

Update 2008

The European Society of Cardiology

Core Curriculum for the General Cardiologist



EUROPEAN
SOCIETY OF
CARDIOLOGY®

The ESC Core Curriculum for the General Cardiologist

Prepared by the Education Committee of the European Society of Cardiology

ESC Education Committee 2006 – 2008

Peter Kearney, Ireland
Chairman of the ESC Education Committee

Jean-Pierre Bassand, France
Carina Blomström-Lundqvist, Sweden
Martin Cowie, UK
Filippo Crea, Italy
Frank Flachskampf, Germany
Dan Gaita, Romania
Lino Gonçalves, Portugal
Roger Hall, UK
Erhard Kaiser, Germany
Jose Luis Lopez-Sendon, Spain
Jean Marco, Monaco
Iraklis Mavrakis, Greece
Peter Mills, UK
Tomasz Pasierski, Poland
Peter Polak, The Netherlands
Juerg Schwitter, Switzerland

Other contributor
Don Poldermans, The Netherlands

ESC Staff
Keith McGregor, France
Claire Bramley, France
Dominique Poumeyrol-Jumeau, France



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Foreword



The ESC Core Curriculum for the General Cardiologist is a major step forward towards the coordination of the training of cardiologists in Europe. With increasing workforce movement it is of great importance to assure that practical skills and theoretical knowledge of a general cardiologist are independent of the country where he or she has been trained. Over the coming months the Curriculum will be incorporated into an electronic platform that could form the basis of formative assessment necessary for certification and revalidation. The ESC and UEMS (cardiology section) working through the National Societies are committed to delivering a European standard for cardiology that may prove to be a model for other medical specialties.

In addition, cardiology as a specialty is expanding, and many subspecialties, such as interventional cardiology, electrophysiology or cardiovascular imaging, to name just

a few, are emerging. In this context, definition of the core knowledge, required for all cardiologists, independent of their subspecialty, appears to be even more relevant.

Obviously, the success of the Core Curriculum depends on its adoption on the national level. Broad participation of specialists representing different National Societies of Cardiology, as well as the Working Groups, Associations and Councils, makes us hope that this document will gain universal acceptance and will form a base for training in most European countries.

Finally, we hope that well trained physicians across the continent will be able to contribute to achieve the mission of the European Society of Cardiology – reducing the burden of cardiovascular disease in Europe.

Kim Fox, President
European Society of Cardiology

Roberto Ferrari, President Elect
European Society of Cardiology

Preface



The first European Curriculum for General Cardiology was published in 2006. Building on the ESC Core Syllabus published two years previously, it provided for the first time a detailed framework for harmonizing the training of Cardiologists in Europe, aimed at improving the quality and reliability of care of patients with Cardiovascular Diseases.

It was predicted that a curriculum for such a dynamic field would require early and frequent revision and accordingly this first revision of the curriculum comes just two years after its launch. Changes are generally modest but a number of important omissions from the first edition have been addressed.

The Core Syllabus was intended primarily as a summary of the core knowledge base for Continuing Medical Education for trained cardiologists and thus omitted a fundamental subject for trainees, namely the Cardiovascular History and Physical Examination; this has been included and a chapter on the Cardiac Consultation has been added. Appropriate amendments to existing chapters have been made in response to the helpful feed back from representatives of ESC Constituent Bodies of National Societies, Associations, Working Groups and Councils as well as interested individuals.

The Curriculum will prove to be worthwhile and only achieve its aims if it is widely implemented. A significant and exciting step is now underway as the European Board for the Specialty of Cardiology (EBSC), a joint venture between the European Society of Cardiology and the UEMS Cardiology Section, embarks on the creation of an electronic platform to deliver the Curriculum. This will serve a number of important functions. It will outline the curriculum to trainees and trainers on a repeated basis, link to the appropriate knowledge base incorporating regular formative assessment, and will detail and document the assessments appropriate for each of the necessary skills and behaviours. In short it will provide structure and facilitate documentation of a trainee's progress through the curriculum.

We believe this revision has improved the curriculum, although the next is likely to be particularly important and potentially far reaching, based as it will be on feedback from two important sources. The first will be those involved in building the electronic platform who will scrutinize the curriculum in the greatest of detail as they devise links to a knowledge base and assessments for each component. The second will follow from the field testing of the users of the electronic platform.

We hope you find this version of the Curriculum useful and look forward to your active participation in its implementation.

A handwritten signature in black ink, appearing to read "Peter Kearney".

Peter Kearney
Chairman of the ESC Education Committee

Introduction



Cardiology is a clinical specialty in the field of Medicine. Its practitioners have a particular interest and skills in the treatment of patients with diseases of the heart and the blood vessels, including the circulation to the lungs. The term "Cardiovascular Medicine" is an acceptable alternative title to "Cardiology".

The Core Curriculum of the European Society of Cardiology aims to provide an agreed framework for the purposes of training doctors in the specialty. Furthermore, it provides a basis for the development of continuing medical education (CME) for trained, practicing Cardiologists.

The European Society of Cardiology (ESC) Core Syllabus, published in 2004, summarizes subject matter considered integral to the specialty. This serves two functions, 1) to define the boundaries of the specialty and 2) determines the knowledge base on which the Curriculum is developed. The Core Curriculum goes significantly beyond the Syllabus, in outlining the knowledge, skills and attitudes required of a General Cardiologist. More broadly it provides structure for the educational activities of the European Society of Cardiology both within its own organisation as well as in discussion with outside bodies. Ultimately, aiming to improve training standards for Cardiologists, the Core Curriculum offers an opportunity to favourably influence the European political agenda, thereby improving care for patients with cardiological disorders throughout Europe.

The European Society of Cardiology is committed to reviewing and revising the Curriculum on a regular basis. These reviews will cater for developments in the diagnostic and treatment modalities of this rapidly changing field.

The process of creating and revising the Core Curriculum recognises two important dynamic influences.

The first is that currently there are very different levels of curriculum development throughout Europe and indeed what subjects or activities are considered core to the specialty varies significantly between different countries. The current document aims to offer a consensus as to what knowledge, skills and attitudes should be possessed by General Cardiologists in Europe.

Second, the Core Curriculum aims to define what every Cardiologist should know. The European Board for the Specialty of Cardiology (EBSC) is coordinating curriculum development for the various sub-specialties in cardiology. The sub-specialty curricula define the greater depth of knowledge and understanding expected of a sub-specialist in, for instance, Interventional Cardiology, Cardiac Imaging Modalities or Invasive Electrophysiology. It is clear that the interface between "core" and "sub-specialty" Cardiology will be a dynamic one, and will be revisited in future years. This interface is also modulated by the local degree of acceptance of formal sub-specialties, which differs considerably from country to country. It is understood that all Cardiologists with sub-specialty interests have completed training in General Cardiology. Additionally, an ongoing interest in the general breadth of the specialty is considered both necessary and important to ensure best practice of sub-specialty cardiology.

Rationale - Summary of the Clinical Field of Cardiology



The clinical subject of Cardiology aims to deliver competent care for patients presenting with disorders of the heart, the pulmonary vasculature and the systemic arterial and venous systems. Currently, the commonest cardiovascular pathology is atherosclerosis as it affects the coronary and systemic arterial systems. An understanding of the risk factors and their modification to minimise the long term adverse effects of atherosclerosis as well as the treatment of the complications of atherosclerosis, such as the acute coronary syndrome or heart failure, are major components of Cardiology. Many other important diseases affect the myocardium, the pericardium and the cardiac valves. Systemic diseases such as arterial hypertension or diabetes

affect not only cardiac, but also vascular structures, notably the arteries. Disorders of heart rhythm range from the benign to the life threatening. A comprehensive knowledge of these disorders, their diagnosis, including the array of imaging modalities of heart and vascular structure, and of the rapidly expanding pharmacologic, percutaneous, device-based, and surgical treatments for them are integral parts of the Core Curriculum.

These topics are gathered together in this Core Curriculum to provide the standards for Training in Cardiology as well as a template for the maintenance of Clinical Competence for qualified Cardiologists.

General Aspects of Training in the Specialty



Candidates for training should be licenced physicians in an EU country or have an equivalent qualification approved by the host country.

It is understood that a common trunk of General Professional Training should be completed before Postgraduate Specialist training is undertaken. General Training should include a significant knowledge of and exposure to the acute and chronic presentation of a broad range of medical conditions. It includes acquisition of generic knowledge and skills including communication training, bioethics, biostatistics, and the ability to analyse, interpret and utilize medical literature, elements of training and practice that are further reinforced during ongoing training. The trainee must have the necessary linguistic ability to communicate with patients and colleagues in the country of training.

The recommended minimum duration of postgraduate education is six years, to include two years of common trunk and a minimum of four years training in Cardiology, one of which is flexible, and may be devoted to internal medicine, cardiovascular research, cardiovascular pharmacology, cardiovascular epidemiology, cardiovascular preventive medicine or rehabilitation, angiology or general cardiology or other related aspects of cardiovascular disease.

