostic radiology or for surgical procedures, or between hospitals. • The principles of safe transfer are the same, regardless of the distance travelled. • All trainees should gain supervised experience in safe transfer. • Interhospital transfer in particular requires a high level of expertise because additional help cannot be obtained if problems occur.	• Principles of safe transfer of patients • Understanding portable monitoring systems	• Intra-hospital transfer of patients requiring ventilatory support alone • Interhospital transfer of patients with single or multiple organ failure	• Insistence on stabilisation before transfer • Pre-transfer checking of kit and personnel • Planning for and prevention of problems during transfer • Communication with referring and receiving institutions and teams • Insistence on adequate support from senior / more experienced colleagues

10. SEPSIS AND INFECTION CONTROL

Overview	Knowledge	Skills	Attitudes
• The immunoinflammatory response is a fundamental mechanism in disease processes. • Critical illness is frequently attended by excessive activation of the immunoinflammatory cascade combined with immunoincompetence. • Patients are susceptible to, and are a source of, resistant organisms, and the most common vector between patients is a member of staff's hand or clothing. • Meticulous hand disinfection is the oldest, best-verified, and most effective method of preventing cross infection.	• Universal precautions and good working practices (hand washing, gloves etc) • Proper handling of medical devices including intravascular devices • Cross infection: modes of transfer and common agents • Autogenous infection: routes and methods of prevention • Emergence of resistant strains • Antibiotic policies in a hospital • Activity of commonly used antibiotics • Common surgical infections: antibiotic choice and prophylaxis • Infections from contaminated blood • Hepatitis and HIV infections: modes of infection: natural history: at risk groups • Immunisation policy • Sterilisation of equipment • Strategy if contaminated	• Recognition of at risk groups including the immunocompromised patient • Administration of IV antibiotics: risk of allergy and anaphylaxis • Aseptic techniques • Use of disposable filters and breathing systems • Use of protective clothing/gloves/masks etc • Application of methods for preventing autogenous infection (e.g.: posture, mouth hygiene)	• Every patient entitled to the best care available • Prevention of self-infection • Prevention of cross infection is my responsibility

11. COMFORT CARE

Overview	Knowledge	Skills	Attitudes
• For many patients and most relatives the ICU is an intimidating environment. • Critical illness is often attended by discomfort and pain, and sometimes by the most extreme distress. • Minimising unpleasant symptoms and delivering care with compassion is an essential duty of all staff, as is supporting each other during difficult periods.	• Causes of, and methods of minimising, distress to patients • Bereavement: anticipating and responding to grief • Methods of communicating with intubated patients • Methods of measuring depth of sedation • Stress responses • Causes and management of acute confusional states • Sleep deprivation and its consequences • Acute pain management • Patient-controlled analgesia • Indications, contra-indications and complications of commonly used analgesic, hypnotic, and neuromuscular blocking drugs • Pharmacokinetics and dynamics of commonly used analgesic and hypnotic agents, and neuromuscular blocking drugs, in patients with normal and abnormal organ system function. • Indications, contra-indications, methods and complications of regional analgesia in critical illness • Importance of mouth care	• Identify and treat causes of distress • Safe use of analgesic, hypnotic and neuromuscular blocking drugs • Management of established epidural analgesia • Minimise complications associated with opioid and non-opioid analgesics	• Desire to minimise patient distress • Work with nurses and relatives to minimise patient distress • Aim to communicate with and support next-of-kin

12. PRE- AND POST-ICU CARE

Overview	Knowledge	Skills	Attitudes
• 'Outreach' care is now recognised as an essential component of the 'ICU service without walls'. • It is the responsibility of the ICU staff to provide safe care to all patients regardless of environment, within the constraints of available service provision. • Early intervention may reduce cardiopulmonary arrest rates and hence risk of critical illness. • Optimisation of the high-risk surgical patient reduces mortality and costs of care.	• Factors which predispose patients to critical illness, including poor nutrition • Early warning signs of impending critical illness • Methods of optimising high risk surgical patients • Criteria for admission to and discharge from intensive and high dependency (HDU) care units • Risk factors for ICU readmission following discharge to the ward • Tracheostomy care outside the ICU or HDU • Post-ICU mortality rate, and common reasons for death following discharge • Common symptomatology following critical illness • Rehabilitation: physical and psychological • Long-term or home ventilation • Persistent vegetative state	• Resuscitation and initial stabilisation (see domain 1) • Recognition and management of risk factors associated with critical illness • Optimisation of high-risk surgical patients before surgery: site of care, management, communication • Liaison with ward staff to ensure optimal communication and continuing care after ICU discharge • Timely discussion of 'do not resuscitate' orders and treatment limitation decisions • Identification of complications associated with critical illness (e.g.: nerve palsies) and appropriate referral	• Determination to provide best care possible regardless of environment • Follow-up of patients following discharge to the ward • Good communication and relationships with ward staff

13. END-OF-LIFE CARE

Overview	Knowledge	Skills	Attitudes
• Death is a common event in intensive care; it may also be inevitable, and a dignified death a desirable though sad outcome. • Sustained organ system support of patients who are certain to die is unkind, unethical, inappropriate, and depletes the medical commons. • Withdrawal of support does not mean withdrawal of care, and a kind death does much to resolve guilt and unhappiness persisting for years in the surviving family. • Brain death and organ donation must be handled with sensitivity and strictly	• Basic ethical principles: autonomy, beneficence, non-maleficence, justice • Ethical and legal issues in decision-making for the incompetent patient • Surrogate decision making • Advance directives • Difference between consent and assent for treatment and research • Methods for assessing or measuring quality of life • Confidentiality • With-holding and withdrawing treatment: omission and commission • Difference between euthanasia and allowing death to occur: doctrine of double effect • Procedure for withdrawing treatment and support • Attitude of major religions to brain death and organ donation • Cultural differences in attitudes to death and dying • Preconditions, exclusions and tests for the diagnosis of brain death • Responsibilities and activities of transplant co-ordinators	• Communicating with relatives • Discussing treatment options with patient or family before ICU admission • Making substituted judgements and differentiating competent from incompetent statements by patients • Obtaining consent/assent for treatment, research or autopsy • Obtaining information on which to make assessments of quality of life • Relieving distress in the dying patient • Implementation of procedure for withdrawing treatment and support • Performance of tests of brain stem function, including preconditions and exclusions	• Respect for the truth • Respect for the expressed wishes of competent patients • Liaison with religious representative (pastor, vicar, priest, chaplain, rabbi, monk) if requested by patient or family • Liaison with transplant co-ordinators • Desire to support patient, family, and other staff members appropriately during treatment withdrawal

according to national guidelines. • Autopsy (post-mortem) examination often provides important opportunities for learning.	• Management of the organ donor • Completion of death certification • Responsibilities of coroner (procurator fiscal or equivalent), and reasons for referral		

14. SPECIFIC CURRICULUM ON ELECTRICAL THERAPY OF ARRHYTHMIA

Objectives	Knowledge	Skills	Attitudes
• To have an understanding of the mechanisms, diagnosis and treatment of arrhythmias. • To be competent in DC cardioversion. • To be competent to undertake cardiac pacing.	**BASIC PRINCIPLES** • An understanding of the mechanisms of arrhythmias. • A thorough understanding of the 12-lead surface ECG during brady- and tachyarrhythmias • To have an understanding of the therapeutics of antiarrhythmic drugs, and their hazards. **SPECIFIC PATIENT GROUPS** • To know the principles of risk assessment in patients with arrhythmias undergoing cardiac and other surgery, and during pregnancy, and with structural heart disease. **BRADYCARDIA AND PACING** • Investigation of patients with blackouts/T-LOC • Indications for temporary and permanent pacing. • An understanding of pacemaker programming **INVASIVE ELECTROPHYSIOLOGY** • Basic understanding of the use and application of invasive electrophysiology studies. **ICDs and CRT** • An understanding of the use of ICDs	• To be competent in the acute management of arrhythmias, and have an understanding of which patients require further investigation. • To be competent in the management of arrhythmias in post cardiac and noncardiac surgical patients, pregnant patients and patients with structural heart disease. • Use of external pacing systems. • Implantation of temporary pacemakers. • Implantation of permanent pacemakers, both single and dual chamber. • Experience of 20 invasive electrophysiological studies for common arrhythmias, usually involving curative catheter ablation during the same study. • Experience of at least five ICD implants and five CRT procedures. • To be competent in elective and emergency DC cardioversion	• Appreciate the anxiety often suffered by patients and their relatives. • Appreciate the limitations of drug therapy in the treatment of arrhythmias. • Have appropriate self-confidence and recognition of limitations. • Appreciate the importance of radiation protection.

	• An understanding of the role of devices in heart failure **CARDIOVERSION** • Understanding the mechanisms of cardioversion. • Understanding of the indications for cardioversion.		

15. PERICARDIOCENTESIS

Objectives	Knowledge	Skills	Attitudes
• To be able to carry out pericardiocentesis in the diagnosis and treatment of patients with pericardial disease.	• Define the indications for diagnostic and therapeutic pericardiocentesis.	• Be able to undertake pericardiocentesis.	

Pericardiocentesis

Given the usual clinical circumstances surrounding pericardiocentesis it does not seem appropriate to ask trainees to undergo standard DOPS assessments for these procedures. However, in order to document competence trainees should record all supervised pericardiocentesis procedures undertaken using a DOPS-like recording form.

16. SUDDEN CARDIAC DEATH (SCD) AND RESUSCITATION

Overview	Knowledge	Skills	Attitudes
SCD • To manage patients with threatened or aborted SCD, including risk stratification, investigation and treatment. **Resuscitation** • To be able to carry out basic and advanced cardiac life support.	**SCD** • Define SCD and know and understand the epidemiology, aetiology, pathology, pathophysiology, and clinical presentation of the different conditions which may lead to SCD. • Define the principles of acute management of patients with SCD. • Define the principles of diagnostic work up and risk stratification of survivors: in particular recognize ECG signs indicative of high SCD risk (e.g. long QT, short QT, Brugada syndrome etc.) and how to further evaluate patients with these signs and their families. • Select appropriate long term therapeutic options. • Recall the current recommendations for secondary prevention of SCD (e.g. indications for preventive ICD implantation in patients with ischaemic cardiomyopathy). • Identify, risk stratify and manage individuals at elevated risk, including family members of SCD patients. • **Resuscitation** • Explain the methods and guidelines of basic and advanced life support including airway management, appropriate drug use, defibrillation and pacing.	**SCD** • Perform resuscitation. • Take a relevant history and perform an appropriate clinical examination. • Interpret prodromal symptoms, underlying causes and prognosis of a SCD survivor. • Perform and interpret risk stratification using the following techniques (Holter-ECG, LV function, Echo, Cath, EP, heart rate variability). • Follow up SCD survivors. **Resuscitation** • Identify the cause of collapse • Perform BLS (CPR) and ACLS including different skills • Lead and coordinate the actions of an ACLS team. • Teach basic life support.	**SCD** • Recognise the urgency of the management of cardiac arrest. • Recognise the importance of prodromal symptoms. • Appreciate patient and family anxieties. • Appreciate the importance of patient and family education and secondary prevention. • Understand the medical, psychological and social problems arising in patients with end stage heart failure and frequent ICD activation. **Resuscitation** • Appreciate the importance of working in a team with laypersons, paramedics and other medical personnel during resuscitation (BLS and ACLS). • Understand the importance of regular audit of the basic and advanced life support programme.

