ESC Council Valvular Heart Disease

Heart Valve Specialist Core Syllabus

A learning framework for continuous medical education on valvular heart disease

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Foreword

Heart valve disease becomes a major cardiovascular pathologic entity, as a result of an increase in prevalence in the continuously aging population. A recent (2015) large scale community screening study (OxVALVE) found a prevalence of moderate and severe heart valve disease of 11.3% in individuals over the age of 65, with a predicted double prevalence by 2046. The consequent increase in demand for heart valve disease diagnostic and management services require advance planning of education and training of heart valve disease specialists. Advances in diagnostic and management techniques require the development of specific individual expertise and the development of expert multidisciplinary Heart Valve Teams.

The ESC Council on Valvular Heart Disease aims to encourage structured education on heart valve disease and to support the development of an accreditation process. Describing knowledge requirements and providing the framework for structured education, the Core Syllabus provides a platform for certification in heart valve disease of individuals and of Heart Valve Teams and for accreditation of Heart Valve Centres of Excellence. The ESC Council on Valvular Heart Disease plans to provide certification and accreditation opportunities as an incentive and motivation for self-improvement and also to document the recognition of quality in heart valve disease care.

The Core Syllabus provides a learning framework for individual learning and for the development of educational material and teaching events.

Introduction

The diagnosis, follow-up and management of heart valve disease require specific knowledge and skills from the multidisciplinary team involved. The Core Syllabus outlines the elements of knowledge needed as background for the development of skills.

Following the publication of the Heart Valve Specialist Core Syllabus, the ESC Council on Valvular Heart Disease will encourage and support the development of sessions dedicated to the Core Syllabus at the EuroValve Congress, at the European Society of Cardiology annual Congress, at PCR London Valves, at the European Association for Cardio-Thoracic Surgery Annual Meeting and at EuroEcho Imaging. Furthermore, The Accreditation Taskforce of the ESC Council on Valvular Heart Disease will develop and publish accreditation criteria and the description of the accreditation process.

Core Syllabus

1. Epidemiology

ESC Topics 15.1, 15.2

- Epidemiology

- Variations in aetiology globally

- Increase in degenerative and iatrogenic disease

- Effect of ageing population

- Device related endocarditis

- IVDU related endocarditis

- Global and local prevalence of valve disease

- Results of population surveys (e.g. Global Burden of Disease, OxVALVE, Nkomo et al. US-based, Norwegian Tromsø, Finnish)

- Findings of EuroHeart Surveys I and II

2. Mechanisms of disease

ESC Topics 15.1, 15.2

- Pathology of calcific aortic disease

    - Similarities and differences compared with coronary disease

- Pathology of bicuspid aortic valve disease and associated disease of the aorta

- Pathology of annulo-aortic ectasia

- Pathology of aortic valve cusp prolapse

- Pathology of subaortic stenosis

- Pathology of degenerative mitral valve disease

    - Barlow Disease

    - Forme fruste

    - Fibroelastic deficiency

- Pathology of calcific mitral stenosis

- Pathology of rheumatic disease

    - Jones, WHO and other criteria for initial and subsequent attacks

- Treatment of acute rheumatic fever

- Secondary prophylaxis including duration

- Reasons for decline in rheumatic disease

- Pathology of carcinoid valve disease

- Drug-induced valve disease

- Radiation-induced valve disease

- Valve disease in systemic diseases

- SLE and antiphospholipid syndrome

- Ankylosing spondylitis

3. Valvular heart failure

ESC Topics 15.1, 15.2

- Heart failure in primary heart valve disease

- Left ventricular remodelling

- Heart failure with preserved ejection fraction (HFpEF)

- Heart failure with reduced ejection fraction (HFrEF)

- Secondary pulmonary hypertension and right heart failure

- Secondary heart valve disease in heart failure

- Ventricular-secondary regurgitation of atrio-ventricular valves

- Atrial-secondary regurgitation of atrio-ventricular valves (including regurgitation due to atrial fibrillation