In order to gain sufficient experience the trainee should be involved in the management of an appropriate mix and number of in-patients and out-patients. A full time position for at least one year is recommended. Part-time positions may make up the remaining training period which must be correspondingly prolonged. Practical participation in the clinical management of inpatients, including the coronary care unit and provision of cardiac

consultations for other services, should constitute a minimum of one year of training, preferably in the first or second year. Supervised involvement in the management of outpatients, including new and return cases, should be undertaken at least once a week, for at least one year of training. The trainee should have an on-call commitment for Cardiology (rather than General Internal Medicine or unselected medical emergencies) of at least 100 nights during cardiology training. The training programme should include structured training sessions of at least two hours per week. Trainees should perform a sufficient number of practical procedures of sufficient diversity, as detailed in the Core Curriculum.

Not all elements of training (such as direct exposure to cardiac surgery) may be accessible at a single training centre. Candidates should have the opportunity to obtain training in all aspects of the curriculum, which may involve rotation through different training institutions or sessional attendance for training in centres providing treatments or technologies (such as a Adult Congenital Heart Disease clinic or Cardiac MRI) that are not widely available.

The training programme should be clearly defined, incorporate annual assessment of the trainee's progress, and should itself be assessed on at least a five yearly basis.

Requirements for Training Institutions



Training institutions should be recognized by a National Training Authority as eligible to provide complete or partial training. They should offer the opportunity for interaction with other major specialties, have a library and internet facilities offering access to the current world scientific literature, specifically major international journals relating to Cardiology and Internal Medicine, and should provide the necessary physical infrastructure for training including conference rooms and allocated office space for trainees.

The training institution or combination of institutions making up any given training programme should have the necessary facilities to ensure that trainees can fulfill all aspects of the curriculum, and the following facilities as a minimum: A fully equipped out-patient department for cardiological patients, including emergencies, a sufficient number of beds for in-patients and for intensive care medicine. The intensive care unit should have at least 6 beds, fully equipped for electrocardiographic and haemodynamic monitoring, anti-bradycardiac pacing, cardioversion and

defibrillation and preferably haemodynamic support devices (intra-aortic balloon pumps, haemofiltration etc.). The programme must incorporate an institution providing cardiac surgery. Equipment should be available for all types of non-invasive investigation and procedures such as X-ray, ECG, exercise testing, ambulatory ECG monitoring, echocardiography including Doppler echocardiography and transoesophageal echocardiography (TEE), pacemaker check-up and cardiac magnetic resonance imaging, cardiac computed tomography, and nuclear medicine facilities. The programme must include centres that provide invasive cardiology, including diagnostic and therapeutic cardiac catheterization and electrophysiological studies.

Requirements for Trainers



Trainers should be based in an eligible Training Centre, should be accredited, should have experience in Research and Teaching and should be recognized as a designated Trainer by the National Training Board. There should be a minimum number of senior trained specialists in the unit to ensure expert training for a range of areas included in the Core Curriculum, and sufficient protected teaching time

and continuity of training. An equal number of trainers and trainees is recommended. Delivery of the curriculum may be facilitated by a structure which includes a Director of Training (National/Regional), a Training Mentor, and multiple Clinical Trainers.

Assessment methodology



Assessment is a key driver of learning and is an essential component of curricular development. Whereas summative tests are used to confirm attainment of a stipulated level of competence and to rank candidates, assessment should as far as possible play a **formative** or active educational role. For each component of the curriculum, the relevant knowledge, skills and attitudes/behaviours require different and varied assessment methods. All methods have some limitations in terms of their validity to predict an individual's competence in a reproducible manner. It is therefore recommended that a variety of suitable different methods involving a number of different observers be applied over time during training.

Knowledge: Tests of knowledge including multiple choice questionnaires are a familiar form of assessment. They are readily produced, are valid when properly designed and executed, but cannot constitute the only or predominant method of assessment.

Skills: A logbook, based on the curriculum, is an important means of documenting experience. It may provide a simple count of different procedures or conditions encountered or may encourage reflection by including items such as complications. Structured skills evaluation methods such as DOPS (Direct Observation of Procedural Skills) should also be incorporated.

Attitudes/behaviours. A traditional method of assessing performance is a supervisor's report, including considerations relating to clinical, clerical and team performance. A more contemporary approach is the Multisource Feedback or 360° assessment which is more objective, balanced and potentially more informative. This

entails a blinded, structured assessment of the candidate by colleagues from various disciplines (medical, nursing, paramedic, technician) and their patients.

Whichever methods are adopted, the training programme should incorporate a series of interactive meetings between trainee and supervisor and trainee and the local or national director of training, during which the documentary evidence of training, including the portfolio, can be systematically considered. The portfolio includes a record of clinical experience, audit activity, presentations, and evidence of self directed learning. It should also include documentation of Research undertaken and completed by the candidate, considered essential for all Cardiologists in training.

LEARNING OBJECTIVES

Chapters in the Curriculum:



These are specific statements of intent which express what the learner will be able to do at the end of the educational intervention. They are framed in terms of learners' capabilities in specific tasks. Objectives are classified under the headings of knowledge, skills and attitudes/behaviours.

Knowledge: The knowledge base trainees require. The subject matter is defined by the ESC Core Syllabus. In the curriculum it is framed in terms that reflect how the trainee should handle this knowledge.

Skills: The effective application of knowledge to problem solving, clinical decision making and performing procedures, acquired from experience and training

Attitudes and behaviours: What attitudes or beliefs trainees develop and demonstrate in respect of the subject, and their impact on how they behave in real world practice.

Each objective defines what is to be achieved, how it will be achieved (conditions or workplace context) and the standard required.

Categories / Levels of Competence

In the next section of the curriculum, mention is made of different levels of competence expected for a given area of subject matter. These are defined as follows.

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 superior). 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, 24 hour long term ECG monitoring, pacemaker implantation, transthoracic echocardiography, and diagnostic cardiac catheterization).

Indicative Numbers

First hand exposure and practical experience play an important role in the learning of techniques. Of itself,

the number of procedures engaged in by a trainee is not a sufficient measure of his/her competence but reporting indicative numbers has a role in ensuring adequate exposure. The numbers in the following table are based on the European Board for the Specialty of Cardiology's last update of the Cardiology section of Chapter 6 of the UEMS Charter for Medical Training in 2003, with appropriate additions and modification where necessary. These figures relate to basic Cardiology training and clearly those sub-specialising in a particular aspect of cardiology will require greater numbers and higher levels of competence than stated for the relevant techniques. It is also recognised that in some countries the stated numbers may be difficult to achieve for some techniques due to the organisation of care. The numbers may be considered aspirational at the present time for such countries, but will likely be achievable as resources increases. Rotation of trainees through reference training centres offers an opportunity for most trainees in Europe to achieve these aims. Simulation training promises to play an increasingly important role in technical skills training and will likely reduce the numbers of actual procedures to which a trainee must have direct exposure to achieve competence.

Technique	Number	Level of competence
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

Acknowledgements



This revision of the Core Curriculum has benefited from active contributions of National Cardiac Societies, ESC Associations, Working Groups, Councils and the European Board for the Subspecialty of Cardiology, all of which deserve our thanks. All members of the Education Committee of the ESC have devoted considerable time and energy to the process, but special mention must go to Dr. Frank Flachskampf who provided outstanding leadership and co-ordination of the revision and to Dr. Peter Mills for his contributions based on unique wisdom and experience in the field. Our colleagues in Heart House, Dominique Poumeyrol-Jumeau, Claire Bramley, Celine Carrera and Keith McGregor have again provided outstanding support.

1. History taking and clinical examination



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To obtain a history from the patient relevant to cardiovascular disorders: <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Symptoms of any co-morbidities The social history Current and past drug therapy 	<ul style="list-style-type: none"> To be able to describe the range of, and the meaning of, words used by patients to describe cardiovascular systems 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 typical and atypical symptoms of cardiovascular disease To recognize cardiovascular risk factors from the patient's history To know the names and side effects of drugs used To know the symptoms and treatments of the co-morbidities often associated with cardiovascular disease. 	<ul style="list-style-type: none"> To analyse 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) 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Clinical examination <ul style="list-style-type: none"> 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 systems. <ul style="list-style-type: none"> To examine the heart 	<ul style="list-style-type: none"> To be able to recognise 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 patho-physiology of the cardiac cycle and therefore to understand how normal heart sounds, abnormal heart sounds and systolic and diastolic murmurs are generated and how to best auscultate them 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 	<ul style="list-style-type: none"> 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 maximise 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 	<ul style="list-style-type: none"> 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 emphasising life long learning.



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

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To select, perform and interpret each of the three non-invasive ECG techniques 	<ul style="list-style-type: none"> Use these modalities to identify the normal ECG and ECG abnormalities, in particular: <ul style="list-style-type: none"> arrhythmias bundle branch blocks hypertrophy acute and chronic ischemia QT abnormalities pericarditis electrolyte abnormalities pacemaker dysfunctions 	<ul style="list-style-type: none"> Choose the appropriate techniques for specific clinical situations including a thorough understanding of the Bayesian approach. Choose techniques modalities and 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. 	<ul style="list-style-type: none"> 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.