Section VI. Cardiac pacing and basic electrophysiology

1. Pacemaker implantation and programming

Objectives	Knowledge	Skills	Attitude
To understand the basic principles of pacing including electrical parameters and the engineering involved. To understand pacemaker lead characteristics. To understand the published guidelines for implantation of pacemakers and clinical indications. To understand the implantation procedure and the cardiac and thoracic anatomy. To master safe sterile technique for all procedures. To have basic	Know the principles of pacing and the engineering of pacemakers and of pacing leads. Understand medico-legal issues concerning consent and provision of information. Of the cardiac conduction system and its disease processes. Of the cardiac and thoracic anatomy, especially in respect of venous access including the cephalic vein approach. Of the indications and guidelines for correct pacemaker prescription including pacing mode. Of the safe implantation of pacemakers including the operating environment and antibiotic usage.	Skills in correct patient selection for and safe implantation of single and dual chamber pacemakers via the cephalic and subclavian approaches. Intravascular catheter manipulation and surgical skills in opening manipulating and closing wounds. Managing complications eg cardiac tamponade. The insertion and care of temporary pacing wires. Detailed and safe	Correct attitude to a surgical approach – appreciating sterility and antibiotic usage. To foster a team approach to pacing including a close relationship with cardiac physiologists. Committed to audit of long term outcomes including infection and lead complications. To develop a critical attitude towards a safe pacing programme in the hospital and to support patients in their community with adequate pacing follow-up. To educate patients as to the treatment options open to

knowledge of the programming of pacemakers following implantation including troubleshooting.	Of management of complications of pacemaker implantation including pneumohaemothorax, lead perforation, lead fracture. Of the management of lead problems – when to extract and when not to. Of programming issues specifically related to leads. Of modern pacing systems and of troubleshooting. Of rate modulated pacing and sensor technology. Of driving restrictions.	approach to cephalic subclavian or internal jugular venous access. Competent programming of pacemakers and troubleshooting including the programming of ensors and newer sensors and newer anti-atrial tachycardia algorithms.	them and to explain treatment strategies. To work closely with other health care professionals as necessary: Cardiac physiologists, Cardiologists, Infection control Care of the elderly, Neurologists To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

2. ICD implantation and programming

Objectives	Knowledge	Skills	Attitude
Understand the principles and guidelines for ICDs. To carry out specialist	Of the cardiac and thoracic anatomy, especially in respect of venous access. Of national and	Select and investigate patients appropriately for ICD implantation (including whether revascularisation is required).	Appreciate the importance of informed consent, and the need to explain lifestyle issues and driving restrictions to the

investigation and treatment of patients who may benefit from ICD implantation. To u nderstand the implantation procedure, the cardiac and thoracic anatomy and safe sterile technique for procedures. To be able to assist implanting single and dual chamber ICDs, and recognise and treat complications which may occur. To be able to	international guidelines for ICD implantation, and their evidence base. Of medico-legal issues concerning consent and provision of information. Up-to-date knowledge of recent clinical trials in ICD therapy. The effects of antiarrhythmic drugs on defibrillation and pacing thresholds. Of the proarrhythmic effects of antiarrhythmic drugs and their effect on left ventricular function. Of the current recommendations regarding fitness to drive with an ICD.	Explain the procedure possible complications, and possible effects on the patient's lifestyle to the patient and relatives. Assess the anaesthetic/ sedation needs for the implantation. Assess whether a single, dual or triple chamber (i.e. biventricular) device is best suited to the patient. defibrillation safely and thoroughly during the implant. Be able to program the device appropriately.	patient. Correct attitude to a surgical approach – appreciating sterility and antibiotic usage. Appreciate the importance of team-working with nursing, technical, radiographic, anaesthetic and (if appropriate) industry staff. Appropriate self-confidence and recognition of limitations. Committed to audit of long term outcomes. Cardiac physiologists, Cardiologists, Infection control, Care of the elderly, Neurologists, Appreciate the anxiety that patients

"troubleshoot" ICD problems, including recognition of; drug-device interactions, appropriate and inappropriate shocks, device and lead complications, and problems that may require specialist intervention such as ablation (for both supraventricular and ventricular arrhythmias).		Perform post-implant assessment of the patient. Perform routine follow up of ICD patients.	suffer with an ICD. To appreciate the psychological impact of the patient's arrhythmia illness on the patient and their family, and manage it sensitively.

3. Multi-site ventricular pacing for cardiac resynchronisation (CRT)

Objectives	Knowledge	Skills	Attitude
To appreciate the role CRT plays in the management of patients with CHF. To assist in the implantation of CRT devices with a high probability of success. To recognize and refer for complications of implant or device behaviour.	Of techniques available to identify patients likely to benefit from CRT and to be aware of limitations of these techniques. Of medico-legal issues concerning consent and provision of information To be able to determine which patients for CRT also require ICD back-up.	To be able to select appropriate patients for CRT. To be able to consent a patient in a balanced and informed way about the success rate, risks and benefits of CRT. To be able to proceed with a CRT implant in a safe and logical fashion. To be able to recognize nature of implant difficulties and to take	Take a sensible, professional attitude to CRT, learn under supervision with appropriate requests for advice. Consent patients sensitively with an objective assessment of likelihood of benefit. Be aware of the importance of members of a multi-disciplinary team in heart failure management and in

To be able to optimize therapy delivery.	Of all the equipment available, both for implantation and also subsequent programming. Of relative benefits of different leads and devices. Of implantation techniques and how to deal with common problems. Of potential complications.	appropriate action to overcome these. To appreciate when an alternative technique or approach may be required e.g. surgical device Implantation. To be able to programme the devices appropriately, and to advice on optimization using recognized techniques such as echocardiography.	maximising benefit of CRT. To deal appropriately with patients in whom CRT implantation has not been effective. To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

4. Pacing/ICD lead extraction techniques

Objectives	Knowledge	Skills	Attitude
To understand the basic principles of pacing. To understand the engineering of endocardial leads. To understand the implantation procedure, and the cardiac and thoracic anatomy. Safe sterile techniques for all procedures. To be able to select appropriate cases for endocardial lead extraction. To be able to safely extract pacing leads using all available technology.	Of the basic principles of pacing and the electrical properties of the heart. Of medico-legal issues concerning consent and provision of information. Of the engineering of pacemakers and of pacing leads. Of the published guidelines for lead extraction. Of the cardiac and thoracic anatomy. Of safe implantation of pacemakers including the operating environment and antibiotic usage. Of management of complications of pacemaker implantation including; pneumo-haemothorax. Lead perforation, lead fracture. Of the management of lead problems – when to extract	In correct patient selection. In the implantation of both single and dual chamber pacemakers via the cephalic and subclavian approaches. In handling intravascular catheters. In wound repair and closure. In handling immediate complications of implants e.g. cardiac tamponade. Ability to extract leads from both the superior and femoral approaches. In using cutting, laser and femoral extraction	Correct attitude to a surgical approach – appreciating sterility and antibiotic usage. To foster a team approach to lead extraction including a close relationship with cardiac surgeons. Use of self audit regarding complications. To educate patients as to the treatment options open to them and to explain treatment strategies including surgical extraction. To work closely with other health care professionals as necessary: Cardiac technicians Cardiologists Infection control

	and when not to. Of programming issues specifically related to leads.	techniques	Cardiac surgeons
	Of the lead extraction systems including cutting, laser and diathermy sheaths, and the use of the femoral approach to lead extraction. Of the specific complications of lead extraction and of how to prevent/handle them.		To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

5. Mechanisms of arrhythmias, complex electrocardiography and the principles of intracardiac electrophysiology

Objectives	Knowledge	Skills	Attitude
To understand the principles underlying the main causes of cardiac arrhythmias at cellular and tissue level. Familiarity with the use of the surface ECG for arrhythmia management. To understand the classification of clinical arrhythmias based on their site of origin within the heart. A knowledge of the	Of re-entrant, automatic and triggered arrhythmia mechanisms. An understanding of the differences between anatomic and functional reentry, including spiral wave generation. Of the pathophysiology of atrial fibrillation, atrial tachycardia and flutter, junctionaltachycardias (including AV nodal tachycardia and the Wolff-Parkinson-White syndrome), ischaemic and nonischaemic VT.	History taking and appropriate examination in patients with or at risk of cardiac arrhythmias. Obtaining an adequate ECG record during an arrhythmia using available technologies. Demonstrate a systematic approach to interpretation of surface ECGs	Take a sensible, Professional attitude to the management of patients with arrhythmias, using non-invasive techniques and treatments appropriately, and conserving resources. To educate patients as to the treatment options open to them, to

pathophysiology of atrial fibrillation, atrial tachycardia and flutter, junctionaltachycardias (including AV nodal tachycardia and the Wolff-Parkinson- White syndrome),	Of distinguishing between the principle mechanisms of arrhythmias from the characteristics of the 12-lead surface ECG, and their response to certain manoeuvres such as vagotonic actions and drug administration. Of the causes of wide-complex tachycardias and morphological schemes for the diagnosis of VT. Of the use the surface ECG to assess the likely location of a critical tissue sustaining an arrhythmia, e.g. an accessory AV connection in the WPW syndrome. Of the ECG in Long QT and Brugada syndromes and right ventricular dysplasia (ARVD)/ cardiomyopathy (ARVC). Of the understanding of invasive electrophysiological studies (EPS) and their clinical indications. To have observed and understood invasive EPSs and	during arrhythmias. Demonstrate appropriate use of vagal manoeuvres and drugs for arrhythmias. Demonstrate familiarity with ECG schema for localising accessory pathways in WPW syndrome. An appreciation of the relevance and limitations of basic arrhythmia mechanisms in terms of clinical arrhythmia management. To be able to describe abnormal electrical activity in terms of the 3-D structure of the human heart in situ.	empower them to take their own decisions as to their preferred treatment strategy. To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

	radiofrequency ablations		

6. Intracardiac Electrophysiology Techniques

Objectives	Knowledge	Skills	Attitude
To successfully evaluate a patient presenting with a sustained narrow complex tachycardia and identify all possible electrophysiological mechanisms. To elicit key factors in the history to help to distinguish between different SVTs. To understand and be able to direct autonomic maneuvers in a clinic setting. To be able to select appropriate investigations to help diagnose the presenting arrhythmia. To correctly select patients appropriate for electrophysiological	Of the electrophysiology of supraventricular tachycardias and typical atrial flutter. Of medico-legal issues concerning consent and provision of information. Of the range of variation in presentations and clinical findings associated with different arrhythmia mechanisms. Of the range of ECG recording equipment for detecting intermittent arrhythmias and their appropriate use Of 3-dimensional cardiac anatomy. Of the equipment required for electrophysiological studies and catheter ablation. Of intracardiacelectrographic patterns in SVT and atrial flutter, and their	To communicate effectively with patients and their family and contacts to take an effective history. To communicate effectively with patients to gain informed consent. Competence in performing autonomic maneuvers. To prepare a patient for an electrophysiological study, safely and competently insert vascular sheaths and undertake the procedure. To safely and accurately manipulate electrodes in the blood vessels and heart.	Take a sensible, professional attitude to arrhythmia management, learn under supervision with appropriate requests for advice. Consent patients sensitively with an objective assessment of risks. Be aware of the importance of members of a multidisciplinary catheter laboratory team in safe performance of procedures Communicate effectively and positively with other professionals involved in the patient's care.

studies and catheter ablation. To safely and competently assist in an invasive electrophysiological study and interpret the findings. To assist in curative catheter ablation procedures. To safely and competently manage all drug therapy associated with care of the patient.	interpretation. Of ablation techniques and ability to use information from imaging and intracardiacelectrograms to guide and evaluate the effectiveness of ablation. Of potential complications of invasive electrophysiological procedures and their management. Of the pharmacology, side effects and interactions of drugs used in the management of these conditions. Of arrhythmogenic right ventricular dysplasia (ARVD) or cardiomyopathy (ARVC)	To accurately document records of all aspects of patient care. Technique of Transeptal punctures.	Remain calm and professional in the event of adverse complications. Be diligent in recording the management of the patient and achieving effective communication with Primary Care Physicians and other professionals involved To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

7. Ablation of SVT, Typical Atrial Flutter and Normal Heart Ventricular Tachycardia

Objectives	Knowledge	Skills	Attitude
To understand the principles and practical aspects of the use of conventional intracardiac recording to define the mechanism and precise site of origin of clinical cardiac arrhythmias. To understand the principles and practical aspects of the use of 3D mapping. To be familiar with catheter ablation techniques for the treatment of arrhythmias.	Of endocardial activation patterns in AF, atrial flutter, atrial tachycardia, AV nodal reentrant tachycardia, AV re-entrant tachycardia and VT. Of endocardial signals suggestive of critical sites for arrhythmia maintenance e.g. very early atrial or ventricular signals in WPW syndrome, slow pathway potentials in AV nodal reentrant tachycardia and mid-diastolic potentials in VT. Of the use of intracardiac programmed stimulation to induce and terminate tachycardias, aid in the diagnosis of dual AV nodal pathways, define the mechanism of a junctional reciprocating tachycardia, the presence of unidirectional or bidirectional isthmus block in patients presenting with atrial	Manipulation and positioning of electrophysiological recording, pacing and ablation catheters safely and effectively. Ability to recognize activation patterns characteristic of specific arrhythmias in "real time". Ability to successfully ablate cardiac arrhythmias based on interpretation of endocardial signals and pacing techniques. Perform entrainment, concealed entrainment and pace-mapping to identify sites critical for arrhythmia maintenance. Demonstrate endpoints of successful ablation. Safely deploy, set-up, interpret and use complex mapping systems.	A professional attitude based on an evaluation of the patient as a whole and an awareness of the efficacy, complications and costeffectiveness of invasive intracardiac techniques. To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively. To deliver a clear explanation of the risks and complications when consenting patients.

	flutter and pulmonary vein isolation in patients with AF. Of the use of pacing techniques to define critical sites for arrhythmia generation in patients with VT Of the principles underlying non contactintracardiac mapping, complex activation and potential maps. An understanding of benefits and limitations of these systems. Of the biophysics of RFA catheter ablation, and understanding of alternatives.	Demonstrate ability to identify electrical wavefronts during re-entrant arrhythmias and electrically silent areas in patients with VT or complex congenital heart disease. Use of these systems to demonstrate lines of block after catheter ablation lesions. To recognise and treat complications.	