4. General care

ESC Topics 15.3, 15.4, 15.5, 15.6

- Management of patients requiring non-cardiac surgery

- Effect on driving and insurance

- Advice to athletes

- Pregnancy

- Dental surveillance

- Advantages and drawbacks of population screening

- Costs

- Medicalisation of well people
- Evaluating surgical risk
- Drawbacks of EuroSCORE
- Frailty index and Futility for intervention
- Quality of life
- Effect of multiple morbidities on symptoms and principles of assessment
- Use of biomarkers notably BNP
- Patient and family education
- Variation in access to specialist care
    - The Heart Valve Clinic
    - The Heart Valve Centre of Excellence
    - The endocarditis team in the endocarditis reference centers
    - Interhospital variation in perioperative mortality
    - Interhospital variation in mitral valve repair rates
    - The effect of surgeon and hospital volumes
- Methods for organising care
    - Arguments for and against specialist valve clinics and specialised surgeons
    - Structure of Multidisciplinary teams
    - Culture of safety
    - Defining a valve specialist
    - Reduced access for the elderly
    - Effect of TAVI programmes on conventional surgical rates
    - Standards of a Heart Valve Centre
    - Virtual valve clinics
    - Models for community care
    - GP with special interest in valve disease
    - Murmur clinic
    - Open access echocardiography
- Screening

- Different yields from clinical vs. echocardiographic screening
- Groups at particularly high risk
    - Elderly
    - Relatives of probands with bicuspid valve disease
    - Relatives of probands with Barlow mitral valve disease
    - Migrants from countries in which rheumatic fever is endemic
    - Atrial fibrillation
- Patient involvement
    - Effect of education on acceptance of results

5. Aortic stenosis

ESC Topics 15.1, 15.2, 15.3, 15.4, 15.5

- Epidemiology
- Aetiology
- Common and less common causes
- The bicuspid aortic valve
    - Functional vs. anatomical bicuspid aortic valve
    - Patterns of cusps morphology
    - Association with aortic dilatation / aortic coarctation / mitral valve prolapse
    - Natural history
        - Risk of developing haemodynamically significant valve disease
        - Risk of developing aortic dilatation
        - Risk of dissection
- Natural history of aortic stenosis
    - Response of the left ventricle to pressure load
    - Gender differences in response
    - Effect of coexistent coronary disease and hypertension
    - Conduction disease
    - Effect of LV hypertrophy on outcome
    - Prevalence of pulmonary hypertension and effect on outcome

        - Valvular heart failure in aortic stenosis

- Symptoms and signs

        - Exercise testing to reveal latent symptoms

- Principles of assessment by echocardiography ***(ESC Topic 3.1)***

        - Classification of severity and how to approach apparent discrepancies

        - Effect of incorrect readings

        - Use of dimensionless index and indexing to body surface area

        - The role of valve stress echocardiography

- Role of CMR ***(ESC Topic 3.3)***

- Role of MDCT ***(ESC Topic 3.2)***

- Role of Nuclear Imaging ***(ESC Topic 3.4)***

- Low-flow low-gradient aortic stenosis with reduced and preserved EF

- The approach to the patient with moderate aortic stenosis and symptoms

- Frequency of surveillance

- Indications for and timing of surgery for severe aortic stenosis ***(ESC Topic 26.2)***

- Criteria for surgery at the time of CABG or aortic surgery ***(ESC Topic 26.2)***

- Indications for TAVI

- Evidence for balloon valvotomy and role as bridge to conventional surgery

- Postoperative complications including LV outflow acceleration ***(ESC Topic 26.2)***