The Electrocardiogram: standard ECG, ambulatory ECG, exercise ECG

(continued)



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> • Long-term ambulatory ECG and ECG • Loop Recording 	<ul style="list-style-type: none"> • Identify the indications • Recognise the limitations 	<ul style="list-style-type: none"> • Perform and interpret ambulatory ECGs/loop recorder ECGs in the clinical context (a documented indicative number being 200) to achieve level III competence. 	<ul style="list-style-type: none"> • Recognise 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.
<ul style="list-style-type: none"> • Exercise ECG Testing 	<ul style="list-style-type: none"> • Recognise the main indications: <ul style="list-style-type: none"> ▫ Evaluation of ischemia ▫ Evaluation of valvular diseases ▫ Evaluation of hypertrophic cardiomyopathy ▫ Evaluation of treatment response ▫ Evaluation of functional capacity ▫ Evaluation of inducible arrhythmias ▫ Identify the contraindications • Recognise the main limitations: <ul style="list-style-type: none"> ▫ Identity the criteria for stopping the testing ▫ Identify the complications and their treatment 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Recognise strengths and weaknesses of exercise ECG testing in a clinical situation. • Explain to patients and their family the implications of the results of the electrocardiogram.

3. Non Invasive Imaging

Echocardiography, CMR, Cardiac CT and Nuclear techniques



Objectives	Knowledge	Skills	Behaviours and Attitudes
<p>Appropriately select from the four imaging modalities of:</p> <ul style="list-style-type: none"> - Echocardiography - Cardiac Magnetic Resonance (CMR) - Computed Tomography (CT) - Nuclear Techniques <p>and then integrate the results into individual patient care</p>	<ul style="list-style-type: none"> • Use these modalities to measure cardiac structure and function. - Ventricular chamber and wall dimensions - Left ventricular (LV) Mass - Ventricular volumes - Ejection / regurgitation fractions - Regional wall motion abnormalities - Estimation of shunt size - Calculation of valve stenosis - Estimation of valvular regurgitation - Estimation of LV diastolic function - Calcification of coronary arteries - Myocardial perfusion - Myocardial disease - Coronary Artery Disease 	<ul style="list-style-type: none"> • Skills are specific to each modality. See below. 	<ul style="list-style-type: none"> • Choose the appropriate imaging techniques for specific clinical situations, including a thorough understanding of the Bayesian approach • Choose imaging techniques, modalities and protocols in a clinically useful and cost effective way, avoiding over and under utilisation of tests, keeping in mind radiation exposure, where appropriate • Integrate data from different non-invasive techniques as well as from invasive imaging • Remain current with developments in the field of non-invasive imaging

Non Invasive Imaging

Echocardiography, CMR, Cardiac CT and Nuclear techniques

(continued)



Objectives	Knowledge	Skills	Behaviours and Attitudes
Echocardiography	<ul style="list-style-type: none"> Techniques: <ul style="list-style-type: none"> - M-mode - 2-dimensional (2D) mode - Doppler imaging (blood flow and tissue) - Contrast echocardiography Indications: <ul style="list-style-type: none"> - Evaluation of systolic and diastolic function (including ejection fraction) of the left ventricle - Regional wall motion abnormalities - LV mass - Chamber volumes and wall dimensions - Cardiomyopathies - Valvular morphology and function, including stenosis and regurgitation - Right ventricular function - Shunt lesions - Pericardial masses (tumors, thrombi, vegetations) - Congenital heart disease - Aortic disease Modalities <ul style="list-style-type: none"> - Transthoracic echo - Stress test - Contrast echocardiography - 3D echocardiography 	<ul style="list-style-type: none"> Perform and interpret transthoracic (level III competence) and transoesophageal and stress echocardiography (level II competence). A documented broad experience is required. (minimum of 6 months experience in an echo laboratory and ≥350 transthoracic echocardiograms) Stress testing 	<ul style="list-style-type: none"> Recognise strengths and weaknesses of echocardiography in a clinical situation Cooperate with interventional cardiologists, electrophysiologists, anaesthesiologists and other physicians involved in emergency medicine and intensive care, and with cardiac surgeons Explain to patients the implications of the results of the echocardiography test
Cardiovascular Magnetic Resonance (CMR)	<ul style="list-style-type: none"> Techniques <ul style="list-style-type: none"> - 2D mode - Perfusion imaging - Late enhancement Indication <ul style="list-style-type: none"> - Volumes - Ejection fraction - LV mass - Shunt Modalities <ul style="list-style-type: none"> - Cine-MR - MR angiography - TI imaging 	<ul style="list-style-type: none"> Select the appropriate CMR indications for patients with known or suspected cardiovascular diseases 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. 	<ul style="list-style-type: none"> Cooperate with radiologists and CMR and radiology technicians.

ESC Guidelines

- Clinical role of cardiac magnetic resonance in cardiovascular disease. (European Heart Journal 1998; 19: 19-39)
- Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

Non Invasive Imaging

Echocardiography, CMR, Cardiac CT and Nuclear techniques

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
Cardiac Computed Tomography	<ul style="list-style-type: none"> Techniques <ul style="list-style-type: none"> - 2D - 3D Indications - Calcium score - Coronary Artery Disease (CAD) (including grafts and stents) Modalities <ul style="list-style-type: none"> - Ultra-fast CT - Coronary angiogram 	<ul style="list-style-type: none"> 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). 	<ul style="list-style-type: none"> Cooperate with radiologists and radiology technicians. Assess the side effects of contrast media and recognize the risk of radiation to patient and personnel
Nuclear Imaging	<ul style="list-style-type: none"> Techniques <ul style="list-style-type: none"> - Planar angiography - SPECT - Gated SPECT - Gated blood pool SPECT - PET Tracers <ul style="list-style-type: none"> - Thallium - Technetium-labeled tracers - Fluorodeoxyglucose Indications <ul style="list-style-type: none"> - Myocardial perfusion - Viability - RV and LV volumes - Ejection fraction - Diastolic function - Phase analysis for cardiac asynchrony - Shunt Modalities <ul style="list-style-type: none"> - Rest metabolism - Stress protocols (exercise or pharmacological) 	<ul style="list-style-type: none"> Evaluate cardiac nuclear examinations in the clinical context and with reference to other noninvasive and invasive approaches. Level II competence requires a documented indicative number of 50 cases and suggested exposure of 20 half day sessions. Stress testing 	<ul style="list-style-type: none"> Choose the appropriate stress modality for a particular patient Cooperate with nuclear medicine physicians and technicians Recognise the risk of ionizing radiation for patient and personnel

ESC Guidelines

- Clinical role of cardiac magnetic resonance in cardiovascular disease. (European Heart Journal 1998; 19: 19-39)
- Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

4. Invasive Imaging – Cardiac Catheterisation and Angiography



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> Coronary and left ventricular angiography: To be able to perform and interpret native coronary and surgical conduit angiograms and left ventricular angiograms Cardiac catheterisation: To be able to perform and interpret right and left heart catheterisation. 	<ul style="list-style-type: none"> Describe the principles of fluoroscopic imaging, radiation physics and safety. Describe the potential complications of cardiac catheterisation and angiography (including hypotension, heart failure, arrhythmias, ischemic 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 during catheterisation. Recognise pressure waveforms obtained during cardiac catheterisation. Describe the routine collection of haemodynamic and oxymetric data, and how to calculate cardiac output, vascular resistances, valve areas, and AV shunts from measurements. Describe the different percutaneous and cut down techniques of catheterisation. Describe the different type of catheters used in coronary arteriography and cardiac catheterisation. Describe the equipment used and the technique of transseptal cardiac catheterisation, and discuss its applications. 	<ul style="list-style-type: none"> Demonstrate knowledge of catheterisation lab equipment (physiological monitoring, transducers, blood gas analysers, power injector). Obtain percutaneous arterial access (femoral, radial, brachial) and venous access and achieve haemostasis after catheterisation. Perform left heart catheterization including coronary angiography, ventriculography, and angiography of coronary bypass grafts; a documented minimum experience is required. Perform right heart catheterisation at the bedside including measurement of cardiac output, pressure measurement and oxymetry; a documented minimum experience is required. Demonstrate proficiency in managing life-threatening arrhythmias and other emergency situations in the cath lab, including resuscitation and life support measures. Evaluate normal and pathological coronary angiograms, ventriculograms, aortograms, and pulmonary angiograms. 	<ul style="list-style-type: none"> 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 catheterisation, taking the clinical context into account. Recognise the limitations and potential risk of invasive procedures and to inform patients accordingly. Recognise 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

Invasive Imaging – Cardiac Catheterisation and Angiography

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
	<ul style="list-style-type: none">Explain when and how to perform cardiac pacing and pericardiocentesis, and the potential complications associated with its use.Understand the basic principles and indications for intracoronary ultrasound, Doppler and pressure assessment.		

ESC Guidelines

- Clinical role of cardiac magnetic resonance in cardiovascular disease. (European Heart Journal 1998; 19: 19-39)
Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

5. Genetics



Objectives	Knowledge	Skills	Behaviours
<ul style="list-style-type: none"> To be able to perform general cardiological assessment and treatment of patients with inherited or familial cardiovascular disease. 	<ul style="list-style-type: none"> 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. Describe the principles of Mendelian inheritance. Describe the principles of polygenic cardiovascular diseases (such as hypertension, diabetes and dyslipidaemias) Recall knowledge of major monogenic cardiovascular diseases; hypertrophic cardiomyopathy, familial aortopathies such as the Marfan syndrome, Ehlers Danlos syndrome, and William's syndrome; familial dilated cardiomyopathies; familial channelopathies; 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 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination. Evaluate relevant family history and 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. 	<ul style="list-style-type: none"> Cooperate with clinical geneticists Develop a systematic method of approaching a family with a potentially inherited cardiovascular disease. Adopt appropriate counseling 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 professionals of other specialties on patients with genetic disorders

6. Clinical Pharmacology



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To master the theory and practice of state of the art pharmacological treatment of cardiovascular disorders 	<ul style="list-style-type: none"> Recognise the classification and mode of action of drugs (with emphasis on angiotensin-converting enzyme inhibitors, 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 renin-inhibitors or potassium channel blockers) 	<ul style="list-style-type: none"> Take a relevant history of a patient's medication regime, 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 treatment regimen. 	<ul style="list-style-type: none"> Incorporate the principles of evidence based therapy and current Guidelines into 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.