8. Catheter Ablation for AF/AT & Non-Isthmus Dependent Atrial Flutter

Objectives	Knowledge	Skills	Attitude
To select appropriate patients for catheter ablation treatment for atrial fibrillation and complex atrial arrhythmias such as atypical atrial	Of risks associated with ablation of AF/AT/AFL, patient factors that may increase these and methods for reducing these risks. Of medico-legal	Good assessment of a patient with AF/AT/AFL appropriate investigations/ therapy to reduce intraoperative risk. Detailed working knowledge of cardiac and thoracic anatomy for	Willing to assess, counsel and investigate patients as outpatients. Willing to set up and work equipment used for AF/AT/AFL ablation including

flutter. To have a basic understanding of the anatomy and electrophysiology of the atria.	issues concerning consent and provision of information. Of the anatomy of the left and right atria and how this may be distorted by disease process. Of all tools used for ablation of AF/AT/AFL including transseptal puncture equipment, ablation catheter, electrophysiology systems (basic and complex), lesion generator. Anatomy, location of pulmonary veins and risks of cannulation Risks and complications associated with the energy source used and the location and nature of vulnerable regions in the atria and how to monitor and avoid complications of energy delivery. Short, medium and long term	AF/AT/AFL ablation. Satisfactory consent of patients for ablation. Able to safely and effectively sedate a patient for ablation of AF/AT/AFL and monitor throughout the procedure Able to perform femoral and subclavian puncture and intubate the right atrium and coronary sinus with electrode catheters in >80% of patients Able to deliver energy in all relevant regions of the atria with minimum risk. Able to monitor and investigate patients for possible complications arising from AF/AT/AFL ablation.	EP systems and ablation generator. Willing to consent patients for catheter ablation AF/AT/AFL ablation. Willing to participate in safe catheter ablation practice and obtain help when needed Willing to undertake central venous puncture and electrode catheter placement and obtain help when needed Willing to intubate the pulmonary veins with electrode and angiographic catheters. Willing to perform postoperative follow up and obtain help when needed. To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

	complications of AF/AT/AFL management their investigation and treatment		

9. Catheter Ablation for Ventricular Tachycardia

Objectives	Knowledge	Skills	Attitude
To understand the role of VT ablation in the overall management of patients with VT. To participate in ablation of normal heart VT To recognize and deal with VT Storms.	Of the indications and limitations of VT ablation. Of medico-legal issues concerning consent and provision of information. Recognition of the ECG features of normal heart VT.	Be able to select appropriate patients for VT ablation. Be able to consent a patient in a balanced and informed way about the success rate, risks and benefits of VT ablation. Demonstrate catheter manipulation skills necessary to perform VT ablation	Take a sensible and professional attitude to VT ablation; learn under supervision with appropriate requests for advice. Consent patients sensitively with an objective assessment of likelihood of benefit. Be aware of the importance of an overall view of the patient and see the arrhythmia in its wider context. To deal appropriately with patients in whom VT ablation has not been effective. To deal sensitively with end of life decisions in very sick patients with

			VT. To appreciate the psychological impact of the patient's illness on the patient and their family, and manage it sensitively.

10. Trans-septal puncture and catheterisation

Objectives	Knowledge	Skills	Attitude
To undertake trans-septal catheterisation (TSP) safely for access to the left atrium/ventricle during interventional electrophysiological studies and interventions. To manage the risks of TSP throughout any period of access to the left atrium/ventricle.	Define the anatomical arrangements in the atria with knowledge of the detailed anatomy of the inter-atrial septum, fossa ovalis, His bundle and coronary sinus. Of medico-legal issues concerning consent and provision of information Of the type of patients who will require access by TSP. Of the equipment required for safe effective access to the left atrium by TSP.	Be able to select appropriate patients for safe conduct of a TSP. Be able to consent a patient in a balanced and informed way about the risks and benefits of TSP. Be able to describe the setup and safe conduct of a TSP. Be able to prepare a patient for a TSP and undertake the procedure safely. Be able to recognise	Take a sensible, professional attitude to TSP, learn under supervision with appropriate requests for advice. Consent patients sensitively with an objective assessment of risks. Be aware of the importance of members of a multi-disciplinary catheter laboratory team in safe TSP. Remain calm and professional in the event of adverse complications of TSP.

	Of the anticoagulation regime required to minimise the risks of EP interventions in the left atrium/ventricle. Of potential complications, particularly the management of cardiac tamponade.	immediately when complications are occurring and minimise harm by taking appropriate action.	

11. Advanced assessment of the risk of life-threatening arrhythmias or sudden cardiac death (SCD) both inherited and acquired

Objectives	Knowledge	Skills	Attitude
To successfully identify patients at high risk of life threatening arrhythmias and SCD using evidence based protocols and awareness of risk in some hereditary cardiac conditions. To identify adults with poor LV function after myocardial infarction who are candidates for an ICD in keeping with the results of large randomized	Of the benefits in ICD therapy in high risk patients after myocardial infarction. Of medico-legal issues concerning consent and provision of information. Of the benefits of ICD therapy in patients with heart failure. Of the symptoms, physical signs, electrocardiography and other evidence of inherited structural heart disease or	To be able to assimilate electrocardiographic, haemodynamic, echocardiographic and other clinical data, in conjunction with evidence based guidelines from randomized, controlled trials to prescribe ICD and other potentially life-saving treatments in patients deemed to be at high risk. To determine which patients are at low risk, in whom treatment might be more harmful than	To appreciate the importance of multidisciplinary collaboration, especially with colleagues in other disciplines e.g. echocardiography, cardiac NMR imaging and other specialties such as clinical genetics in the risk assessment and screening of patients and families for inherited cardiac conditions. To appreciate the importance of cardiac risk on patients health and social well-being, and the impact on

controlled trials. To identify young adults at risk of SCD by assessing symptomatic patients for the presence of a structural cardiac abnormality e.g. HOCM, or a primary electrical disease that confers high-risk e.g. Long QT syndrome or Brugada syndrome. To understand the use and applicability of non-invasive, invasive and genetic testing effectively to screen family members of those who have suffered life-threatening arrhythmias or SCD for evidence of risk that might lead to preventative treatments.	primary electrical dysfunction of the heart that confers a high risk of life threatening arrhythmias or SCD. Of the use of provocative testing to assess risk e.g. drug infusion and programmed ventricular stimulation in the Brugada syndrome.	helpful.	education, family life, employment, driving and insurance especially in the young To appreciate that an accurate diagnosis (e.g. Long QT) and effective treatment has a huge impact on patients' lives. To appreciate the psychological impact of the patients' illness on the patient and their family and manage it sensitively.

12. Management of cardiac arrhythmias in patients with adult congenital heart diseases (ACHD)

Objectives	Knowledge	Skills	Attitude

To appreciate the role of arrhythmogenesis in the morbidity and mortality of the various conditions in patients with palliated or "corrected" congenital heart disease. To interpret cardiac arrhythmias and undertake risk stratification of identified arrhythmias in this patient population. To undertake sudden cardiac death risk stratification. To undertake complex interventions in this patient groups, including device implantation and ablation of arrhythmia mechanisms. To undertake management strategies which	Of techniques available to palliate symptoms and improve prognosis in ACHD patients Of all the complex anatomical variations occurring in and. Of the cellular level actions of antiarrhythmic drugs that may be employed. Of the related surgical procedures used for the management of ACHD. Of cross sectional imaging techniques that may assist interventions. Of diagnostic catheter based techniques used in the assessment of ACHD patients. Of appropriate catheter-based ablation interventions, and the complex technologies used in these procedures. Of therapeutic innovations and technology advances that will facilitate improved	To be able to select appropriate patients for drug or device or ablation management. To be able to consent a patient in a balanced and informed way about the success rate, risks and benefits of medical therapies and interventions. To be able to determine which patients will benefit from intervention or drug prescription. To be able to perform complex cardiac catheterization in the haemodynamic evaluation of ACHD patients. To be able to proceed with all types of device implants in the full range of complex intracardiac anatomies.	Take a sensible, professional attitude to arrhythmias occurring in ACHD; learn under supervision with appropriate requests for advice. Consent patients sensitively with an objective assessment of likelihood of benefit. Be aware of the importance of members of a multidisciplinary team in management of these complex patients who will often require surgical and psychological inputs for management. To deal appropriately with patients in whom arrhythmias cannot be effectively managed. To appreciate the

will determine long term outcome in respect of physiological monitoring and prevention of sudden cardiac death. To be able to undertake long term follow up of patients with arrhythmias and ACHD	patient care. Of the evidence base which mandates the various treatment strategies that may be employed. Of potential complications. Of appropriate endpoints that indicate successful medical therapy/device/ablation interventions.	To be able to undertake the complex range of ablation therapies using multiple access routes and complex catheter manipulations. To appreciate the interactions and adjunctive nature of various therapeutic strategies, including indications for surgery. To be able to provide all necessary clinical advice. To facilitate arrhythmia interventions at the time of surgery. To be able to programme any implanted devices appropriately, and to advice on optimization using recognized techniques such as echo after an intervention.	psychological impact of the patient's illness on the patient and their family, and manage it sensitively. To appreciate the psychological impact of an awareness of sudden cardiac death risk and manage it sensitively.

Section VII. Adult congenital heart disease

1. Adult Congenital Heart Disease

Objectives	Knowledge	Skills	Attitude
1. To be able to apply appropriately to the management of ACHD: (i). a knowledge of the substrate of congenital heart disease (CHD) (ii). the knowledge that CHD is a lifelong condition (iii). a knowledge of the natural and unnatural (operated) history of simple and complex CHD.	Define the anatomy of the heart and great vessels. Have a detailed understanding of cardiac embryology and development. Define both common and rare congenital defects, their morphology and nomenclature. Know that CHD is a continuum from fetal life to childhood to adult life. Define the natural history of simple and complex CHD.	Be able to take a relevant history and perform an appropriate examination. Be able to interpret paediatric, and to perform and interpret adult congenital echocardiograms. To be able to use echo to analyse the morphology and physiology of simple and complex CHD. Demonstrate the ability to educate adolescents and young adults about their condition and its impact on their life.	Appreciate the importance of the management of patients during the transition from paediatric to adult clinics. Recognise the importance of a multidisciplinary team in the managements of adolescents and young adults. Through attendance at paediatric and adult CHD clinics, recognise how CHD develops and may become modified throughout life.
2. To be able to apply appropriately the knowledge that the management of ACHD requires a multidisciplinary approach.	Define the unnatural (operated) history of simple and complex CHD. Know that CHD has a psycho-social as well as physical impact on the patient and their family. Be able to identify	Be able to communicate with the parents and carers of adolescents and young adults, whilst respecting patient confidentiality. Be able to communicate effectively within a multi disciplinary team. Be able to communicate sensitively with adolescents and young	Recognise which patients with CHD need lifelong specialist follow up. Appreciate the social and emotional difficulties encountered by patients with CHD. Appreciate the psychological impact of ACHD on patients

	the ways in which CHD may impact on patients' lifestyle. Be able to explain how patient education can empower young adults to take responsibility for their health.	adults.	and their families.
3. To apply a thorough understanding of CHD to the investigation of ACHD 4. To apply appropriately a knowledge of CHD to its medical and surgical treatment	Know how to investigate patients with CHD including the use and interpretation of non-invasive investigations such as echo and MRI, and invasive investigations such as cardiac catheterization and TOE. Know the extended role of MRI in the management of patients with ACHD. Know that congenital cardiac lesions and previous surgery may be associated with specific arrhythmias. Know the	Be able to explain the impact of CHD on adolescent and young adults' leisure and work activities. Be able to perform and interpret echocardiograms, including TOE, of patients with AACHD. Be able to interpret cardiac MRI images. Be able to undertake diagnostic cardiac catheterisations in patients with CHD. Be able to manage patients with arrhythmias and CHD. Be able to recognise the arrhythmias that are peculiar to some forms of CHD. Be able to evaluate	Appreciate the complex relationships that sometimes exist between patients with ACHD and their parents. Recognise the different and complementary contributions of different imaging modalities in the assessment of individual congenital cardiac lesions. Recognise the urgency of treatment of arrhythmia in some patients with ACHD. Recognise the need for first time and repeat operations in ACHD. Appreciate the need for effective communication with

	indications for first time and repeated cardiac surgery for ACHD Identify potential complications faced by patients with CHD undergoing non-cardiac surgery.	patients at particular risk from arrhythmia. Be able to oversee the perioperative care of patients having surgical correction of CHD and recognise the postoperative and iatrogenic complications faced by patients with complex disease. Be able to assess the risk of noncardiac surgery and provide appropriate advice on perioperative management to avoid complications; especially the special risks faced by patients with complex disease.	healthcare professionals involved in the care of ACHD patients undergoing non-cardiac surgery.
5. To be able to apply appropriately a knowledge of CHD to catheter based treatment of ACHD (Specific example: performing and assessing suitability for device closure of atrial septal defect (ASD) or patent foramen ovale: Type 1 trainees)	Know that patent foramen ovale and secundum ASD defect may not exist in isolation. Know that both are associated with other lesions that may need simultaneous device closure or	To be assessed as competent in diagnostic ACHD cardiac catheterisation before performing interventions. Be able to undertake catheter based interventions, including joint procedures with paediatric interventional cardiologists for complex interventions. Be able to perform and analyse TOE to identify different types of ASD and assess suitability	Recognise the need to audit all CHD activity. Recognise the need to contribute data on all CHD interventions to the national CHD database Recognise the desirability of a team approach to complex CHD interventions Recognise the need for continuous TOE or

6. Pregnancy & sexual health See separate curriculum	may make the index defect unsuitable for device closure. Know that the severity of coexistent acquired lesions such as mitral valve disease may be underestimated in the presence of ASD. Be able to define and identify the different types of interatrial communication.	for closure. Be able to identify contraindications to device closure. Be able to evaluate MV disease in the presence of ASD. Be able to assess pulmonary vascular resistance in the presence of a shunt. Be able to interpret pulmonary haemodynamic data in evaluating the suitability of an intracardiac repair.	intracardiac echo monitoring during device closure of cardiac defects.