- Medical therapy

        - To reduce the rate of progression

        - In valvular heart failure

                - In end-stage inoperable aortic stenosis

                - In HFpEF despite successful valve replacement

        - Evidence for medical therapy in aortic dilatation

6. Aortic regurgitation

ESC Topics 15.1, 15.2, 15.3, 15.4, 15.5

- Epidemiology

- Aetiology

- Primary and secondary causes

- Natural history

    - Response of the left ventricle to volume load

    - Effect of LV size on wall stress

    - Valvular heart failure and aortic regurgitation

- Symptoms and signs

    - Exercise testing to reveal latent symptoms

- Principles of assessment by echocardiography ***(ESC Topic 3.1)***

    - Classification of severity

    - Importance of LV volumes

    - The role of valve stress echocardiography

- Role of CMR ***(ESC Topic 3.3)***

- Frequency of surveillance

- Indications for and timing of surgery ***(ESC Topic 26.2)***

- Types of surgery ***(ESC Topic 26.2)***

    - Aortic valve replacement

    - Aortic valve repair

    - Valve-sparing aortic surgery

- Likelihood of permanent pacing

- Medical therapy

    - To reduce the rate of progression

    - Evidence for nifedipine, ACE inhibitors and AT receptor-blockers

    - Use and avoidance of beta-blockers

7. Mitral stenosis

ESC Topics 15.1, 15.2, 15.3, 15.4, 15.5

- Epidemiology

- Aetiology

    - Rheumatic

    - Calcific – Mitral Annulus Calcification

    - SLE
- Natural history
    - Effect on pulmonary artery pressures and right ventricular function
    - Valvular heart failure in mitral stenosis
    - Complications including thromboembolism
- Symptoms and signs
- Exercise testing to reveal latent symptoms
- ECG and radiographic features
- Principles of assessment by echocardiography ***(ESC Topic 3.1)***
    - Classification of severity
    - The role of 3D echocardiography
    - The role of valve stress echocardiography
- Role of CMR ***(ESC Topic 3.3)***
- Role of MDCT ***(ESC Topic 3.2)***
- Frequency of surveillance
- Indications for and timing of intervention
- Balloon valvotomy
    - Favoured over surgery
    - Morphologic criteria of eligibility (echocardiographic assessment)
    - Natural history after balloon valvotomy
- Types of surgery ***(ESC Topic 26.2)***
    - Open valvotomy
    - Replacement
    - The role of repair
- Need to intervene for secondary tricuspid regurgitation
- Medical therapy
    - Rate control
    - Diuretics
    - Criteria for anticoagulation in sinus rhythm

8. Mitral regurgitation

ESC Topics 15.1, 15.2, 15.3, 15.4, 15.5

- Epidemiology
- Aetiology
    - Primary and secondary
- Natural history
    - Effect of LV volume load
    - Pulmonary artery pressures
    - Valvular heart failure and mitral regurgitation
- Symptoms and signs
- Exercise testing to reveal latent symptoms
- Principles of assessment by echocardiography ***(ESC Topic 3.1)***
    - Classification of severity
    - The role of 3D echocardiography
    - Morphologic characteristics of primary and secondary mitral regurgitation
    - Detailed morphologic and physiologic analysis to guide surgery
    - Differences in effect of grading in primary and secondary regurgitation
    - Role of valve stress echocardiography
- Role of CMR ***(ESC Topic 3.3)***
- Role of MDCT ***(ESC Topic 3.2)***
- Role of fusion imaging and planning (percutaneous mitral valve prosthesis)
- Frequency of surveillance
- Indications for and timing of intervention in primary / secondary mitral regurgitation ***(ESC Topic 26.6)***
    - Mitral valve repair
    - Types of repair
        - Triangular resection, quadrangular resection, sliding plasty
        - Respect vs. resect
        - Neochords

- Annuloplasty
- Under-sizing annuloplasty in secondary mitral regurgitation
- Differences in indication according to suitability for repair / need for CABG
- The definition of successful repair
- Iatrogenic / functional mitral stenosis
- Iatrogenic LVOTO
- Residual mitral regurgitation
- Natural history after repair

- Transcatheter procedures
  - Indications
  - Suitability based on valve morphology
- Need to intervene for secondary tricuspid regurgitation
- Medical therapy
  - Rate control
  - Evidence for ACE inhibitors and beta-blockers
  - Medical therapy in valvular heart failure

9. Right heart valve disease

ESC Topics 15.1, 15.2, 15.3, 15.4, 15.5

- Epidemiology of tricuspid and pulmonary valve disease
- Aetiology
  - Association with congenital syndromes
  - Primary and secondary causes
- Natural history
  - Effect of RV volume load
  - Pulmonary artery pressures
  - Valvular heart failure and right heart valve disease
- Principles of assessment by echocardiography ***(ESC Topic 3.1)***
  - Classification of severity
  - Assessment of morphology

- Role of CMR ***(ESC Topic 3.3)***
    - Prominent role in pulmonary regurgitation
    - Assessment of right ventricular volumes and ejection fraction
- Role of MDCT ***(ESC Topic 3.2)***
- Role of fusion CT / Echo findings for guiding better the percutaneous treatments
- Frequency of surveillance
- Indications for and timing of intervention ***(ESC Topic 26.2)***
    - In tricuspid stenosis and pulmonary stenosis
    - In primary and secondary tricuspid regurgitation
        - Effect of delay in surgery
    - In pulmonary regurgitation
- Types of repair ***(ESC Topic 26.2)***
- Prototype transcatheter devices
- Medical therapy
    - Rate control
    - Off-loading