ESC Guidelines

- Expert consensus document on the use of antiplatelet agents. (European Heart Journal 2004; 25: 166-181)
- Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

7. Cardiovascular Disease Prevention – Risk Factors, Assessment and Management

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> 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 to the global efforts in reducing Cardiovascular morbidity and mortality by communicating the prevention message to the public. To approach risk prevention in a holistic way, understanding the potential of cardiovascular risk by clustering of risk factors. 	<ul style="list-style-type: none"> 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. Recognise that risk factors often cluster and require a comprehensive approach. Explain risk assessment in secondary prevention including drug therapy. Recognise the complications and consequences of specific risk factors. 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination. Evaluate CVD risk and assess global CVD risk at individual level (HeartSCORE). Evaluate CVD risk at population level (mortality, morbidity, disability) Evaluate the benefit 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 benefit of risk factor intervention for the individual patient. 	<ul style="list-style-type: none"> Appreciate the importance of risk factor management. Appreciate variation in CVD risks across population, socioeconomic, gender, and racial groups. Through patient education, encourage a healthier lifestyle with specific emphasis on risk factors and maintenance of favourable risk profile over lifetime. Offer advice and support to family members with inherited CVD. Cooperate with other specialists such as dieticians, diabetologists and specialist nurses. To participate actively at CVD prevention programs (children, adults and elderly) .. To consider cost-effectiveness of the prescribed treatment regimen.



Cardiovascular Disease Prevention – Risk Factors, Assessment and Management

(continued)



Objectives	Knowledge	Skills	Behaviours and Attitudes
Hypertension • To diagnose and treat different forms of arterial hypertension. • To assess cardiac and other end-organ complications in patients with arterial hypertension.	<ul style="list-style-type: none"> Define the epidemiology aetiology and pathophysiology of Essential Hypertension. Describe the complications and consequences of essential hypertension. Describe the diagnosis and assessment of essential hypertension; <ul style="list-style-type: none"> - Blood pressure measurement, including ambulatory blood pressure monitoring - Symptoms and signs of target organ damage Diagnostic procedures Elaborate the management of essential hypertension. Define secondary hypertension and recall its various causes - Renovascular hypertension - Bilateral renal parenchymal disease - Hypertension induced by hormonal contraceptives and conjugated oestrogens - Other forms of secondary hypertension. Outline the cell biology of left ventricular hypertrophy 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination. Assess blood pressure using the correct methods for diagnosis and treatment control in hypertension, including ambulatory blood pressure monitoring. Advise patients on lifestyle management and treatment compliance. Advise patients on measuring their own blood pressure. Perform cost efficient screening for secondary hypertension. Select adequate treatment for lowering Blood Pressure to target values and prevent/treat end-organ damage. Select appropriate parameters in order to describe the risk profile in an individual patient with hypertension. Identify secondary organ damage (in particular cardiac, neurological, renal and atherosclerotic vascular disease) caused by hypertension. Manage multi-drug treatment regimes according to a patient's co-morbidities and possible side effects. 	<ul style="list-style-type: none"> Recognise that the diagnosis and treatment of hypertension need a multidisciplinary approach. Be able to motivate the patient to maintain long term compliance with antihypertensive therapy. Appreciate that hypertension itself is often under diagnosed and under-treated. Recognise the clustering of risk factors that include hypertension in order to formulate a holistic approach to patient management
Dyslipidemia • To diagnose and treat different forms of dyslipidemia. • To assess cardiac and extra-cardiac complications of dyslipidemia.	<ul style="list-style-type: none"> Define the epidemiology, aetiology and pathophysiology of dyslipidemia Describe the complications and consequences of dyslipidemia Describe the diagnosis and assessment of dyslipidemia. Elaborate the management of dyslipidemia. Outline the cell biology of atherosclerosis. 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination. Assess dyslipidemia using the correct methods for diagnosis and therapeutic control. Advise patients on lifestyle management and treatment compliance. Advise patients on measuring their lipids. Select adequate treatment for lowering blood pressure to target values and prevent/treat its consequences 	<ul style="list-style-type: none"> Recognise that the diagnosis and treatment of dyslipidemia sometimes need a multidisciplinary approach. Be able to motivate the patient to maintain long-term compliance with antihypertensive lipid lowering therapy Recognise the clustering of risk factors that include dyslipidemia in order to formulate an integrated approach to patient management.

Cardiovascular Disease Prevention – Risk Factors, Assessment and Management

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> Diabetic heart disease Diagnose and treat cardiovascular complications in the diabetic patient, appreciating the continuum ranging from impaired fasting glucose to insulin dependent diabetes and its complications. 	<ul style="list-style-type: none"> Define Diabetes Mellitus Describe the role of diabetes in Coronary heart disease in the following areas <ul style="list-style-type: none"> - Epidemiology - Pathophysiology of cardiovascular complications - Role of risk factor intervention - screening for CAD in diabetics - screening for diabetes in CAD (oral glucose testing) Describe the pathophysiology of diabetes and its non-cardiac and cardiac complications (CAD, diabetic cardiomyopathy, autonomic neuropathy and its cardiovascular affects). Outline treatments including diet, exercise, hypoglycaemic drugs and insulin Explain current thinking regarding the concept of the metabolic syndrome 	<ul style="list-style-type: none"> Select appropriate parameters to describe the risk profile in an individual patient with dyslipidemia Identify other vascular areas affected by atherosclerotic vascular disease Manage multidrug treatment regimens according to a patient's comorbidities and possible side effects. 	<ul style="list-style-type: none"> Understand the multidisciplinary approach to the patient with diabetes. Be aware of the importance of recognising 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. Recognise the clustering of risk factors that include diabetes in order to formulate a holistic approach to patient management

⁽¹⁾ ESC Guidelines on the Fourth Joint European Societies' Task Force on cardiovascular disease prevention in clinical practice. Executive Summary [European Heart Journal 2007;28:2375-2414] and Full text [European Journal of Cardiovascular Prevention and Rehabilitation 2007; 14(suppl 2):S1-S113]

8. Acute Coronary Syndromes (ACS)

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform specialist assessment and treatment of patients with acute coronary syndromes including <ul style="list-style-type: none"> - STEMI (ST segment elevation myocardial infarction) - Non-STEMI - Unstable angina 	<ul style="list-style-type: none"> Outline the main aspects of the pathophysiology of acute coronary syndromes; Myocardial ischaemia, Atherosclerosis of the epicardial coronary arteries, Events that precipitate ACS, Non-atheromatous CAD Describe the dominant clinical features of ACS; Cardiac Ischaemic chest pain, examination of CV system in ACS, Silent ischaemia and infarction Describe the diagnostic process in unstable angina and non-ST elevation MI - analysis of symptoms and clinical differential diagnosis, 12-lead ECG, Laboratory studies, Imaging modalities Describe the diagnostic procedures in AMI - analysis of symptoms and clinical differential diagnosis, 12-lead ECG, Laboratory studies, Imaging modalities Describe the potential complications of AMI; Myocardial Ischemia, Arrhythmias and Mechanical complications Describe treatment options for AMI; Pre-hospital and early-hospital adjunctive pharmacological therapy, percutaneous coronary intervention (PCI), Coronary bypass grafting (CABG), early in-hospital. 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Appreciate the role of risk factors, the clinical characteristics of coronary occlusion, and subsequent clinical course. Interpret biochemical markers of myocardial damage. Interpret ECG and imaging techniques to detect and locate ischaemia and/or infarction. Understand the importance of monitoring patients with ACS. Provide appropriate pharmacological treatment including analgesic, antiplatelet, and antithrombotic and anti-ischaemic therapy. Understand indications and contraindications for acute reperfusion treatment and make appropriate decisions. Demonstrate proficiency in selecting cardiac catheterisation in the context of ACS. Demonstrate proficiency in treating patients with heart failure and cardiogenic shock, including invasive haemodynamic monitoring. Demonstrate knowledge of advanced CPR techniques and management of life threatening arrhythmias. 	<ul style="list-style-type: none"> Recognise the urgency of organised teamwork required for the optimal management of patients with ACS. Recognise the urgency of making rapid decisions regarding patients with ACS, from the time of their arrival in the emergency department until definitive therapy is established (for example minimising door-to-balloon/needle time). Appreciate the distress that unexpected and serious illness causes both to the patient and their relatives. Recognise when to transfer the patient to another hospital for interventional or surgical revascularisation. Contribute to improving public awareness of the significance of chest pain and encouraging early presentation.