Section VIII. Primary prevention and cardiac rehabilitation

Cardiovascular Disease prevention – risk factors, assessment and management

Objectives	Knowledge	Skills	Attitudes
• To assess and treat patients with risk factors for cardiovascular disease. • To be able to evaluate how different prevention methods work. • To describe cardiovascular disease and risk factors in the local community. • To contribute in the global efforts in reducing cardiovascular morbidity and mortality by communicating the prevention massage to the public. • To approach risk prevention in a hostilic way, understanding the potentiation of cardiovascular risk by clustering of risk factors.	• Define epidemiology of cardiovascular disease in the local community, incidence, prevalence, survival. • Define risk factors and describe distribution and frequency of high risk conditions in the local community. • Explain risk assessment in primary prevention, multifactorial risk interaction: risk scoring charts. • Explain diet and nutrition in relation to cardiovascular risk management. • Describe special treatment/prevention strategies for smoking, dyslipidaemia, diabetes mellitus hypertension, physical inactivity, left ventricular hypertrophy (LVH), obesity, metabolic syndrome, psychosocial factors. • Recognize that risk factors often cluster and require a comprehensive approach. • Explain risk assessment in secondary prevention including drug therapy. • Recognize the complications and consequences of specific risk factors.	• Take a relevant history and perform an appropriate clinical examination. • Evaluate CVD risk and assess global CVD risk at individual level (mortality, morbidity, disability) • Evaluate the benefits of prevention at individual and population levels. Manage risk factors appropriately and communicate their importance to patients. Their families and the wider community. • Evaluate the risk of CVD for an individual patient. • Evaluate the benefits of risk factor intervention for the individual patient.	• Appreciate the importance of risk factor management. • Appreciate variation in CVD risk across population, socio-economic, gender and racial groups. • Through patient education encourage a healthier lifestyle with specific emphasis on risk factors and maintainance of favorable risk profile over lifetime. • Offer advice and support to family members with inherited CVD. • Cooperate with other specialists such as dieticians, diabetologists and specialized nurses. • To participate actively at CVD prevention programs (children, adults and elderly). • To consider cost-effectiveness of the prescribed treatment regimen.

CORE CURRICULUM OF PREVENTIVE CARDIOLOGY:

1. Risk assessment and atherosclerotic risk factor management.
2. Lipidology – including dietary and pharmacologic lipid management, as well as patient monitoring and follow-up.
3. Exercise Physiology/Cardiac Rehabilitation – This will include exercise testing and interpretation, exercise kinetics, exercise prescription, supervision and monitoring of exercise testing/exercise programs. Additionally, risk stratification and determination for need for ongoing monitoring will be covered.
4. Hypertension Management – This will include evaluation of hypertension and tailoring of longitudinal hypertensive regimens.
5. Psychosocial Screening/Behavioral Counseling – This will include introduction to psychosocial screening tools, behavioral counseling, psychosocial interventions, etc.
6. Diabetology/Management of Insulin Resistance
7. Vascular Biology – Including understanding of endothelial health and dysfunction, atherosclerosis progression and regression and hemostatic components of atherosclerotic disease, etc.
8. Cardiovascular Outcomes/Epidemiology in Clinical Trials – This will include didactic and applied learning principals of preventive medicine, outcomes assessment, statistics, clinical epidemiology, and cardiovascular risk stratification and screening.

SECONDARY AREAS (OPTIONAL):

9. Non-invasive Atherosclerotic Imaging - including ultrasound of the carotid and femoral arteries, cine CT, MRI, nuclear perfusion stress testing and cine CT screening for coronary calcification.
10. Prevention of Congestive Heart Failure – smoking, alcohol, health education tool/model preparation, counselling.

Syllabus of cardiac rehabilitation

1. Benefits of exercise in heart disease
2. Physical activity after heart attack
3. Physical activity at home after discharge
4. Supervised exercise in heart disease

5. Long term exercise plan
6. Exercise in special situations
7. Coronary heart disease risk factors
8. Rest, sleep, recreation, and medication in heart disease
9. Sex and heart disease
10. Stress management
11. Return to work after heart attack
12. Guidelines for recovery after CABG (Coronary Artery Bypass Grafting)
13. Care after heart valve replacement
14. Guidelines for recovery after coronary balloon angioplasty (PTCA)

Section IX. Cardiac Pharmacology

Clinical Pharmacology

Objectives	Knowledge	Skills	Behavior and Attitudes
• To master the theory and practice of state of art of pharmacological treatment of cardiovascular disorders.	• Recognize the classification and mode of action of drugs (with emphasis on angiotensin-receptor blockers, aldosterone antagonists, antiarrhythmic drugs, beta-blockers, calcium antagonists, diuretics, lipid lowering drugs, antiplatelet agents, anticoagulants, inotropes, digitalis, nitrates, other vasodilating drugs, drugs with cardiac toxicity and other drugs with novel mechanisms of action like rennin inhibitors or potassium channel blockers). • Recognize for the drugs listed above: 1. Pharmacokinetics (absorption, bioavailability, distribution, biotransformation, excretion) 2. Pharmacodynamics 3. Pharmacogenetics 4. Indications 5. Contraindications 6. Interactions 7. Adverse effects and toxicity • Perform and interpret diagnostic tests to assess drug efficacy and safety (laboratory tests, ECG and haemodynamic monitoring, echo). • Describe basic knowledge of randomized clinical trials and evidence based medicine.	• Take a relevant history of a patient's medication regimen, including purchase of over the counter medicines. • Assess the risks and benefits of prescribing an individualized drug treatment regimen for a given cardiovascular condition. • Monitor the desired effects of a patient's drug therapy and also the side effects. From this be able to make appropriate modifications to the treatement regimen. • Recognize and manage possible drug interactions (including treatements of	• Incorporate the principles of evidence based therapy and current guidelines in to clinical practice. • Communicate with patients and their family members to improve treatment compliance, and to ensure early recognition of possible adverse effects. • Consider cost-effectiveness and feasibility of the prescribed treatment regimen.

		concomitant disease). • Evaluate the design and results of published clinical trials. • Identify and incorporate the importance of herbal remedies taken by patients.	

Syllabus of clinical cardiac pharmacology

1. Beta-blockers:
   - New concepts
   - Beta-receptors
   - Mechanism of action
   - Dosage considerations
   - Pharmacologic properties and clinical implications
   - Salutary effects of Beta-Adrenergic Blockade
   - Beta-Blockers versus Calcium Antagonists and Oral Nitrates
   - Indications for Beta-Blockers
   - Advice and adverse effects
   - Individual Beta-Blockers
   - Which Beta-Blocker is best for which patient

2. Beta-Blocker controversies
   - Beta-Blocker are not a good initial choice for hypertension: True or False?
   - Beta-Blockers are not recommended for treatment of elderly hypertensives: True or False?
   - Beta-Blockers cause diabetes: True or False?
   - Do all Beta-Blockers cause Glucose intolerance?

- Beta-Blockers should not be given to patients during the early hours of acute MI: *True or False?*

3. Angiotensin-Converting Enzyme inhibitors and Angiotensin II Receptor Blockers
   - Mechanism of action
   - ACE inhibitors versus other vasodilators
   - Clinical indications
   - Contraindications
   - Advice, Adverse effects and interactions
   - Individual ACE inhibitors
   - Angiotensin II Receptor Blockers

4. ACE inhibitor controversies
   - ACE inhibitors versus ARBs: does the choice matter
   - ACE inhibitors / ARBs cause renoprotection: True or False?
   - ACE inhibitors decrease the incidence of diabetes: True or False?
   - Combination of ACE inhibitor and ARB proven effective: True or False?
   - ACE inhibitors for HF with preserved systolic function

5. Calcium Antagonists (Calcium Channel Blockers)
   - Mechanism of action
   - Major calcium antagonists
   - When to choose a calcium antagonists
   - Indications for calcium antagonists
   - Which calcium antagonists to choose
   - Combination of calcium antagonists with beta blockers, nitrates or digoxin

6. Calcium Antagonists Controversies
   - Calcium antagonists and heart failure.
   - Are calcium antagonists useful for hypertensives with CAD?

7. Diuretics
   - Indications
   - Thiazides

- Loop diuretics
- Potassium-sparing diuretics
- Other diuretics
- Potassium chloride supplements

8. Hypertension
   - Which drugs to choose
   - Beta-Blockers
   - Diuretics
   - ACE inhibitors and angiotensin II receptor blockers
   - Calcium antagonists (extended release)
   - Centrally acting drugs
   - Alpha1- blockers
   - Hypertensive crisis

9. Hypertension controversies
   - Beta-Blockers should not remain first choice in the treatment of primary hypertension: True or False?
   - Diabetic risk with Beta-Blockers and diuretics
   - Hypertensive agents increase heart failure risk: True or False?
   - Is angioedema a significant risk with ACE inhibitors?
   - Age and ethnicity hold the key for drug choice.
   - Recommendations for future randomized trials

10. Management of angina
    - Treatment of stable angina
    - Management of unstable angina
    - Variant angina (Prinzmetal's)
    - Controversies
    -

11. Management of Acute Myocardial Infarction
    - Limitation of infarct size and increased survival
    - Percutaneous coronary intervention
    - Thrombolytic therapy
    - Antithrombins
    - Beta-Blockers
    - ACE inhibitors
    - Nitrates
    - Statins

- Magnesium
- Management of complications of infarction
- Management of Non-ST-Elevation Myocardial Infarction

12. Management of heart failure
    - Vasodilators
    - Diuretics
    - Aldosterone antagonists
    - Beta-Blockers
    - Inotropic agents
    - Management of pulmonary oedema

13. Heart failure controversies
    - Management of heart failure preserved ejection fractions (HFPEF)
    - Digoxin is not useful for HFPEF: True or False?
    - Is CHARM-preserved a clear study of HFPEF?
    - Does an ACE inhibitor combined with an ARB improve outcome?
    - Aldosterone antagonists: Useful but Harmful?
    - Heart failure in blacks: Do difference exist?
    - Should the role of natriuretic peptides be expanded?
    - Is Nesiritide a useful addition?
    - Are statins recommended for patients with heart failure?

14. Management of cardiac arrhythmias
    - Management of supraventricular arrhythmias
    - Ventricular arrhythmias
    - Ventricular tachycardia

15. Cardiac arrest
    - Life-Saving procedures
    - Drug therapy

16. Management of infective endocarditis
    - Therapy
    - Prophylaxis of bacterial endocarditis

17. Management of dyslipidaemia
    - Dietary therapy

- Guidelines for drug therapy
- Statins
- Combination therapy
- Nicotinic acid
- Fibrates
-

18. Statin controversies
    - High intensity statin therapy causes significant regression of coronary atheroma: *True or False?*
    - LDL cholesterol: How low should it be for stable CAD patients?
    - Rhabdomyolysis is a cause for alarm: *True or False?*
    - Statin interactions
    - Do fibrates have a role in treatment of CVD?

19. Antiplatelet agents, anticoagulants, specific thrombin inhibitors
    - Antiplatelet agents
    - Anticoagulants
    - Specific thrombin inhibitors

20. Cardiac drugs during pregnancy and lactation
    - Antihypertensive agents in pregnancy
    - Drug therapy for heart failure in pregnancy
    - Antiarrhythmic agents in pregnancy
    - Cardiac drugs during lactation

21. Effects of drug interactions
    - Interactions of cardiovascular drugs
    - Antiarrhythmic agents
    - Antiplatelet agents / anticoagulants
    - Beta-Blockers
    - Calcium antagonists
    - Digoxin
    - Diuretics
    - Nitrates
    - Lipid-Lowering agents
    - Thrombolytic agents
    - Interactions of cardiac and non-cardiac drugs
    - Cardiac effects of non-cardiac drugs

22. Hallmark clinical trials

- Acute coronary syndrome RCTs
- Heart failure RCTs
- Aldosterone antagonists trials
- Hypertension trials
- Statin RCT s
- Arrhythmia RCT s
- Beta-Blockers and diabetes
- Clopidogrel
- Clopidogrel/Beta-Blockers
- Folic acid / B6, B12

Annex 2. Portfolio

The Portfolio must be presented under the following sections:

1. Log of special technique experience sessions.
2. Log of clinical services.
3. Log of academic activity.
4. Log of general professional conduct.