10. Infective endocarditis

ESC Topics 16.1, 16.2, 16.3, 16.4, 16.5, 16.6

- Prevalence estimates
- Changing epidemiology
    - Causative organisms for native, prosthetic and IVDU
    - Causes of culture negative IE
- Pathology of infective endocarditis (IE)
- Diagnosis of IE
    - Presentation of IE
    - When to suspect IE
    - Duke criteria for diagnosis
    - The differential diagnosis between IE and line infection
    - The difference between pacemaker pocket infection and device infection

- Complications of IE and of treatment
- The differential diagnosis between discitis and osteomyelitis
- Investigation of IE
    - Blood tests
        - Blood cultures, number and timing
    - Role of imaging
        - Central role of echocardiography
        - When TOE is indicated and when TTE is sufficient
        - Role of CT and PET
- Antibiotic management
        - Dose and duration
        - Methods of delivery including PICC or central line
        - Indications and evidence for outpatient management (OPAT)
- Determinants of mortality
- Indications for and timing of surgery
    - Effect of cerebral event and other complications
    - Effect of residual vegetation size
    - Special cases
        - Prosthetic valve IE
        - Right-sided IE
        - Management of implantable electrical device infection
- Service delivery
    Endocarditis teams
    Communication between hospitals and cardiothoracic center
    Patient education
- Outpatient follow-up
    - Recurrence and relapse rate
    - Requirement for surgery for residual regurgitation
    - Long-term survival

- Management of IV drug use
- Principles of managing representation in IVDU
- The need for dental surveillance
- Antibiotic prophylaxis - ESC guidelines

11. Replacement ('prosthetic') heart valves

ESC Topics 15.4, 26.2

- Types of replacement valve
    - Design
        - General design features (occluder, housing, sewing ring)
        - Common designs of mechanical valves
        - Common designs of stented xenograft
        - Types of stentless xenograft and potential advantages
    - Positioning (supra-annular, intra-annular, intermediate)
    - Homograft preparation and use
    - The Ross procedure and its indications
- Complications of replacement heart valves
    - Prevalence
    - Effect of valve design
    - Modes of primary failure of biological and mechanical valves
    - Valve dehiscence
    - Patient-prosthesis mismatch
        - Adverse effects
        - How it can be avoided
- Natural history of different valve types
    - Patient factors in determining failure: age, diabetes and hypertension
- Assessment of function
    - Detection of obstruction and regurgitation
    - Differentiation of thrombus and pannus
    - Identification of patient-prosthesis mismatch

- Management of anticoagulation
    - Pregnancy
    - Over-dose and active bleeding
    - Use of anticoagulants in biological valves
    - Role of vitamin K antagonists and of direct oral anticoagulants
- Management of valve thrombosis
- Management of valve dehiscence / paravalvular leak (regurgitation)
    - Conservative treatments and indications for intervention
    - Transcatheter paravalvular leak closure vs operative repair
- Principles of choosing type of valve
    - RCT of different designs of valve and microsimulation studies
    - Special cases, the woman of child-bearing age, the athlete, the fit elderly
- Risks of redo surgery
- Indications for valve-in valve transcatheter techniques
- Future directions for research and development
    - Design
    - Biopolymers and stem cell research
    - Transcatheter valves

Annex

ESC Topic List

ESC
European Society
of Cardiology

ESC TOPIC LIST

A - BASICS
1 - History of Cardiology
2 - Clinical Skills
2.1 - History Taking
2.2 - Physical Examination
    2.2.1 - Auscultation
    2.2.99 - Physical Examination, Other
2.3 - Electrocardiography
2.99 - Clinical Skills - Other

B - IMAGING
3 - Imaging
3.1 - Echocardiography
    3.1.1 - Echocardiography: Technology
    3.1.2 - Echocardiography: Dimensions, Volumes and Mass
    3.1.3 - Echocardiography: Systolic and Diastolic Function
    3.1.4 - Echocardiography: Valve Disease
    3.1.5 - Echocardiography: Masses and Sources of Emboli
    3.1.6 - Doppler Echocardiography
    3.1.7 - Transesophageal Echocardiography
    3.1.8 - Contrast Echocardiography
    3.1.9 - Tissue Doppler, Speckle Tracking and Strain Imaging
    3.1.10 - Stress Echocardiography
    3.1.11 - 3D Echocardiography
    3.1.12 - Intraoperative and Interventional Echocardiography
    3.1.99 - Echocardiography, Other
3.2 - Computed Tomography
    3.2.1 - Computed Tomography: Technology
    3.2.2 - Computed Tomography: Dimensions, Volumes and Mass
    3.2.3 - Computed Tomography: Systolic and Diastolic Function
    3.2.4 - Computed Tomography: Valve Disease
    3.2.5 - Coronary Calcium Score
    3.2.6 - Coronary CT Angiography
    3.2.7 - Computed Tomography: Plaque Imaging
    3.2.8 - CT Myocardial Perfusion