Acute Coronary Syndromes (ACS)

(continued)

Percutaneous coronary intervention

Objectives	Knowledge	Skills	Behaviors and Attitudes
<ul style="list-style-type: none">To understand indications, techniques, typical acute and long-term problems, limitations, complications, alternatives, and adjunctive pharmacotherapy of PCI	<ul style="list-style-type: none">Know mechanisms of action of main PCI techniques (balloon angioplasty, stent implantation, rotablation).Understand fundamental characteristics of balloons and stents, including typical lengths and diameters, antiproliferative drug coating.Understand the problem of restenosis, acute and subacute stent thrombosis, and appropriately weigh risks and benefits of interventional techniques.Recognize the added risk from diabetes and renal impairment;Be aware of acute and chronic complications of PCI.Know current differential indications for surgical and interventional revascularization as well as conservative treatment of CAD with respect to anatomy, extent of disease, role of left ventricular function both in the setting of ACS and of chronic CAD.	<ul style="list-style-type: none">To appropriately select ACS patients who are candidates for urgent angiography and PCITo appropriately select chronic CAD patients who are candidates for angiography and PCI.To adapt pharmacotherapy, especially anti-coagulation and anti-aggregatory medication, before and after PCI to clinical needs.To be responsive to potential hazards such as contrast nephropathy, arterial access complications (hematoma), drug compliance issues, drug resistance, non-cardiac diseases or interventions with bleeding risks while the patient is on thienopyridine and aspirin medication.	<ul style="list-style-type: none">Explain risk, benefits and alternatives in a compassionate way to the patient and be responsive to his fears and worries; take patient's wishes, co-morbidities and social situation into account when making medical decisionsInteract and cooperate professionally with interventional cardiologists, heart surgeons, and supporting medical personnel

ESC Guidelines

- Guidelines on the Management of Non-ST Segment Elevation Acute Coronary Syndromes (European Heart Journal, 2007; 28 (13): 1598-1660).
- Guidelines for Percutaneous Coronary Interventions (PCI) (European Heart Journal, 2005; 26 (8): 804-847).

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

9. Chronic Ischaemic Heart Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform specialist assessment and treatment of patients with chronic Ischaemic Heart Disease (IHD) To evaluate patients and interpret the results of diagnostic procedures To select and manage appropriate therapies 	<ul style="list-style-type: none"> Describe the epidemiology of chronic IHD and its risk factors Explain the molecular and cellular biology of IHD, its pathology and development, and the effects of ischaemia on the cardiac myocyte Describe events that precipitate a clinical angina attack Outline the prognosis of chronic IHD Describe the clinical assessment of known or suspected chronic IHD, including evaluation of chest pain, other symptoms and signs, and diagnostic procedures Describe the management of chronic IHD, including lifestyle measures, pharmacological management - 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination. Demonstrate the ability to risk stratify individual patients and to select an appropriate management strategy. Select, use and interpret non-invasive and invasive diagnostic tools for the evaluation of ischaemia, viability, left ventricular structure and function and coronary anatomy. Identify and treat risk factors for chronic IHD. 	<ul style="list-style-type: none"> Recognise the importance of risk factor management and secondary prevention. Consult with specialists such as interventional cardiologists, cardiac surgeons, dieticians and diabetologists in order to devise an appropriate management plan for individual patients

Chronic Ischaemic Heart Disease

(continued)

Stress Testing

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none">To be able to perform exercise or pharmacological stress testing alone, or in conjunction with, an imaging modality	<ul style="list-style-type: none">Outline the basic principles of coronary physiologyDescribe the principles of exercise physiologyDescribe the mechanisms of action of vasodilators and inotropic drugs used for stress testingAppreciating the indication of stress testing in other cardiac disorders (including valvular disease, arrhythmias and heart failure)	<ul style="list-style-type: none">Be able to interpret the ECG to detect ischaemia and/or arrhythmiasManaging life-threatening arrhythmias ischaemia, or other emergency situations, including ACLS, during the test	<ul style="list-style-type: none">Select the appropriate stress modality for a particular patient and interpret according to Bayesian principles taking into account specific strengths and weaknesses of a given test modality in a given patient (e.g., frequent false positive stress ECG in women)

(For PCI, see chapter 8.)

ESC Guidelines

- European guidelines on cardiovascular disease prevention in clinical practice – Executive Summary [European Heart Journal 2007; doi: bis.1093/eurheartj/ehm316]
- Management of stable angina pectoris. [European Heart Journal 2006; 27: 1341-1381]
- Guidelines on universal myocardial infarction redefinition [European Heart Journal 2007; doi: bis.1093/eurheartj/ehm355]

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

10. Myocardial Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform specialist assessment and treatment of patients with cardiomyopathy and myocarditis. 	<ul style="list-style-type: none"> Define and describe the epidemiology of dilated, hypertrophic, restrictive, infiltrative cardiomyopathies and obliterative endomyocardial disease Describe the pathophysiology including genetics, clinical features and diagnostic criteria of cardiomyopathies Elaborate the medical and invasive (surgical, electrophysiological and interventional) management of cardiomyopathies: indications, contraindications, possible adverse effects Identify prognostic factors <p>Myocarditis</p> <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination To be able to interpret diagnostic data (ECG, ambulatory ECG, Echo, exercise testing, chest X-ray, cardiac catheterisation, coronary angiography, magnetic resonance and radionuclide imaging, 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. 	<ul style="list-style-type: none"> To establish cooperation with medical professionals in other specialties (immunology, bacteriology, genetics, cardiac surgery, interventional cardiology, imaging) for timely differential diagnosis of myocardial disease and further treatment To be able to counsel patients with cardiomyopathies and their relatives about associated risks.

ESC Guidelines

- Clinical expert consensus document on hypertrophic cardiomyopathy (European Heart Journal 2003; 24: 1965-1991)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

11. Pericardial Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform specialist assessment and treatment of patients with pericardial diseases 	<ul style="list-style-type: none"> Classify and define <ul style="list-style-type: none"> - 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 constrictive pericarditis from restrictive cardiomyopathy Describe the management of pericarditis Recall related complications; pericardial effusion, cardiac tamponade and constriction. 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Demonstrates 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 and ideally perform pericardiocentesis on appropriately selected patients 	<ul style="list-style-type: none"> Consider pericardial diseases 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.

ESC Guidelines

- Guidelines on the diagnosis and management of pericardial diseases. (European Heart Journal 2004; 25: 587-610)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

12. Cardiac Tumours



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none">To be able to perform specialist assessment and treatment of patients with cardiac tumours	<ul style="list-style-type: none">Classify and describe the epidemiology, pathophysiology, pathology and clinical manifestations of primary cardiac tumours and metastatic cardiac tumours, including lymphomaDescribe effect of tumour size and locationOutline clinical features including - Impairment of cardiac functionSystemic manifestationsSystemic and pulmonary emboliSigns of physical obstruction to blood flow (e.g. atrial myxoma)- Pericardial involvement-constriction and tamponade	<ul style="list-style-type: none">Take a relevant history and perform an appropriate clinical examinationSelect and use appropriate imaging modalitiesConsider a differential diagnosis of primary or secondary neoplastic involvement of the heartRecognise other cardiac masses including thrombi or vegetations	<ul style="list-style-type: none">Collaborate effectively with cardiovascular surgeons and with other specialists dealing with neoplastic diseaseUnderstand the importance of support and counselling for the patient and family

13. Congenital Heart Disease in Adult Patients



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to assess, manage and appropriately refer adult patients with congenital heart disease including those patients who have undergone previous cardiac surgery 	<ul style="list-style-type: none"> Describe the epidemiology, aetiology, prevention, pathophysiology, nomenclature, and foetal and transitional circulations Describe diagnosis and assessment Outline principles of management Identify pathology, diagnosis and management of specific conditions <ul style="list-style-type: none"> Atrial septal defect Atrioventricular septal defects Ventricular septal defects Anomalous pulmonary venous connections Pulmonary stenosis Aortic stenosis Patent ductus arteriosus Coarctation of the aorta Tricuspid atresia Ebstein's anomaly of the tricuspid valve Abnormalities of the left atrioventricular junction Tetralogy of Fallot Double-outlet right ventricle Complete transposition of the great arteries Congenitally corrected transposition of the great arteries <ul style="list-style-type: none"> Double outlet left ventricle Common arterial trunk 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Select imaging techniques and where appropriate use invasive procedures for diagnosis and treatment. Following diagnosis and initial treatment provide long term follow up, including patient monitoring and lifestyle advice. 	<ul style="list-style-type: none"> Understand the importance of referring patients for a specialist opinion. Appreciate the importance of genetic counselling. Appreciate the social and emotional difficulties encountered by adult patients with congenital heart disease

Congenital Heart Disease in Adult Patients

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
	<ul style="list-style-type: none">- Pulmonary atresia- Congenital malformations of coronary arteries- Congenital malformations of pulmonary arteries- Aortic arch anomalies- Arteriovenous malformations		

ESC Guidelines

- Guidelines for the interpretation of the neonatal electrocardiogram. (European Heart Journal 2002; 23: 1329-1344)
- Management of grown up congenital heart disease. (European Heart Journal 2003; 24: 1035-1084)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines



14. Pregnancy and Heart Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform cardiac evaluation and treatment of women contemplating pregnancy 	<ul style="list-style-type: none"> For each of the listed objectives consider the following clinical conditions which may affect the pregnant woman: congenital heart disease, acquired valve disease, prosthetic valves, coronary artery disease, cardiomyopathies, arrhythmias, hypertension, Marfan's syndrome, Aortic dissection 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Perform clinical evaluation and interpret the results of diagnostic procedures to assess the cardiac risk of pregnancy Indicate preventive cardiac intervention if needed 	<ul style="list-style-type: none"> Recognise the importance of education for women with heart disease on the potential risks of pregnancy Co-operate with obstetricians and midwives to detect pregnant women with unknown heart disease and to identify those at high risk
<ul style="list-style-type: none"> To be able to perform cardiac follow-up of the pregnant patient with heart disease 	<ul style="list-style-type: none"> Outline cardiac follow-up of pregnant women Identify situations requiring medical therapy Outline treatment of arterial hypertension and its complications Identify situations in which cardiac intervention may be required Define the modalities of delivery Describe the management of anticoagulation therapy 	<ul style="list-style-type: none"> Perform clinical and non-invasive evaluation of the cardiac tolerance of pregnancy Select which drug therapies can be used during pregnancy Evaluate the foetal and maternal risk of different cardiac interventions Assess the foetal prognosis 	<ul style="list-style-type: none"> Recognise the importance of patient education on the symptoms of poor cardiac tolerance Educate obstetricians and midwives on symptoms of undiagnosed heart disease enabling the prompt identification of situations requiring rapid cardiac management Co-operate with obstetricians and anaesthesiologists to plan delivery (date, method, drug therapy, medical environment)

Pregnancy and Heart Disease

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none">To be able to perform specialist assessment and treatment of cardiac patients after pregnancy	<ul style="list-style-type: none">Describe follow-up modalities during the post-partum periodDiagnose and treat post-partum cardiomyopathy	<ul style="list-style-type: none">Analyse cardiac condition after pregnancyAssess the cardiac risk of subsequent pregnancies	<ul style="list-style-type: none">Inform obstetricians and midwives on the risk of worsening of cardiac status during the early post-partum period

ESC Guidelines

- Expert consensus document on management of cardiovascular diseases during pregnancy. (European Heart Journal 2003; 24: 761-781)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

15. Valvular Heart Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to perform a specialist assessment and treatment of patients with the following valvular pathologies: <ul style="list-style-type: none"> - Aortic stenosis - Aortic regurgitation - Mitral valve stenosis - Mitral valve regurgitation - Tricuspid stenosis - Tricuspid regurgitation - Pulmonary valve disease 	<ul style="list-style-type: none"> Explain pathology and pathophysiology Recall natural history and progression. Explain strengths and limitations of diagnostic techniques, in particular echocardiography, and recognize the value of additional techniques such as magnetic resonance imaging or and invasive hemodynamics in cases of discrepant findings Recall the indications, benefits, and risks of medical therapy, and surgical or percutaneous interventions Appreciate the indications for and management of anticoagulation Know the role of concomitant coronary heart disease in valvular heart disease and its impact on surgical management Outline post operative care 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Select the appropriate use of invasive or non-invasive diagnostic techniques Interpret results of diagnostic procedures Be able to decide whether to indicate surgery and appropriate timing Convey to the patient the importance of monitoring of symptoms and signs of valvular heart disease and of periodic follow-up by the cardiologist 	<ul style="list-style-type: none"> Co-operate with cardiovascular surgeons, interventional cardiologists, and radiologists Recognise importance of patient education, with respect to the natural history of valvular heart disease, management of anticoagulation, prophylaxis of bacterial endocarditis and choice of valve prosthesis when appropriate Convey to the patient the importance of monitoring of symptoms and signs of valvular heart disease and of periodic follow-up by the cardiologist
<ul style="list-style-type: none"> To be able to perform follow up after valve surgery or percutaneous intervention, including immediate post-operative care and long term management of patients with prosthetic valves 	<ul style="list-style-type: none"> Understand postoperative pathophysiology Postoperative management of anticoagulants, diuretics and other drugs, prophylaxis against infective endocarditis, management of pregnancy and non-cardiac surgery in the patient with prosthetic valves 	<ul style="list-style-type: none"> Recognise and manage the complications which may occur in patients with prosthetic valves or after valvular interventions 	<ul style="list-style-type: none"> Co-operate with cardiac surgeons and anaesthetists Recognise the appropriate frequency of follow up with specific reference to the clinical condition following surgery or intervention.

ESC Guidelines

- Guidelines on the Management of Valvular Heart Disease [European Heart Journal 2007; 28: 230-268]

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

16. Infective Endocarditis



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none">Assess, diagnose and treat patients with infective endocarditis (of native and prosthetic valves as well as due to indwelling devices such as pacemakers and catheters)	<ul style="list-style-type: none">Describe epidemiology, pathology, pathogenesis and microbiology of infective endocarditisRecognise the clinical featuresDescribe laboratory investigations including microbiological resultsDescribe the use of cardiac imaging and the importance of transoesophageal echocardiography to detect complications such as abscessesExplain the selection and management of antibiotic therapyDescribe the role of valve surgery in patients with endocarditisDescribe the management of complicationsRecognise high-risk patients and situationsIdentify indications for antibiotic prophylaxis	<ul style="list-style-type: none">Take a relevant history and perform an appropriate clinical examinationSelect the appropriate use of laboratory investigations and diagnostic procedures, in particular echocardiographySelect appropriate antibiotic regimenBe able to determine the need for, and timing of surgeryManage complicationsPrescribe appropriate antibiotic agents for prophylaxis	<ul style="list-style-type: none">Develop a multidisciplinary approach with cardiac surgeons, and microbiologists for diagnosis and managementRecognise the importance of patient and physician education on prophylaxis

ESC Guidelines

- Guidelines on the prevention, diagnosis and treatment of infective endocarditis – Executive Summary. (European Heart Journal 2004; 25: 267-276)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

17. Heart Failure (HF)



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To recognise the impact of heart failure on morbidity and mortality in the local and general population To be able to recognise the different underlying causes of heart failure To be able to perform specialist assessment and treatment of patients with heart failure 	<ul style="list-style-type: none"> Describe the epidemiology, pathophysiology and prognosis of heart failure Recognise complications Recall the international classifications of functional limitation (for example NYHA classes) Outline the diagnostic procedures in the patient with known or suspected HF including Natriuretic peptides, Echo, ECG, ambulatory ECG, stress testing, cardiac catheterisation Describe the medical management of acute HF Describe the medical management of chronic HF (neurohumoral blockade) Outline device management of HF: Cardiac Resynchronisation Therapy, ICD Explain the role of cardiac surgery including transplantation Identify the role of exercise training programs in HF patients Recognise the importance of multidisciplinary care, including home based nursing in HF Identify the complications of HF-patients Determine the appropriate follow up of HF-patients Recognise the importance of the volumic status and the evaluation of renal function and electrolytes in HF patient 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Be able to select and use diagnostic techniques to differentiate the underlying causes of HF Be able to deliver lifestyle advice and home based treatment strategy to patients Be able to risk stratify HF patients and select appropriate drug and other therapies (Implantable Cardiac Defibrillator (ICD), Cardiac Resynchronisation therapy (CRT), surgery) To evaluate HF patients during follow up and appropriately and continuously adjust the treatment plan. 	<ul style="list-style-type: none"> Emphasise the importance of lifestyle, exercise and weight loss. Help patients to understand the need for long-term complex drug therapy Appreciate the importance of rehabilitation Develop and sustain supportive relationships with patients with chronic heart failure Teach patients, relatives and special nurses in HF treatment. Recognise the advantages and limitations of specific heart failure therapies Explain, negotiate and overcome the barriers to compliance with heart failure treatments Recognise the importance of supportive and palliative care in the heart failure population

Heart Failure (HF)

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
	<ul style="list-style-type: none">Recall the indications and contraindications for heart transplantationDetermine the appropriate follow up of patients following heart transplantation		

ESC Guidelines

- Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2008 (European Heart Journal 2008) doi:10.1093/eurheartj/ehn309
- Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines



18. Pulmonary Arterial Hypertension



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to diagnose pulmonary arterial hypertension (PAH) To be able to provide optimal management for patients with PAH To be able to distinguish between the different causes of pulmonary hypertension 	<ul style="list-style-type: none"> Define pulmonary hypertension and its functional classification Describe the epidemiology of PAH (incidence, prevalence, aetiology, genetics, high-risk groups) Describe the pathology and pathophysiology of PAH Describe the clinical features of PAH Outline the diagnostic criteria of PAH Identify prognostic markers Describe management of PAH (medical, surgical and interventional including balloon atrial septostomy, indications, contraindications and possible adverse effects) 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Recognise clinical signs suggestive of PAH Differentiate between pulmonary hypertension and other diseases with similar symptoms Perform and interpret accurate medical assessment (using laboratory analyses including arterial blood gases, cardiac biomarkers; pulmonary function test, ECG, Echocardiography, cardiopulmonary stress-testing, ventilation-perfusion lung scan, spiral CT, magnetic resonance imaging, cardiac catheterisation and pulmonary angiography, lung biopsy) Prescribe appropriate medical or invasive (surgical or interventional) management Evaluate clinical and haemodynamic prognostic markers 	<ul style="list-style-type: none"> Establish cooperation with family physicians and other health care professionals for early recognition of primary pulmonary hypertension; Effectively collaborate with other medical specialists (family medicine, thoracic surgery, invasive cardiology, imaging) for differential diagnosis of pulmonary hypertension and timely referral to surgical treatment Provide genetic counseling to families affected by familial PAH Maintain long-term involvement of patients and their family members in supportive activities for healthy life-style adherence and treatment compliance Appreciate the increased prevalence of PAH in other medical conditions, such as scleroderma Refer to Specialists in PAH when appropriate