1.1 Log of special technique experience sessions:

The log book must contain records in the following areas:

		Year 1 No.	**Year 2** No.	**Year 3** No.
1. **Cath lab sessions**	(a) Invasive (b) Interventional			
2. **2D Echo**				
3. **TOE**				
4. **3D**				

5. **Pace maker lab sessions**	- VVI - VVRR - IDDD - ICD			
6. **Electrophysiology attachment** (4 weeks)	- PPM programming - ICD programming - Tilt table testing			
7. **Cardiac rehabilitation attachment** (4 weeks)	- Exercise programme, - Health education, - Life style modifications, - Counselling techniques,			
8. **Cardio thoracic attachment** (4 weeks)	- Data required for pre-op assessment for proper planning of surgical procedures. - Cardiac intensive care - Intra operative TOE			
9. **Coronary care unit sessions**	- Cardiac output measurements - Fibrinolysis - Cardioversion - Defibrillation - Tachypacing - Temporary pacing (transvenous, transthoracic)			
10. **Noninvasive electro**	- stress ECG			

cardiology sessions	- Holter monitoring			
11. **Paediatric cardiology attachment** (4 weeks)	- Special procedures in neonatology - Paediatric echo - Paediatric therapeutics - When to refer for surgical intervention			
12. **Nuclear cardiology attachment** (1 week)				
13. **Community cardiology** (3 months) in a peripheral hospital				

1.2 <u>Cath labs sessions: Areas of competence</u>

		Year 1 No.	**Year 2** No.	**Year 3** No.
1. Coronary angiography	- Femoral - radial			
2. Coronary angioplasty or stenting (Selection of lesion for PTCA)				
Experience in PTCA	- Primary - unstable angina - chronic stable angina			
3. Device closure	- ASD - PDA - VSD - AV fistula			
4. Valvuloplasty	- Mitral (Technique, Pre-procedural assessment) - Aortic - Pulmonary			
5. RHCC/LHCC studies				
6. Alcohol ablation of HOCM				
7. Catheter based therapy of other conditions	- coarctation of aorta - ruptured sinus valsalva			
8. Other	- carotid, renal etc - Embolization of MAPCA - atrial septotomy			

1.3 **Record of special/complicated cases**

Serial No	Cath. Register No.*	Procedure	Operator status	Notes on problems	Critical comments
	*Enter the date and the No given in the cath lab register for these cases.	Indicate whether diagnostic CA or graft CA etc.	1st operator 2nd operator Observer	Record the problems and difficulties encountered during the procedure and all complications which occurred. Note in detail the techniques used to overcome the problem(s), the therapeutic interventions and innovations used to treat the complication(s).	Critically assess the indications, choice of procedure, selection of catheters, devices etc. Make a critical evaluation on the techniques used to overcome the problems, remedies employed to treat complications.

*A minimum of 50 such cases must be entered.

1.4 **Pace maker lab sessions: Areas of competence.**

		Year 1 No.	**Year 2** No.	**Year 3** No.
1. Temporary Pace maker insertions				
2. Permanent Pace maker implants	- Single chamber - Dual chamber			
3. Other	- Lead extraction - Epicardial screw electricity			

Log of PPM lab experience: Record of special/complicated cases:

Serial No	Cath. Register No.*	Procedure	Operator status	Notes on problems	Critical comments
	*Enter the date and the No given in the cath lab register for these cases.	Indicate whether diagnostic CA or graft CA etc.	1st operator 2nd operator Observer	Record the problems and difficulties encountered during the procedure and all complications which occurred. Note in detail the techniques used to overcome the problem(s), the therapeutic interventions and innovations used to treat the complication(s).	Critically assess the indications, choice of procedure, selection of catheters, devices etc. Make a critical evaluation on the techniques used to overcome the problems, remedies employed to treat complications.

1.5 <u>Log of cardiac electrophysiology and arrhythmia sessions – Areas of competence.</u>

	Sessions attended
1. Approach to diagnosis, investigation and management of the patient with cardiac arrhythmias, with special emphasis on indications and contra-indications to invasive cardiac electrophysiology testing.	
2. Discussion of invasive procedures and consent issues in patients requiring invasive electrophysiology or catheter/surgical ablation.	
3. Conduct of an invasive diagnostic electrophysiology test (ie; equipment; catheters; pre-medication and sedation; intra-operative analgesia and sedation; venous and arterial access; trance-septal and retrograde approaches to the left heart; coronary sinus cannulation).	
4. A systematic approach to a diagnostic electrophysiology study in patient with i. Narrow QRS tachycardia ii. Broad QRS tachycardia iii. Syncope and risk stratification in some	
5. Curative therapy for arrhythmias – catheter ablation: general concepts; energy sources; and catheter design; mapping of arrhythmias; specifies of pathway ablation; AV-nodal modification for AVNRT (AVJRT) and complete AV-nodal ablation for paroxysmal or permanent atrial fibrillation; atrial flutter ablation; mapping and ablation of ventricular tachycardia; noval approaches curative ablation for atrial fibrillation.	
6. Pacing therapies for prevention and control of paroxysmal atrial fibrillation – including device selection, lead implantation and testing.	
7. Implantable-defibrillator therapy: indications; implant technique; intra-operative testing under sedation or general anesthesia; patient follow up and management of patients following shock therapy; psychotherapy and	

rehabilitation issues.	
8. Arrhythmias in children: limited exposure to the differential diagnosis of arrhythmias in the paediatric age group – including the approach to invasive electrophysiology testing and ablation.	
9. Permanent pacing for bradycardias – single and dual-chamber systems; device selection; and lead positioning; device programming and follow-up.	
10. Multi-size pacing as an adjunct to heart failure therapy ('resynchronization therapy') – limited training will be available depending on progress in skills at pacing for brady-arrhythmias.	

1.6 <u>Log of cardiac rehabilitation</u>

	Sessions attended
1. Exercise sessions supervised	
2. Health education sessions provided	
3. Counselling sessions participated	

4. Comments / observations / suggestions

(i).

(ii).

(iii).

1.7 **Log of community cardiology**

2. Cardiological problems identified as priority in the community (i). (ii). (iii).
3. Problems encountered in delivering of cardiac case (i). (ii). (iii).
4. Proposals for remedial activity A. Short term (i). (ii). B. Long term (i). (ii).
5. Comments (i). (ii). (iii).

To write an essay (1500 words) on cardiovascular and/or NCD prevention at

a) Peripheral / provincial hospital level

b) National level – with emphasis on

(i). Importance of controlling the CV diseases epidemic

(ii). Personal needs

(iii). Financial aspects

(iv). Mobilization of resources from private sector NGOs

(v). Interaction with existing services

(vi). Mobilization of allied health sector workers including arurvedic doctors

(vii). Public health education sessions

(viii). Importance of monitoring facilities

(ix). Regular follow up

(x). Empowering patients to be responsible for their health

2. **Log of clinical services:**

		Year 1 No.	**Year 2** No.	**Year 3** No.
1. On call services to	- Medical - Surgical - Obstetric - Accident units. (A & E)			
2. Ward rounds				
3. Weekend/PH clinical duties				
4. Outpatient clinics	- general follow up - special clinics			
5. Cardiac consult	Record interesting, challenging problems referred from other units with - Brief case summary - Problems encountered - Methodology used to solve the problem			

3. Log of academic activity:

1. Undergraduate teaching sessions. - Topics
   (i). …….
   (ii). ……
   (iii). ……
   (iv). …….

2. Postgraduate teaching sessions. - Topics
   (i). ……..
   (ii). ……..
   (iii). ……..
   (iv). ……..

3. CME presentations. - List topics
   (i). …….
   (ii). …….
   (iii). …….
   (iv). …….

4. Research projects or audits. -
   Heading -
   Background -
   Objectives -

   CPR sessions conducted for junior doctors and nursing staff.

5. Familiarity with prescribed texts.

6. Familiarity with ACC/ESC guidelines.

The portfolio should include the following descriptive reports:-

1. Detailed complex cardiac problems with differential diagnosis and discussion of symptoms, physical signs, investigation and management (3 cases).

2. Detailed 2D echo – adults and paediatric. (doppler, tissue doppler, 3D) (15 reports).

3. Detailed reports - ECG – IHD, cardiomyopathy (3 reports).

   - ECG – arrhythmia (3 reports).

4. Interesting case reports (3 reports).

4. Log of general professional conduct:

	Year 1	Year 2	Year 3
1. Relationship with peers. - Comments from other specialists.			
2. Relationship with colleagues.			
3. Interaction with patients.			
4. Attendance.			
5. General attitudes towards Professionalism. (commitment, responsibility, reliability, Patient first).			
6. Reaction in adverse (stressful) clinical situations.			
7. Interaction with relatives.			

*The assessment in this log will be as

- Unsatisfactory
- Needs improvement
- Satisfactory

SR – Year 01 – Subspecialty training Basic level – essential skills

		*1st quarter	*2nd quarter	*3rd quarter	*4th quarter
1. CCU care – direct involvement in assessment, investigations, management of all categories of cardiology emergencies The trainee should be very familiar with standard protocols and should help in formulation and modification of relevant management protocols.	- Acute myocardial infarction - cardiogenic shock - Arrhythmias - Acute pulmonary oedema - Hypertensive crisis	Y/N			
Basic skills to be acquired	- Basic life support, Advanced life support				

- Temporary pacing - Arterial BP monitoring - CVP line insertion - Swan-Ganz catheters, PCWP measurement - Pericardial aspiration - C-Pap management - IABP insertion and management - Defibrillation, cardioversion - External pacing				

2. Inpatient and outpatient care- Routine care of patients admitted for	(i). Assessment – to be able to critically evaluate the investigations for which patient is admitted. (ii). Treatment – plan out management protocols in the • Short term – involving days • Intermediate term – involving weeks • Long term – involving months and years (iii). Recommended – • Assist ward rounds for 2 sessions per week • Conduct outpatient clinics on their own (independent) for 2 sessions per week		Inpatients Outpatients		
3. Routine management involvement will include	(i). On-call emergency rota (ii). Liaison with cardiac surgeons (iii). Liaison with SR level medical officers in other specialties				
4. Investigations	(i). ECG				

to be thoroughly familiar with	(ii). Radiography (iii). Fluoroscopy (iv). 2D echo (v). Doppler (vi). Transoesophageal echo (vii). Stress testing (viii). Holter monitoring (ix). tilt testing				

*To be filled in by Y/N response only

The trainee is required to enter all procedures / relevant activities performed during each session, entering the date and the time of the session.

The logs will be assessed at 3 months interval for years and then at 6 months deemed appropriate. The log of general professional conduct will be filled in by the traineer.

The trainee will be expected to spell out his/her own perceptions and deficiencies in his knowledge, skills and training so that these could be specifically addressed.

Annex 3. Guidelines to prepare the Research Proposal

Section 1

1. Name of trainee
2. Name(s) of supervisor(s)
3. Training centre

Section 2

1. Project title
2. Background and justification
3. Objectives of study
4. Research plan
    a. Design
    b. Setting
    c. Method
    d. Sample size and sampling techniques
    e. Outcome measures
    f. Statistical analyses and plan of presentation of results
    g. Ethical considerations
    h. Work plan and time lines
5. References

6. Funding for study
7. Signature of trainee

Section 3

Recommendation of supervisor(s)

Signature of Supervisor 1	Signature of Supervisor 2
Date	Date

Section 4

Date of submission to PGIM

Date of approval by BOS	Signature of Secretary BOS

Annex 4. Guidelines for evaluation of the Research Proposal

1. **Name of Trainee:**

2. **Training Centre:**

3. **Supervisor:**

4. **Reviewer:**

Name:

Designation: Address Official:

Tel//Fax: Email:

5. Title of Project:

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6. Please comment on each of the following headings.

6.1 Introduction : Rationale(Justification) – problem identified and quantified. Hypothesis and expected outcome, impact and relevance of the study.

Comment : …….

6.2 Literature Review: Adequacy (evidence of a systematic search for related. similar, relevant studies)

Comment : ……..

6.3 Objectives : Clearly defined . relevant and stated in measurable terms .

Comment : ……..

6.4 Method: Appropriate study design to address the objectives with clear detailed description of subjects, sampling technique and sample size, interventions , data collection and management. The study should be , internally valid and reproducible. Where specific details are available in the literature, reference should be made to the original papers, and comments kept to a minimum. If modifications have been made to the published techniques, these should be described in full. Appropriate statistical tests planned should be mentioned and ethical issues addressed

Comment : ……..

6.5 Results: Order of presentation and appropriate presentation of tables, figures, graphs. Appropriate statistical analyses and interpretations

Comment :…….

6.6 Discussion: The findings of the study should be discussed taking into consideration findings of relevant studies, within and outside the country. The discussion should not be a repetition of the results only. Limitations should be included.