3.2.9 - CT Imaging of Structural Heart Disease
3.2.10 - CT-derived FFR
3.2.11 - Computed Tomography: Extracardiac Findings
3.2.12 - Computed Tomography: Radiation Exposure
3.2.99 - Computed Tomography, Other

3.3 - Cardiac Magnetic Resonance

3.3.1 - Cardiac Magnetic Resonance: Physics and Technology
3.3.2 - Cardiac Magnetic Resonance: Dimensions, Volumes and Mass
3.3.3 - Cardiac Magnetic Resonance: Systolic and Diastolic Function
3.3.4 - Cardiac Magnetic Resonance: Valve Disease
3.3.5 - Cardiac Magnetic Resonance: Deformation Imaging
3.3.6 - Cardiac Magnetic Resonance: Flow Imaging
3.3.7 - Stress CMR
3.3.8 - Late Gadolinium Enhancement and Viability
3.3.9 - T1 and T2 Mapping, T2*
3.3.10 - Cardiac Magnetic Resonance: Coronary Imaging
3.3.11 - Cardiac Magnetic Resonance: Plaque Imaging
3.3.12 - Cardiac Magnetic Resonance: Angiography
3.3.13 - Cardiac Magnetic Resonance: Myocardium
3.3.14 - Cardiac Magnetic Resonance: Pericardium
3.3.15 - Cardiac Magnetic Resonance: Cardiac Masses
3.3.16 - Cardiac Magnetic Resonance: Safety
3.3.99 - Cardiac Magnetic Resonance, Other

3.4 - Nuclear Imaging

3.4.1 - Nuclear Imaging: Technology and Tracers
3.4.2 - Single Photon Emission Computed Tomography (SPECT)
3.4.2.1 - Single Photon Emission Computed Tomography (SPECT) - Dimensions, Volumes and Mass
3.4.2.2 - Single Photon Emission Computed Tomography (SPECT) - Systolic and Diastolic Function
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3.4.2.4 - Single Photon Emission Computed Tomography (SPECT) - Inflammation
3.4.2.99 - Single Photon Emission Computed Tomography (SPECT) - Other
3.4.3 - Positron Emission Tomography (PET)
3.4.3.1 - Positron Emisssion Tomography (PET) - Dimensions, Volumes and Mass
3.4.3.2 - Positron Emisssion Tomography (PET) - Systolic and Diastolic Function
3.4.3.3 - Positron Emisssion Tomography (PET) - Ischaemia and Viability
3.4.3.4 - Positron Emisssion Tomography (PET) - Inflammation
3.4.3.99 - Positron Emisssion Tomography (PET) - Other
3.4.4 - Nuclear Imaging: Dimensions, Volumes and Mass
3.4.5 - Nuclear Imaging: Systolic and Diastolic Function
3.4.6 - Molecular Imaging
3.4.99 - Nuclear Cardiology, Other

3.5 - Hybrid and Fusion Imaging

3.6 - Cross-Modality and Multi-Modality Imaging Topics

3.6.1 - Imaging: Cardiac Dimensions, Volume, and Mass
3.6.2 - Imaging: Systolic and Diastolic Function
3.6.3 - Imaging: Valve Disease
3.6.4 - Imaging: Arrhythmias
3.6.5 - Imaging: Heart Failure
3.6.6 - Imaging: Coronary Artery Disease
3.6.7 - Imaging: Acute Coronary Syndromes
3.6.8 - Imaging: Myocardial Disease
3.6.9 - Imaging: Pericardial Disease
3.6.10 - Imaging: Congenital Heart Disease

3.6.11 - Imaging: Aortic Disease
3.6.12 - Imaging: Peripheral Vascular Disease
3.6.13 - Imaging: Prevention and Rehabilitation
3.6.99 - Cross-Modality and Multi-Modality Imaging, Other

3.99 - Imaging - Other

C - ARRHYTHMIAS AND DEVICE THERAPY

4 - Arrhythmias, General

4.1 - Arrhythmias, General – Pathophysiology and Mechanisms

4.1.1 - Cellular Mechanisms of Arrhythmias
4.1.2 - Genetic Aspects of Arrhythmias
4.1.3 - Arrhythmias, General – Pathophysiology and Mechanisms: Ion Channel Disorders
4.1.99 - Arrhythmias: Pathophysiology and Mechanisms, Other