ESC Guidelines

- Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2008 (European Heart Journal 2008) doi:10.1093/eurheartj/ehn309

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

19. Rehabilitation and Exercise Physiology



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to provide appropriate rehabilitation and secondary prevention services to patients with cardiovascular disease, specifically acute coronary syndromes, after revascularisation, with stable angina pectoris, patients with high cardiovascular risk, heart failure, diabetes, and others To be able to evaluate the cardiovascular risk and the exercise capacity of the patients To be able to evaluate "athletes heart" characteristics 	<ul style="list-style-type: none"> Define rehabilitation and secondary prevention as integrated components of cardiac care Define target populations and risk stratification of patients Understand baseline assessment, exercise testing, exercise training, patient education, lifestyle intervention, risk factor management, psychosocial and vocational support Understand exercise and sports physiology, and benefits of exercise training, recognize safety issues Recognise psychological aspects of rehabilitation Understand specific population challenges Describe programmes for specific populations in appropriate settings 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination as part of a comprehensive baseline assessment Perform and interpret risk stratification, using and/or performing namely the CPX or the conventional exercise test, the echocardiogram or other tests as indicated Prescribe exercise programmes, in terms of mode, intensity, duration and progression, and other lifestyle interventions Prescribe cardiovascular preventive medications according to best practice guidelines Recognize "athletes heart" characteristics (ECG, echol) and use the ESC recommendation for eligibility 	<ul style="list-style-type: none"> Recognise rehabilitation and secondary prevention as an integrated component of cardiac care Recognise the importance of rehabilitation and secondary prevention for professional (work), personal (including driving, travelling, leisure and sex) and social life among patients with heart disease Recognise the interplay of physical and psychological aspects of heart disease Recognise the importance of patients and partners/families education Recognise the role of other professionals including nurse specialists, physiotherapists, psychologists, dieticians and general practitioners in rehabilitation and secondary prevention Recognise the role of sports in Cardiology

20. Arrhythmias



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to assess and treat patients with arrhythmias 	<ul style="list-style-type: none"> Classify and define Bradyarrhythmias Tachyarrhythmias - Supraventricular arrhythmias - Ventricular arrhythmias Describe the epidemiology, pathophysiology, genetics, diagnosis and clinical features of arrhythmias Identify prognosis including risk evaluation Describe the principles of electrocardiography and electrophysiology and relevant findings in different arrhythmias, including high risk features in the resting ECG such as long QT, short QT, and Brugada syndrome 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Be competent in cardio-pulmonary resuscitation Classify arrhythmias by standard electrocardiogram Manage acute arrhythmias with drugs Manage acute arrhythmias with cardioversion Prescribe appropriate preventative pharmacological therapy Perform and interpret electrocardiographic monitoring. Interpret electrophysiological study Refer patients for catheter ablation and perform follow-up after catheter ablation Pacing & ICD Insert temporary pacing electrodes, Implantation of permanent single chamber, dual chamber pacemakers (a documented indicative number being 50 cases to achieve level II competence). Appropriately select and refer patients for biventricular pacing Manage the follow up of patients with pacemakers including interrogation and programming of the device 	<ul style="list-style-type: none"> Appreciate the anxiety suffered by patients with arrhythmias and with some methods of management, e.g. catheter ablation, pacing and ICD Appreciate the importance of coexisting structural heart diseases, including coronary artery disease in relation to the outcome and management of arrhythmias Appreciate the limitations and potential risks of anti-arrhythmic drug therapy Appreciate the palliative nature and potential adverse effects of non-pharmacological therapies
Electrophysiology <ul style="list-style-type: none"> To have a good understanding of diagnostic and therapeutic electrophysiology in relation to patients with arrhythmias 	<ul style="list-style-type: none"> Describe the principles of invasive and device management of arrhythmias, including <ul style="list-style-type: none"> catheter ablation Pacemaker therapy (temporary and permanent) ICD therapy Surgical therapy 		
Pacing <ul style="list-style-type: none"> To be able to assess patients for pacing. Be able to pace patients independently and safely 	<ul style="list-style-type: none"> Describe the pharmacology of antiarrhythmic drug therapy Outline the principles of invasive and device management of arrhythmias, including <ul style="list-style-type: none"> catheter ablation Pacemaker therapy (temporary and permanent) ICD therapy Surgical therapy 		
Implantable Cardioverter Defibrillator (ICD) <ul style="list-style-type: none"> To be able to assess patients who require ICD implantation 			

Arrhythmias

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
		<ul style="list-style-type: none">• Use history, examination and cardiac imaging to determine which patients require an ICD.	

ESC Guidelines

- Guidelines on Cardiac Pacing and Cardiac Resynchronization Therapy [European Heart Journal 2007 - doi: 10.1093/euroheartj/ehm305]
- ACC/AHA/ESC guidelines for the management of patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death – Executive Summary [European Heart Journal 2006; 27: 2099-2140] and Full Text [Europace 2006]
- ACC/AHA/ESC Guidelines for the Management of Patients with Atrial Fibrillation, Executive Summary [European Heart Journal, 2006; 27: 1979-2030] and Full Text [Europace 2006 doi: 10.1093/europace/eui097]

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines



21. Atrial Fibrillation



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to carry out specialist assessment and treatment of patients with Atrial Fibrillation (AF) 	<ul style="list-style-type: none"> Describe the epidemiology, prognosis, and pathophysiology of atrial fibrillation Classify atrial fibrillation Describe the diagnosis, clinical features and impact on quality of life Identify associated conditions Outline diagnostic procedures: <ul style="list-style-type: none"> Minimum evaluation - Additional investigation - Embolic complications Describe management: <ul style="list-style-type: none"> - anticoagulant therapy - rhythm vs. rate control - conversion to sinus rhythm - prevention of recurrences - control of ventricular rate - pacemaker-defibrillator therapy - catheter ablation - surgery 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Perform or interpret: <ul style="list-style-type: none"> - electrocardiogram - echocardiogram - transesophageal echocardiography - prolonged ECG monitoring (e.g. Holter monitoring) - exercise testing <p>Management</p> <ul style="list-style-type: none"> Develop appropriate anti-thrombotic strategies for prevention of ischemic stroke and systemic embolism Select patients appropriately for cardioversion and perform competently: pharmacological electrical Perform rhythm control therapy: <ul style="list-style-type: none"> pharmacological Perform rate control therapy: pharmacological Select and refer patients for: <ul style="list-style-type: none"> - electrophysiological studies - atrial catheter ablation - surgical ablation - pacemaker and defibrillator implantation - AV junction ablation and padding 	<ul style="list-style-type: none"> Appreciate the anxiety patients suffer with AF, particularly in case of certain 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 risks 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 percutaneous or surgical ablation.

ESC Guidelines

- ACC/AHA/ESC guidelines on the management of patients with atrial fibrillation - Executive Summary. (European Heart Journal 2006; 27: 1979-2030). Europeace 2006

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

22. Syncope



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To define syncope To differentiate syncope from the other causes of loss of consciousness To assess and treat of patients with syncope 	<ul style="list-style-type: none"> Describe the epidemiology and understand prevalence of different causes of syncope Describe its pathophysiology Classify causes of loss of consciousness (e.g. Neurally-mediated reflex syncope, Stokes Adams attack, orthostatic hypotension, Identify prognosis Describe diagnostic evaluation - Strategy of evaluation - Initial evaluation (history, physical examination, baseline ECG) - Echocardiogram - Exercise stress testing - Tilt testing - Electrocardiographic monitoring (Long term ECG, external and implantable loop recorders) 	<p>Diagnosis</p> <ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Perform or interpret: <ul style="list-style-type: none"> - electrocardiogram - echocardiogram - carotid sinus massage - tilt testing - electrocardiographic monitoring (Long term ECG, external and implantable loop recorder) - electrophysiological test - exercise stress testing - cardiac catheterization and coronary angiography Perform risk stratification 	<p>Diagnosis</p> <ul style="list-style-type: none"> Appreciate the impact of syncope on the patients lifestyle Appreciate that syncope is a transient symptom and not a disease Consult with other specialists. Recognise the diagnostic criteria for the causes of syncope Recognise appropriate investigations in the various subgroups of patients with syncope Recognise how patients with syncope should be risk stratified Appreciate how patients with syncope should be hospitalized. Recognise treatments that are likely to be effective in preventing syncopal recurrences <p>Treatment</p> <ul style="list-style-type: none"> Select appropriate treatment: <ul style="list-style-type: none"> - Education and reassurance - Physical manoeuvres - Drug therapy - Device implantation Describe treatments: device based or pharmacological for - Neurally-mediated (reflex) syncope - Orthostatic hypotension - Cardiac arrhythmias as primary cause - Structural cardiac or cardiopulmonary disease <ul style="list-style-type: none"> Appreciate that the diagnosis of syncope is often presumptive Appreciate that the diagnostic value (sensitivity and specificity) of tests for syncope is imperfect Appreciate that observations during the event are of key importance Appreciate that the diagnostic yield of the tests depends on their appropriateness of their selection (pre-test probability)

Syncope

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
			<p>Therapy</p> <ul style="list-style-type: none">• Recognise that most patients do not need any specific treatment apart from education and reassurance• Recognise that drug therapies are often ineffective• Recognise the risk-benefit and the cost-efficacy of pacemaker, ICD and catheter ablation therapy