Comment :……

6.7 Conclusion and recommendation: Based of the results of the study and to address the objectives

Comment : ……

6.8 Limitations: Any inherent and / or inadvertent biases and how they were dealt with.

Comment :……

6.9 References: According to the Vancouver system and relevant to the study. Properly documented in the Bibliography and appropriately cited in the text

Comment : ……

6.10 Institution(s) where work would be carried out:

6.11 Ethical considerations/institution from where ethical approval will be /has been obtained:

Comment : ……

6.12 Overall presentation: Overall presentation of the proposal (grammar, spelling, typographical mistakes etc.

Comment : ……

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7. Recommendation of reviewer:

Comment : ……

- Is the dissertation acceptable? Yes / No

- If No, What corrections are required? (Attach a separate sheet of paper if necessary)

Signature: **Date:**

---

8. Recommendation of the BOS:

Signature of Chairperson/Secretary: **Date:**

Annex 5. Instructions to the Research Project Supervisor

- The research paper publication based on a 2-3 year research project.
- Acceptance of the research paper is a requirement to sit the PBCA.
- The trainee should write up the project work as a research paper.
- The supervisor should guide the student in planning and designing, carrying out the research and in presentation of the work.
- The supervisor should obtain recommendation of the research proposal from a reviewer.
- The supervisor should forward Progress Report(s) in the prescribed form every six months.
- The objective of the research project is to prove the trainee's capability to plan, carry out and present his / her own research. The purpose of this training is to ensure maturity, discipline and scholarship in research.
- The research paper should comprise the trainee's own account of his / her research.
- It must contribute to existing knowledge of clinical problems in cardiology relevant to Sri Lanka and afford evidence of originality as shown by independent, critical assessment and / or discovery of new facts in the area under study.
- It should be satisfactory as regards literary presentation.
- The research paper published should be certified by the superviso.
- General Comments on the contents: The objectives should be clearly stated and should be feasible to achieve within the time frame. Other published work relevant to the problem (both international and local) should be comprehensively covered and critically evaluated. An appropriate study design and method should be used to achieve the objectives stated. The results should be appropriately analysed, interpreted and presented effectively. The discussion should include comments on the significance of results, how they agree or differ from published work. If they differ, the probable reasons for these differences need to be discussed. Theoretical / practical applications of the results, if any should be given. The conclusions should be valid and be based on the results obtained on the study.
- Ethics: The candidate should confirm and document that procedures followed were approved by the Ethical Committee of the institution where the work was carried out and ethical approval was obtained by a recognized Ethical Review Committee.

- Prior to submission of the research paper for publication, the trainee will be required to make a short (15 – 20 minutes) presentation of the project once completed, to the SpB members and other invitees This will give the trainee an opportunity to discuss his / her work and obtain a feedback from peers and colleagues. It will not be used for evaluation in any form. The supervisor will also be invited for these presentations.
- If at any time the supervisor is not satisfied with the work progress of the trainee, the trainee should be made aware of the deficiencies and corrective measures suggested. This should be conveyed in writing to the trainee with a copy to the BOS. In such instances, a follow-up report should be forwarded within three months or earlier if necessary to the BOS.

Annex 6. Research project progress report

To be forwarded by the supervisor to the BOS at least once in SIX months

Name of trainee:

1. **Training Centre:**

2. **Supervisor:**

3. **Title of project:**

4. **Description of work carried out to date:**

To be filled in by trainee: briefly describe progress in lab / field work and dissertation writing

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Supervisor's comments

5. **Is the work on schedule**? Yes / No

6. **Progress in dissertation writing**: satisfactory / unsatisfactory

7. **Constraints** (if any)

8. **Recommendation of supervisor**:

Signature: Date:

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9. **Recommendation of the BOS:**

Signature of Secretary: Date:

Annex 7. Guidelines for preparation of the Dissertation

It is essential to start writing the dissertation early and in all cases before the data collection is completed. At the same time, you should make arrangements to have your manuscript word-processed. Your supervisor should be consulted before you start to write and thereafter at regular intervals. It is much easier to make corrections if the draft is double-spaced and printed on only one side of the paper.

The past tense should be used. To avoid exceeding the given word limit, it is suggested that an approximate running total is kept. The metric system and the International System (SI) of units should be used whenever possible.

Length

An ideal length of text is approximately 8000 words, which equals to about 20 - 30 pages. With figures, references, etc., the total length is likely to be in the region of 30 - 40 pages.

Number of copies

Three copies should be submitted to the Director/ PGIM, spiral-bound in the first instance in addition to the soft copy. After obtaining the necessary pass mark (and doing necessary corrections), all three copies should be bound in hard covers (black) with the author's name, degree and year printed in gold on the spine. The front cover should carry the title, author's name and year printed in gold. One copy will be returned to the student, one retained by the supervisor, and the third housed in the PGIM library. This procedure should be completed before board certification.

Layout

The dissertation should be word-processed and printed both-side, on A4-size photocopying paper.

Layout of typescript

There should be 1.5" on left-hand and top margins, and 1.0" on right-hand and bottom margins. It is especially important that the left-hand (binding) margin is of the regulatory size.

Line spacing should be1.5.

Lettering should be in Calibri, font size 11.

All pages should be numbered consecutively throughout, including appendices. Page numbers should be inserted in the bottom right hand corner.

Tables, diagrams, maps and figures

Wherever possible, these should be placed near the appropriate text. Tables should be numbered in continuous sequence throughout the dissertation. Maps, graphs, photographs, etc., should be referred to as Figures. Each of these should also be numbered in a continuous sequence. Colour should be avoided in graphic illustrations (unless it is essential) because of the difficulty of photographic reproduction; symbols or other alternatives should be used instead.

Notes

Notes, if essential, should be inserted, in reduced font, at the foot of the relevant page. If too voluminous for this to be practicable, they should be placed in an Appendix. Notes may be typed in single spacing.

Abbreviations

Where abbreviations are used, a key should be provided.

Preliminaries

The preliminaries precede the text. They should comprise the following:

Title page

Title of dissertation

Author's name

MD (Orthodontics)

Post Graduate Institute of Medicine

University of Colombo

Date of submission

1. *Statement of originality: The work presented in the dissertation should be the trainee's own and no part of the dissertation should have been submitted earlier or concurrently for any other degree. The statement should be signed by the author, and countersigned by the supervisor.*
2. *Abstract: Should be structured (introduction, objectives, method, results, conclusions) Should not include figures, tables, graphs or references Should be limited to 500 words or less*
3. *Table of contents: The table of contents immediately follows the abstract and lists in sequence, with page numbers, all relevant divisions of the dissertation, including the preliminary pages.*
4. *List of tables: This lists the tables in the order in which they occur in the text, with the page numbers.*
5. *List of figures: This lists all illustrative material (maps, figures, graphs, photographs etc) in the order in which they occur in the text, with the page numbers.*
6. *Acknowledgments*

These sections beginning from the title page are given consecutive Roman numerals

The remainder of the text is numbered sequentially in Arabic numerals

Chapter 1- Introduction

This is to "set the scene" for the work that is to follow. It is a short piece of descriptive writing. It has an historical component to introduce the topic. There follows a brief outline of the present state of knowledge and the broad area to which your research will contribute. This section should be no longer than a side and a half of A4.

Chapter 2- Literature Review

This chapter should include reports on the relevant literature.

There are two acceptable styles. The first is a report of what the literature tells you and avoids criticism or analysis of what each paper records. The second approach has a more analytical and critical approach to its description of the literature. Different supervisors may take different approaches. You should ensure that you are clear which your supervisor prefers.

The number of papers that you read and include in the literature review depends on what is available. For example, a literature search on "The adhesion of composite resin to dentine" will record many more papers that one on "airflow patterns in high volume suction". In the former, only those that were focussed around your particular area of investigation would be included, whilst for the latter you could probably include just about everything that has been written on the subject.

The review is not intended to be exhaustive: it is targeted towards the focus for the research. It may point out shortcomings in the available literature. It should give the basis for why the research study is necessary.

It should make use of section headings. These will be numbered according to standard convention. It is generally good style to minimise the number of orders of heading. Three should be sufficient. More than this tends to look unattractive.

Excessively long reviews are unlikely to attract favourable comment. However, where a more extensive review has been necessary, a final section entitled "Conclusions to the Review of the Literature" may help the reader.

Once the literature review has been completed, it should not be revisited at the same time of final writing up. Sometimes the direction of the investigation can change after the literature review has completed. If this is the case, the Literature Review should not be altered. It comes before the investigation and is therefore immune to subsequent changes in the direction of the research.

Chapter 3- Aims

This short section is important. It defines specifically why the investigation is needed. This rarely occupies more than one side of A4. It will contain a "Null Hypothesis".

Chapter 4- Investigation

This is comprised of a number of sub-sections.

a) Programme of work

This is well described by its title. It specifies what is to be done. It is a slightly expanded version of a list of headings. This will take less than one side of A4.

b) Materials and Method

Materials

This describes the materials used in the study. It will also give the origin of materials tested, including batch numbers and manufacturer's details.

Method

It will describe in detail the way in which the study was conducted. It should be sufficient to permit another investigator to repeat your study.

It generally begins by recording any preparatory work that was undertaken to develop and test the method for the study. This is the pilot study. On occasions, this subsection can be long if the method has taken time and a number of modifications to develop. Under these circumstances, the description of the actual method used may be rather short as the description of it was completed in the pilot study.

The progression through this section must be chronological. There must be no discussion in this section. However, the reasons supporting development of the method via the Pilot Study may be described.

Photographs or diagrams are appropriate in this section and should be numbered and labeled. The text should also refer to them at the appropriate point. Illustrations and tables are not incorporated into the text. They should be displayed on a separate page; each page forming part of the sequential numbering.

The method will include details of the data collected including units where appropriate. Equipment used should carry a footnote on the appropriate page regarding the supplier/manufacturer.

Chapter 5- Results

This is the section where the data are recorded. There is an introductory page describing how the data have been displayed. This will include any units for the quantities shown. The data are generally first shown in tabular form before being shown as bar charts, graphs, photographs or other means. Clarity is all-important. There are consequently strong reasons why large amounts of raw data should not be included in this section. If raw data are useful, they may be included in the form of appendices at the end of the report.

There must be no discussion of the results here. However, this is the section where the results of any statistical analyses are shown.

Chapter 6- Discussion

The discussion includes both the methods and the results. Begin by discussing the method and any strengths or weaknesses. Be honest in this section; if you are not, your examiner certainly will be! It makes for easier reading if you follow the order of your methods section, the discussion of the data and then the results of the statistical analysis.

Towards the end of the discussion section, there are two particular sub-sections which must be included. These are **a)Comparison with other studies** and **b) Recommendations for future work**.

It is perfectly acceptable to introduce previously un cited references at this point. The research will have been progress for some time and new publications will have become available. Additionally, the direction of your research may have altered since you began the project; this is your opportunity to redirect aspects of your literature review to the study you have made.

You should make recommendations for further work in this area. These may be for further development of the existing study or for an entirely new one.

Chapter 7- Conclusions

These should be listed 1, 2, 3, 4 etc. They must be based on the results of your study. It is easy to include things that were implied by your results rather than shown. This is common in published papers, but is wrong. When you have written your conclusions, look at them carefully and ask yourself – "Did I find this out?" If not, omit it.

The conclusions may be few in number. The number of conclusions does not reflect the usefulness of the research work. Remember that a negative result is as useful as a positive one.

Chapter 8- References

This is an important section. The references must be cited in Vancouver style. The Library will keep lists of the correct abbreviations.

Examples are given:

Rice CD, Dykstra MAS, Gier RE, Cobb CM. Microbial contamination of four brands of irreversible hydrocolloid impression materials. J Prosthet Dent 1991; **65:** 419-423

Melberg JR, Ripa L. Fluoride in Preventive Dentistry. Chicago: Quintessence, 1983

Weinsteen L, Swartz MN.Pathogenic properties of invading micro-organisms. In: Sodema WA Jr, Sodeman WA, eds. Pathogenic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974; pp. 457-472.

References must be arranged in alphabetical order by author's names. In the text cite references by giving the author and, in parentheses immediately afterward, the year of publication, or by placing both name and date in parentheses where more than one reference is cited.

Where an article has two authors, cite both names in full in the text. Where there are three or greater, the first name is cited followed by "et al." and the date of publication. All authors must be cited in full in the reference section. Remember to include the journal volume, the start and finish pages and the date of publication.

Chapter 9-Acknowledgements

This is your opportunity to thank all those who helped you. You may write here whatever seems appropriate.

Chapter 10 -Appendices

These will contain raw data and should be numbered.

Statistical Support for Research Projects

This service is provided by individuals external to the Institute. Postgraduates should obtain assistance from a member of the Department of Community Dentistry or Community Medicine in a University, a consultant in Community Dentistry or a qualified statistician.

Postgraduates are advised to discuss their statistical needs with their project supervisor when the plan for their work is being developed.

Statistical advice may be necessary at an early stage in your research to determine the size of experimental groups or populations.

Statisticians will be particularly in demand around “writing-up” time. Postgraduates should bear this in mind when planning their own schedules.

Funding of research project

It is the responsibility of the trainees to find funding for their research project

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Annex 8. Dissertation marking grid

Two examiners will be appointed by the BOS to assess and award a mark independently out of 120 using the marking system described below. The final mark for the dissertation out of 120 shall be the mean of the sum of the marks given by each examiner.

1. Title
2. Author's name and address
3. **Abstract (15 marks)**
4. Table of contents
5. List of tables
6. List of figures
7. Introduction
8. Objectives
9. Review of literature
10. **Materials and methods (05 marks)**
11. **Results (40 marks)**
12. **Discussion (including limitations) (40 marks)**

13. **Conclusion and recommendations if any) (05 marks)**

14. Acknowledgements

15. **References (05 marks)**

14. **The overall presentation (10 marks)**

Total Marks (120): ……..

To Pass the Dissertation the trainee should score 50 % (120 marks) or more. If it is less than 50% the trainee should resubmit the Dissertation at a prescribed date after attending to the recommended amendments and improvements for re-assessment by the same pare of examiners. This process to be continued in the same manner until the minimum 50% is obtained.

Signature: …….

Name of Examiner : …….

Date: ……

Annex 9. Progress reports

End of year 1 – Areas of competence: Clinical skills

General cardiology	Key points	Trainer (signature and date)
Management of coronary heart disease	• Diagnosis and management of coronary heart disease syndromes • Indications for PTCA and surgical interventions	
Management of valve disorders	• Diagnosis and management of cardiac valve disorders • Protocols for follow up of patients with valve disorders • Indications for surgical intervention	
Management of cardiomyopathies	• Classification of cardiomyopathies • Knowledge of pathology, prognosis, and management	
Hypertension	• Investigation and management of primary and secondary hypertension • Epidemiology and relation to other risk factors	
Prevention and epidemiology	• Issues related to primary and secondary prevention • Protocols for primary care • Lipid abnormalities and their management • Epidemiology of coronary heart disease	
Rehabilitation	• Principles of cardiac rehabilitation and exercise training • Psychological aspects • Rehabilitation as a tool for secondary prevention	
Therapeutics	• Understanding of pharmaceutical agents used in cardiology • Indications, monitoring unwanted effects and interactions	

End of year 1

Resuscitation	• Principles of cardiopulmonary resuscitation • Basic life support • Advanced cardiac life support • Advisory defibrillation • Hospital resuscitation teams and policies	
Heart disease in pregnancy	• Management of heart disease and hypertension during pregnancy • Multidisciplinary approach	
Management of congenital heart disease in adults	• Investigation and management of "grown up" congenital heart disease • Indications for intervention	
Fitness to drive	• Understanding of medical aspects of fitness to drive in relation to cardiovascular disease	

End of year 1- Areas of competence: Non-invasive procedures

Investigational cardiology (a) **Non-invasive**	**Key points**	**Trainer** **(signature and date)**
ECG interpretation	• Technical aspects • Physiological basis • Diagnostic criteria • High resolution ECG	
Exercise ECG	• Physiology of exercise • Techniques and protocols • Indications and diagnostic criteria • Bayesian theory, sensitivity, specificity, and predictive accuracy • **Supervise and analyse at least 50 tests**	
Holter ECG	• Applications • Techniques • Artefacts • Reporting skills • **Report on at least 50 cases** • **Analyse a minimum of 10 tapes**	
Echocardiography –	• Principles (M mode, cross-sectional, Doppler, colour flow mapping)	

basic	• Reproducibility • Diagnostic criteria • Limitations • **Minimum of 500 examinations** • **Video library 20 cases for review with trainer**	

End of year 1

Edhodardiography – complex	• Transoesophageal echocardiography • **Minimum of 25(50) cases** • Principles of stress echocardiography • Peroperative echocardiography • **Minimum of 20 cases**	
Radionuclide investigation	• Common agents and types of investigation • First pass techniques • Stress testing • Lung scanning • Interpretation and limitations • **Report on at least 25 blood pool scans and 75 perfusion scans**	

End of year 1- Areas of competence: Coronary care

Bed side cardiology	**Key points**	**Trainer** **(signature and date)**
Pre-hospital care	• Conversant with paramedic protocols and training • Knowledge of principles of defibrillation	
CCU and thrombolysis	• Widely experienced in the management of conditions treated in CCU • Knowledge of thrombolysis (indications, risks, cost implications) • Conversant with protocols for managing CCU patients, particularly those with acute manifestations of coronary heart disease • Management of arrhythmias and cardiogenic shock • Temporary cardiac pacing (see pacing section)	

	• Indications for and management of flotation catheters	
Management of heart failure	• Knowledge of aetiology, classification, pathophysiology, diagnosis, and management of heart failure • Indications for heart transplantation	
Management of arrhythmias	• Understanding of the pathology of arrhythmias, conduction disturbances, and sudden death • Recognition and management of tachyarrhythmias • Recognition and management of bradycardias	
Management of cardiac emergencies	• Recognition and management of acute conditions including pulmonary embolism, acute pericarditis, myocarditis, cardiac tamponade, aortic dissection and cardiac rupture • Aortic balloon counterpulsation (indications and management) • Pericardial aspiration	

End of year 1

Management of endocarditis	• Knowledge of protocols for prophylaxis • Diagnosis, investigation, treatment, and monitoring • Indications for surgical intervention	
Postoperative care	• Diagnosis and management of postoperative complications • Rehabilitation of cardiac surgical patients	

End of year 2 - Areas of competence: Invasive procedures

Investigational cardiology (b) Invasive and interventional	Key points	Trainer (signature and date)
Coronary angiography	• Competent as unsupervised operator • Understanding of indications, complications, and safety aspects • Radiation hazards and their limitation • **Minimum of 100 cases**	
Right and left heart catheterisation	• As above • Understanding of pressure measurements (technical aspects and pitfalls) • Use of oxygen saturations and assessment of shunts • Thermodilution techniques and other assessments of cardiac function • **Minimum of 20 left and right heart catheterisations** • Assist in minimum of 10 PTMC and 5 pulmonary valvuloplasty	
Cardiac pacing – basic	• Indications for different pacing modalities • Competent at temporary pacing • **Minimum of 25 temporary systems** • Competent as unsupervised operator for single chamber implants • **Minimum of 50 permanent units of which at least 5 should be dual chamber systems** • Capable of supervising pacemaker clinic • Understanding of components and costs of different pacing systems • Pacemaker complications and indicators of malfunction	

End of year 2 - Areas of competence: Advance cath lab work

Subspecialty experience	Key points	Trainer (signature and date)
Cardiac pacing – complex	• BCS logbook • Competent as unsupervised operator for dual chamber implants • Capable of recognising and managing complications of dual chamber systems • Conversant with other methods of physiological pacing • Minimumn of 70 further implants ofwhich 30 should be complex units	
Electrophysiology – basic	• BCS logbook • Principles, techniques, and safety aspects. • Technique of electrode placement • Stimulation studies and their interpretation • Assessment of sinus node function and atrioventricular conduction • Should witness at least 5 VT studies, 5 catheter ablations, and 5 defibrillator implantations	
Electrophysiology – complex	• As above • Assessment of accessory pathways • Radiofrequency ablation • Implantation of automatic defibrillators • Minimum of 200 cases, at least 50 of these should be VT studies and another 50 should be ablation procedures	
PTCA – basic	• BCS logbook • Understanding of indications, techniques and complications • Experience of at least 20 cases as second operator	

End of year 2

PTCA – advanced	• As above • Competent as unsupervised operator • Perform at least 50 cases as first operator and assist at another 50	
Investigation of congenital heart disease	• Competent as unsupervised operator to investigate invasively adults with congenital heart disease • Indications and complications • Expertise in advanced imaging techniques (eg, TOE and MRI in relation to congenital heart disease)	

Checklist ofrecommended numbers of procedures (end of year three)

Procedure	**Number recommended**	**Number performed**	**Signature of the supervisor**
Non-invasive:			
Stress tests	100		
Ambulatory monitoring	200 (actual analysis of 10)		
Basic echo/Doppler	500 (20 video cases for assessment)		
Nuclear studies:			
Blood pool scans	25		
Perfusion scans	75		
Invasive:			
Coronary angiograms	200		
Left and right heart catheters	50		
Basic PTCA (as assistant)	25		
Pacing:			
Temporary	25		

Permanent	75 (including at least 25 dual chamber)		
Electrophysiology:	(witness or participant)		
Study for ventricular tachycardia	5		
Ablation	5		
Defibrillator implantation	5		

Checklist of recommended numbers of procedures (end of year three)

Procedure	**Number recommended**	**Number performed**	**Signature of the supervisor**
EcholDoppler:	Total 500 cases including:		
Transoesophageal echocardiography	75		
Peroperative	20		
Nuclear:			
Blood pool scan	50		
Perfusion scan	100		
Interventional and invasive:			
Entry criteria	300 (during basic training)		
(coronary angiograms)			
PTCA:			
Involvement	100		
1st operator	50		
Pacing and electrophysiology (practical involvement):			
Total number of	70 (including 30		

pacemakers	complex units)		
Total electrophysiological studies	70		
with participation in:			
Ablations	50		
Defibrillators	Experience of implantation		
Adult congenital:			
Transoesophageal and peroperative echo	50		
Catheterisations	25 with as much experience as possible of interventional techniques		

End of year three **- Categories / Levels of competence**

Technique	**Number**	**Level of competence**	**Yes / No**
ECG	1000	Level III	
Ambulatory ECG	200	Level III	
Exercise ECG testing	300	Level III	
Ambulatory BP monitoring	100	Level III	
Echo-Doppler studies	350	Level III	
Transoesophageal echocardiography	50	Level II	
Stress echocardiography	50	Level II	
Nuclear studies	50	Level II	
Cardiac CT	50	Level II	
MRI	50	Level II	

Coronary and LV angiography	300	Level III	
Percutaneous intervention	50	Level II	
Temporary pacemaker implantation	25	Level III	
Pacemaker/ICD programming	50	Level II	
Pacemaker implantation	50	Level II	
ICD implantation	30	Level I	
CRT implantation	10	Level I	
Electrophysiological studies	50	Level II	
Atrial flutter / atrial fibrillation ablation	10	Level I	

Level I – experience of selecting the appropriate diagnostic modality and interpreting results or choosing an appropriate treatment for which the patient should be referred. This level of competency does not include performing a technique. Examples are advanced methods of imaging or specialized interventions such as catheter ablation.

Level II – practical experience but not as independent operator (has assisted in or performed a particular technique or procedure under the guidance of a supervisor). Examples are electrophysiological study or interventional cardiology.

Level III – is able to independently perform the technique or procedure unaided (for the general cardiologist, these include; ECG, 24hour long term ECG monitoring, pacemaker implantation, transthoracic echocardiography and diagnostic cardiac catheterization).

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Trainee

Trainer

Annex 10. Peer Team Rating Forms

PTR Form

(Rater Assessment 1-20)

PGIM Roll No.

Date of assessment (DD/MM/YY)

Year training 1 2 3 4 5 6

PGIM/					/			-									

Name of Rater

(You can remain Anonymous)

Please indicate your profession by filling in one of the following circles

Consultant	Registrars	SHO or HO	Other Specify
Allied Health Professional	SR	Clerical or Secretarial Staff	……

Please mark one of the circles for each component of the exercise on a scale of 1 (extremely poor) to 9 (extremely good). A score of 1-3 is considered unsatisfactory, 4-6 satisfactory and 7-9 is considered above that expected, for a trainee at the same stage of training and level of experience. Please note that your scoring should reflect the performance of the trainee against that which you would reasonably expect at their stage of training and level of experience. You must justify each score of 1-3 with at least one explanation/example in the comments box, failure to do will invalidate the assessment. Please feel free to add any other relevant opinions about this doctor's strengths and weaknesses.

THE PTR IS NOT AN ASSESSMENT OF KNOWLEDGE OR PRACTICAL SKILLS

1.	**Attitude to staff: Respects and values contributions of other members of the team**								
	Don't know	1	2	3	4	5	6	7	8	9
		UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
2.	**Attitude to patients; Respects the rights, choices, beliefs and confidentiality of patients**								
	Don't know	1	2	3	4	5	6	7	8	9
		UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
3.	**Reliability and punctuality**								
	Don't know	1	2	3	4	5	6	7	8	9
		UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
4.	**Communication skills: communicates effectively with patients and families**								
	Don't know	1	2	3	4	5	6	7	8	9
		UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
5.	**Communication skills: communicates effectively with healthcare professionals**								
	Don't know	1	2	3	4	5	6	7	8	9
		UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
6.	**Honesty and Integrity, do you have any concerns?**					**Yes**		**No**		

7. Team player skills: Supportive and accepts appropriate responsibility; Approachable									
Don't know	1	2	3	4	5	6	7	8	9
	UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
8. Leadership skills: Takes responsibility for own actions and actions of the team									
Don't know	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		
9. OVERALL PROFESSIONAL COMPETENCE									
Don't know	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	UNSATISFACTORY			SATISFACTORY			ABOVE EXPECTED		

Comments about the trainee (BLOCK CAPITALS PLEASE) – Write in English/ Sinhalese/ Tamil

(You can remain Anonymous)

Your Signature:

Please place form in the attached self-addressed envelope and return to the PGIM (PTMU) named on the envelope. DO NOT return to the Registrar or Senior Registrar.

We are very grateful for your independent and honest rating our all trainees.

Annex 11. Annual Assessment schemata (formative assessments)

Proforma for assessment

Year One, two and three (Must be entered separately)

THIS SECTION SHOULD BE COMPLETED JOINTLY BY THE TRAINER AND TRAINEE PRIOR TO EACHANNUAL ASSESSMENT.

IT WILL BE REPEATED IN THIS FORMAT IN THE RECORD OF TRAINING FOR EACH YEAR OF THETRAINING PROGRAMME.