ESC Guidelines

- Guidelines on Management (diagnosis and treatment) of syncope - update 2004, Executive Summary. (European Heart Journal 2004; 25: 2054-2072) and full text (Europace 2004; 6: 467-537)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines



23. Sudden Cardiac Death (SCD) and Resuscitation

Objectives	Knowledge	Skills	Behaviours and Attitudes
Sudden Cardiac Death <ul style="list-style-type: none"> To manage patients with threatened or aborted SCD, including risk stratification, investigation and treatment Resuscitation <ul style="list-style-type: none"> To be able to carry out basic and advanced cardiac life support 	<p>Sudden Cardiac Death</p> <ul style="list-style-type: none"> Define SCD and know and understand the epidemiology, aetiology, pathology, pathophysiology and clinical presentation of these 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 know how to further evaluate patients with these signs and their families Select appropriate long term therapeutic options <p>Resuscitation</p> <ul style="list-style-type: none"> Recall the current recommendations for secondary prevention of SCD (e.g., indications for preventive ICD implantation in patients with ischemic cardiomyopathy) Identify, risk stratify and manage individuals at elevated risk, including family members of SCD patients 	<p>Sudden Cardiac Death</p> <ul style="list-style-type: none"> Perform resuscitation (see below) 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-EKG, LV function, Echo, Cath, EP, heart rate variability) Follow up SCD-Survivors <p>Resuscitation</p> <ul style="list-style-type: none"> 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 (BLS) 	<p>Sudden Cardiac Death</p> <ul style="list-style-type: none"> 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 education and secondary prevention Understand the medical, psychological, and social problems arising in patients with end-stage heart failure and frequent ICD activation <p>Resuscitation</p> <ul style="list-style-type: none"> 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.
			<p>Resuscitation</p> <ul style="list-style-type: none"> Explain the methods and guidelines of basic and advanced life support including airway management, appropriate drug use, defibrillation and pacing

ESC Guidelines

- Guidelines on sudden cardiac death – Executive Summary. (*Europace* 2002; 4: 3-18)
- ACC/AHA/ESC updated guidelines on Ventricular Arrhythmias and Prevention of Sudden Cardiac death – Executive Summary. (*European Heart Journal* 2006; 27: 2099-2140)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

24. Diseases of the Aorta and Trauma to the Aorta and Heart



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to assess diseases of the Aorta, and trauma to the aorta and heart To be able to implement the appropriate medical, interventional or surgical treatment regime 	<ul style="list-style-type: none"> Understand the epidemiology, aetiology, pathology, genetics, pathophysiology and clinical presentation of aortic disease, aortic root disease, and trauma to the aorta and heart including: <ul style="list-style-type: none"> - Acute aortic syndromes: - Aortic dissection - Intramural haematoma - Traumatic aortic transection - Chronic aortic dissection - Aneurysm of the thoracic aorta - Aortic atheromatous disease - Aortitis - Trauma of the heart (including myocardial contusion) 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Choose, perform and interpret the appropriate imaging studies (transthoracic and transoesophageal echocardiography, magnetic resonance, computed tomography, ultrasound (surface and intravascular) and angiography of the aorta and of the heart to assess aortic disease and traumatic lesions To manage different aortic conditions with the appropriate treatment modality in a timely manner 	<ul style="list-style-type: none"> Cooperate with cardiovascular surgeons and interventional cardiologists as well as radiologists for diagnosis and treatment Recognise the potential urgency required in managing patients with diseases of the aorta and cardiac trauma Recognize and organize family screening where appropriate Recognize the need for and undertake long term follow-up of patients with chronic aortic disease

ESC Guidelines

- Diagnosis and management of aortic dissection. (European Heart Journal 2001; 22: 1642-1681)

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines

25. Peripheral Arterial Vascular Diseases



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to assess and treat patients with peripheral arterial vascular disease 	<ul style="list-style-type: none"> Describe epidemiology and pathology Describe diagnosis and assessment Describe medical and invasive (interventional and surgical) intervention management and their relative merit in different situations Identify prognosis Recall the association of peripheral vascular disease with vascular disease in other territories in particular carotid and renal arteries Recognise the causes of acute limb ischaemia and the urgency of its management 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate physical examination, especially the examination of peripheral pulses Identify the risk factors and select appropriately the management strategy keeping in mind that peripheral vascular disease is a manifestation of generalised atherosclerosis Select, use and interpret diagnostic tools appropriately including: <ul style="list-style-type: none"> - Ultrasound (duplex scanning and other Doppler modalities, including ankle brachial index) - MR angiography - CT angiography - Angiography 	<ul style="list-style-type: none"> Appreciate the systemic nature of atherosclerosis and its implication for a patient with disease manifested within a given territory Recognise the importance of risk factor modification in prevention. Encourage patients to adopt a healthier lifestyle with specific emphasis on risk factors Collaborate with specialists such as interventional cardiologists, radiologists, vascular surgeons and diabetologists.

26. Thromboembolic Venous Disease



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> To be able to diagnose, treat and prevent: <ul style="list-style-type: none"> - deep venous thrombosis - pulmonary embolism 	<ul style="list-style-type: none"> 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 Describe the clinical presentation of deep venous thrombosis and pulmonary embolism Outline the diagnosis by: 	<ul style="list-style-type: none"> Take a relevant history and perform an appropriate clinical examination Interpret ECG, echocardiography, spiral CT, ventilation-perfusion scanning signs of 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 	<ul style="list-style-type: none"> Appreciate the difficulties in diagnosing pulmonary embolism on the basis of symptoms and signs Collaborate with other imaging specialists including radiologists and nuclear imaging specialists Ensure patient understanding of the disease, the importance of compliance and appropriate precautions required during long term anticoagulant therapy

Thromboembolic Venous Disease

(continued)

Objectives	Knowledge	Skills	Behaviours and Attitudes
	<ul style="list-style-type: none">• Describe preventive measures: Compression stockings, heparins• Describe management of chronic pulmonary hypertension, including thrombendarterectomy		

ESC Guidelines

- Guidelines on the diagnosis and management of acute pulmonary embolism. [European Heart Journal 2008] doi:10.1093/eurheartj/ehn310
- Expert consensus document on the use of antiplatelet agents. [European Heart Journal 2004; 25: 166-181]

Details of the latest ESC Guidelines can be found at: www.escardio.org/guidelines



27. The cardiac consult



Objectives	Knowledge	Skills	Behaviours and Attitudes
<ul style="list-style-type: none"> Peri-operative cardiac consult for non-cardiac surgery To select appropriate preoperative imaging techniques from the following four imaging modalities for cardiac risk evaluation. <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Understand that preoperative tests should only be done if they will influence perioperative or long-term cardiac treatment and risk management, without delaying surgery if test results will not change management Apply the imaging techniques to assess <ul style="list-style-type: none"> 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 ischemic heart rate threshold during stress testing. Intraoperative cardiac monitoring for volume and ischemia status. Non-invasive coronary angiogram 	<ul style="list-style-type: none"> Consider heart valve replacement in patients with severe stenosis prior to surgery. Consider coronary revascularization in selected patients with extensive stress induced ischemia prior to surgery. Consider immediate coronary revascularization in patients with intraoperative hemodynamic instability, ST-segment changes and new wall motion abnormalities. Recognize strengths and limitations of each imaging modality. 	<ul style="list-style-type: none"> Communicate to patients the implications of the results of preoperative tests on perioperative management. Indicate the potential complications of delaying the index surgical procedure and the benefit of additional (invasive) cardiac therapy. Communicate with other specialties involved in perioperative care (anesthesiologist, surgeon, and intensivist) to individualize patient care.

The cardiac consult

(continued)



Objectives	Knowledge	Skills	Behaviours and Attitudes
Cardiac consult in the patient with ischaemic neurologic symptoms	<ul style="list-style-type: none">Understand the mechanism, likelihood, and potential treatment options of cardiac and aortic sources of embolismBe aware of the frequency of concomitant coronary and other arterial disease in the presence of ischemic neurologic diseaseSearch for other cardiovascular manifestations of atherosclerosis, in particular coronary heart disease and peripheral arterial disease, and advise proper management	<ul style="list-style-type: none">Use echocardiography, including transoesophageal echocardiography, and other techniques to search for potential sources of embolismPropose a diagnostic work-up of the patient for other atherosclerotic manifestations, and devise proper therapy and risk management	<ul style="list-style-type: none">Appreciate that potential sources of embolism are frequently of low probability (in particular, patent foramen ovale) and commonly co-existUnderstand the importance of diagnosing and treating co-existing cardiovascular atherosclerotic disease
Cardiac consult in other situations	<ul style="list-style-type: none">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	<ul style="list-style-type: none">Anticipate cardiovascular problems accompanying primarily non-cardiac diseases	<ul style="list-style-type: none">Cooperate closely with other disciplines and offer prompt support for their needs and questions



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EUROPEAN SOCIETY OF CARDIOLOGY
2035, ROUTE DES COLLES
LES TEMPLIERS - BP 179
06903 SOPHIA ANTIPOLIS CEDEX - FRANCE
PHONE: +33 (0)4 92 94 76 00
FAX: +33 (0)4 92 94 76 01
E-mail: products@escardio.org