(A) Clinical skills (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
History raking	• Incomplete • Inaccurately recorded	• Usually complete • Orderly and systematic	• Comprehensive and perceptive • Precisely recorded
Physical examination	• Incomplete, inaccurate, lacks basic skills • Relies unnecessarily on investigations	• Through, confident examination • Recognizes most significant abnormalities	• Through and accurate • Knows and elicits specialist signs
Investigations	• Inappropriate, random, unnecessarily expensive	• Usually appropriate	• Consistently appropriate in relation to differential diagnosis
Diagnosis	• Fails to interpret and synthesise clinical data • Unable to decide on a differential diagnosis	• Competent in interpreting and synthesising clinical data • Has an orderly approach to differential diagnosis	• Outstanding diagnostician • Has an excellent clinical memory
Judgement	• Unreliable • Does not grasp significance of	• Reliable • Generally interpret clinical	• Outstanding clinician, yet aware of his or her limits • Consistently

	clinical data • Fails to take appropriate action	data correctly • Asks for advice appropriately	correct decisions in complex cases

Technical skills	• Slow to learn a technique • Unsatisfactory at routine procedures • Lacking confidence	• Reasonably quick to learn a technique • Routine procedures carried out satisfactorily • Reasonably confident	• Learns rapidly • Routine procedures carried out fluently and manages difficult ones well Very confident in technical skills
Patient management	• Unsatisfactory at organizing data • Misses important aspects of clinical problems • Formulates ineffective action plans	• Usually organizes data well • Considers most aspects of a problem • Action plans are usually effective	• Organises data very well • Has a clear view of problems Action plans always compatible with the problem

(B) knowledge (Score)	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
Basic science	• Uninterested, does not read the literature • Fails to apply basic science knowledge to clinical problems	• Reasonably up to date with the literature • Satisfactorily relates reading to patient care	• Avid reader of literature • Outstanding knowledge of basic science applied well to patient care
clinical	• Not well read	• Reasonably well read	• Widely read, outstanding

	• Lack appropriate knowledge to construct a differential diagnosis • Does not learn from experience	• Satisfactory knowledge for dealing with common disorders, may miss some aspects of complex cases • Usually modifies practice in the light of experience	knowledge • Alert to unusual cases, seeks advice from senior colloquies to confirm observations • Constantly modifies practice according to experience

(C) Attitudes (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
Reliability	• Unreliable • Forgets to carry out instructions	• Dependable • Conscientious in patient care	• Thoroughly dependable, takes initiative • Anticipates problems and is willing to discuss these with seniors
Self motivation	• Lacks enthusiasm and initiative • Minimal contribution to the team	• Contribution sound especially when encouraged by others • Actively involvedin a team, contributes ideas	• Enthusiasm and initiative sustained even under duress • Good for moral when working with others
Leadership	• Very limited, often alienates others • Colleagues and other staff confused by his or her instructions	• Has reasonable ability to influence others • Usually gives clear instructions	• Exceptional in directing and influencing others • Sets out clear guidelines and encourages others to take initiative
Administration	• Always behind, badly organized	• Conscientious, quite well organised	• Excellent organiser, always on top of the work
Colleagues	• Fails to get on with seniors, peers or juniors • Creates problems rather than solves them • Does not corporate with the workload of others	• Good rapport with seniors, peers and juniors • Sometimes a useful intermediary • Usually willing to help out others in a crisis	• Well respected by seniors, peers and juniors • Able to diffuse dissent amongst colleagues • Selfless, always willing to help even if personally inconvenient

Other staff	• Disregards their skills: rude and unprofessional • Generates staff problems	• Respectful and appreciative of other staff, professional approach • Mediates when problems arise between professional groups	• Good rapport with other professionals, inspires enthusiasm • Professional and diplomatic if problems arise between groups
Patients	• Poor at listening and communicating • Patients prefer other doctors • Increases anxieties	• Generally good at listening and communicating • Patients willing to be seen by him/her • Caring approach, can allay fears	• Excellent at listening and communicating • Patients choose to be seen by him/her • Inspires confidence

(D) **postgraduate activities (Score)**	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
Teaching	• Uninterested and avoids teaching	• Competent and conscientious	• Excellent clinical teacher, can inspire
Lecturing	• Avoids if possible • Poorly prepared • Poorly delivered	• Regular participant • Good preparation • Good delivery	• Keen to lecture • Excellent preparation • Superb communicator
Presentations	• Is not committed to giving papers • Poor presenter, fails to extract and sequence the key features • Poor illustrations • Cannot respond appropriately to	• Enthusiastic presenter • Good delivery, well sequenced information • Appropriate graphic enhance delivery • Responds well to	• Inspirational presenter • Information sound with good interpretation • Outstanding illustrations

	questions	questions	• Responds to questions in a way that encourages development and original ideas
Written communications	• Written style unclear and difficult to understand	• Written style usually clear giving unambiguous directions to others	• Written style clear, appropriately adapted in vocabulary for the recipient
Research ability	• Lacking in inclination to carry out research, not alert to opportunities • Unable to carry out directed projects	• Interested in research activities and has a reasonable grasp of research methods • Requires supervision but competent when given direct support	• Flair for original research • Well able to carry out research independently and synthesises results well
Audit	• Avoids if possible • Contributes little	• Regular attender • Presents topics regularly	• Keen participant • Completes outstanding topics and implements the outcomes

Proforma for assessment

TRAINER'S COMMENTS

(Summary of trainee's character and special attributes or failures. Mention any specific weakness that might hinder further training or requires special attention)

Signed: TRAINER

Date: _____

This is an official document and should be kept in the trainee's register.

It should be made available annually to the head of training and to the PGIM upon completion of training.

Only the head of training, the postgraduate director, and trainers are entitled to copies.

Proforma for assessment

TRAINEE'S COMMENTS

(Mention any positive aspects or problems encountered during your current attachment. Include any unforeseen problems such as illness that might have affected your performance)

Proforma for assessment

Year One, two and three (Must be entered separately)

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Judgement	• Unreliable • Does not grasp significance of clinical data • Fails to take appropriate	• Reliable • Generally interpret clinical data correctly • Asks for advice appropriately	• Outstanding clinician, yet aware of his or her limits • Consistently correct decisions in complex cases

	action		

Technical skills	• Slow to learn a technique • Unsatisfactory at routine procedures • Lacking confidence	• Reasonably quick to learn a technique • Routine procedures carried out satisfactorily • Reasonably confident	• Learns rapidly • Routine procedures carried out fluently and manages difficult ones well Very confident in technical skills
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clinical	• Not well read • Lack appropriate knowledge to construct a differential	• Reasonably well read • Satisfactory knowledge for	• Widely read, outstanding knowledge • Alert to unusual cases, seeks advice from

	diagnosis • Does not learn from experience	dealing with common disorders, may miss some aspects of complex cases • Usually modifies practice in the light of experience	senior colloquies to confirm observations • Constantly modifies practice according to experience
(C) Attitudes (Score)	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
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Leadership	• Very limited, often alienates others • Colleagues and other staff confused by his or her instructions	• Has reasonable ability to influence others • Usually gives clear instructions	• Exceptional in directing and influencing others • Sets out clear guidelines and encourages others to take initiative
Administration	• Always behind, badly organized	• Conscientious, quite well organised	• Excellent organiser, always on top of the work
Colleagues	• Fails to get on with seniors, peers or juniors	• Good rapport with seniors, peers and juniors	• Well respected by seniors, peers and juniors

	• Creates problems rather than solves them • Does not corporate with the workload of others	• Sometimes a useful intermediary • Usually willing to help out others in a crisis	• Able to diffuse dissent amongst colleagues • Selfless, always willing to help even if personally inconvenient

Other staff	• Disregards their skills: rude and unprofessional • Generates staff problems	• Respectful and appreciative of other staff, professional approach • Mediates when problems arise between professional groups	• Good rapport with other professionals, inspires enthusiasm • Professional and diplomatic if problems arise between groups
Patients	• Poor at listening and communicating • Patients prefer other doctors • Increases anxieties	• Generally good at listening and communicating • Patients willing to be seen by him/her • Caring approach, can allay fears	• Excellent at listening and communicating • Patients choose to be seen by him/her • Inspires confidence

(D) **postgraduate activities (Score)**	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
Teaching	• Uninterested and avoids teaching	• Competent and conscientious	• Excellent clinical teacher, can inspire
Lecturing	• Avoids if possible • Poorly prepared • Poorly delivered	• Regular participant • Good preparation • Good delivery	• Keen to lecture • Excellent preparation • Superb communicator
Presentations	• Is not committed to giving papers • Poor presenter, fails to extract and sequence the key features • Poor illustrations • Cannot respond appropriately to	• Enthusiastic presenter • Good delivery, well sequenced information • Appropriate graphic enhance delivery • Responds well to	• Inspirational presenter • Information sound with good interpretation • Outstanding illustrations

	questions	questions	• Responds to questions in a way that encourages development and original ideas
Written communications	• Written style unclear and difficult to understand	• Written style usually clear giving unambiguous directions to others	• Written style clear, appropriately adapted in vocabulary for the recipient
Research ability	• Lacking in inclination to carry out research, not alert to opportunities • Unable to carry out directed projects	• Interested in research activities and has a reasonable grasp of research methods • Requires supervision but competent when given direct support	• Flair for original research • Well able to carry out research independently and synthesises results well
Audit	• Avoids if possible • Contributes little	• Regular attender • Presents topics regularly	• Keen participant • Completes outstanding topics and implements the outcomes

Proforma for assessment

TRAINER'S COMMENTS

(Summary of trainee's character and special attributes or failures. Mention any specific weakness that might hinder further training or requires special attention)

Proforma for assessment

TRAINEE'S COMMENTS

(Mention any positive aspects or problems encountered during your current attachment. Include any unforeseen problems such as illness that might have affected your performance)

Signed: TRAINEE

Date: _____

This is an official document and should be kept in the trainee's register.

It should be made available annually to the head of training and to the PGIM upon completion of training.

Only the head of training, the postgraduate director, and trainers are entitled to copies.

Proforma for assessment

Year One, two and three (Must be entered separately)

THIS SECTION SHOULD BE COMPLETED JOINTLY BY THE TRAINER AND TRAINEE PRIOR TO EACHANNUAL ASSESSMENT.

IT WILL BE REPEATED IN THIS FORMAT IN THE RECORD OF TRAINING FOR EACH YEAR OF THETRAINING PROGRAMME.

(A) Clinical skills (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
History raking	• Incomplete • Inaccurately recorded	• Usually complete • Orderly and systematic	• Comprehensive and perceptive • Precisely recorded
Physical examination	• Incomplete, inaccurate, lacks basic skills • Relies unnecessarily on investigations	• Through, confident examination • Recognizes most significant abnormalities	• Through and accurate • Knows and elicits specialist signs
Investigations	• Inappropriate, random, unnecessarily expensive	• Usually appropriate	• Consistently appropriate in relation to differential diagnosis
Diagnosis	• Fails to interpret and synthesise clinical data • Unable to decide on a differential diagnosis	• Competent in interpreting and synthesising clinical data • Has an orderly approach to differential diagnosis	• Outstanding diagnostician • Has an excellent clinical memory
Judgement	• Unreliable • Does not grasp significance of clinical data • Fails to take appropriate	• Reliable • Generally interpret clinical data correctly • Asks for advice appropriately	• Outstanding clinician, yet aware of his or her limits • Consistently correct decisions in complex cases

	action		

Technical skills	• Slow to learn a technique • Unsatisfactory at routine procedures • Lacking confidence	• Reasonably quick to learn a technique • Routine procedures carried out satisfactorily • Reasonably confident	• Learns rapidly • Routine procedures carried out fluently and manages difficult ones well Very confident in technical skills
Patient management	• Unsatisfactory at organizing data • Misses important aspects of clinical problems • Formulates ineffective action plans	• Usually organizes data well • Considers most aspects of a problem • Action plans are usually effective	• Organises data very well • Has a clear view of problems Action plans always compatible with the problem

(B) knowledge (Score)	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
Basic science	• Uninterested, does not read the literature • Fails to apply basic science knowledge to clinical problems	• Reasonably up to date with the literature • Satisfactorily relates reading to patient care	• Avid reader of literature • Outstanding knowledge of basic science applied well to patient care
clinical	• Not well read • Lack appropriate knowledge to construct a differential	• Reasonably well read • Satisfactory knowledge for	• Widely read, outstanding knowledge • Alert to unusual cases, seeks advice from

	diagnosis • Does not learn from experience	dealing with common disorders, may miss some aspects of complex cases • Usually modifies practice in the light of experience	senior colloquies to confirm observations • Constantly modifies practice according to experience
(C) Attitudes (Score)	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
Reliability	• Unreliable • Forgets to carry out instructions	• Dependable • Conscientious in patient care	• Thoroughly dependable, takes initiative • Anticipates problems and is willing to discuss these with seniors
Self motivation	• Lacks enthusiasm and initiative • Minimal contribution to the team	• Contribution sound especially when encouraged by others • Actively involvedin a team, contributes ideas	• Enthusiasm and initiative sustained even under duress • Good for moral when working with others
Leadership	• Very limited, often alienates others • Colleagues and other staff confused by his or her instructions	• Has reasonable ability to influence others • Usually gives clear instructions	• Exceptional in directing and influencing others • Sets out clear guidelines and encourages others to take initiative
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(D) **postgraduate activities (Score)**	**Poor (1)**	**Average (2) (3) (4)**	**Excellent (5) (6)**
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