4.2 - Arrhythmias, General – Epidemiology, Prognosis, Outcome

4.3 - Arrhythmias, General – Diagnostic Methods

4.3.1 - Arrhythmias, General – Diagnostic Methods: Electrocardiography
4.3.2 - Arrhythmias, General – Diagnostic Methods: Signal-averaged ECG
4.3.3 - Arrhythmias, General – Diagnostic Methods: Holter Monitoring and Event Recorder
4.3.4 - Arrhythmias, General – Diagnostic Methods: Non-invasive Diagnostic Methods
4.3.5 - Arrhythmias, General: Invasive Diagnostic Methods
4.3.99 - Arrhythmias, General: Diagnostic Methods, Other

4.4 - Arrhythmias, General – Treatment

4.4.1 - Arrhythmias, General: Lifestyle Modification
4.4.2 - Antiarrhythmic Drug Treatment
4.4.3 - Cardioversion and Defibrillation
4.4.4 - Catheter Ablation of Arrhythmias
4.4.99 - Arrhythmias, General: Treatment, Other

4.5 - Arrhythmias, General – Prevention

4.6 - Arrhythmias, General – Clinical

4.99 - Arrhythmias, General – Other

5 - Atrial Fibrillation

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5.1.1 - Cellular Electrophysiology
5.1.2 - Cell-cell Interactions
5.1.3 - Disease Modeling in Atrial Fibrillation
5.1.4 - Genetic Causes of Atrial Fibrillation
    5.1.4.1 - Monogenic diseases causing Atrial Fibrillation
    5.1.4.2 - Common Gene Variants in Atrial Fibrillation
5.1.5 - Atrial Stressors Causing Atrial Fibrillation
    5.1.5.1 - Ischemia and Metabolic Imbalance
    5.1.5.2 - Heart Failure and Left Ventricular Dysfunction
    5.1.5.3 - Atrial Stressors Causing Atrial Fibrillation: Valvular Heart Disease
    5.1.5.4 - Sleep Disordered Breathing

- 5.1.5.5 - Obesity and Diabetes
- 5.1.5.6 - Autonomic Dysfunction
- 5.1.5.7 - Sports and Atrial Fibrillation
- 5.1.6 - Defining Types of Atrial Fibrillation
- 5.1.7 - Mechanisms for Stroke in Atrial Fibrillation
- 5.1.8 - Mechanisms for Heart Failure and Cardiac Complications in Atrial Fibrillation
- 5.1.99 - Atrial Fibrillation, Pathophysiology and Mechanism, Other

5.2 - Atrial Fibrillation - Epidemiology, Prognosis, Outcome

- 5.2.1 - Prevalence and Incidence of Atrial Fibrillation
- 5.2.2 - Stroke in Atrial Fibrillation
- 5.2.3 - Heart Failure in Atrial Fibrillation
- 5.2.4 - Sudden Death in Patients with Atrial Fibrillation
- 5.2.5 - Cognitive Function and Autonomy in Patients with Atrial Fibrillation

5.3 - Atrial Fibrillation - Diagnostic Methods

5.4 - Atrial Fibrillation - Treatment

- 5.4.1 - Acute Management of Atrial Fibrillation
  - 5.4.1.1 - Acute Rate Control and Cardioversion
  - 5.4.1.2 - Patient Flow
- 5.4.2 - Rate Control
  - 5.4.2.1 - Rate Control Targets
  - 5.4.2.2 - Medical Therapy for Rate Control
  - 5.4.2.3 - AV Nodal Ablation and Pacemaker Therapy
  - 5.4.2.4 - Outcome of Rate Control Therapy
- 5.4.3 - Rhythm Control, Cardioversion
  - 5.4.3.1 - Pharmacological Cardioversion of Atrial Fibrillation
    - 5.4.3.1.1 - Pharmacological Cardioversion of Atrial Fibrillation: Treatment Pathway and Technique
    - 5.4.3.1.2 - Pharmacological Cardioversion of Atrial Fibrillation: Outcomes and Complications
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    - 5.4.3.2.2 - Electrical Cardioversion of Atrial Fibrillation: Outcomes and Complications
  - 5.4.3.3 - Stroke Prevention in Cardioversion
    - 5.4.3.3.1 - Stroke Prevention in Cardioversion: Oral Anticoagulation
    - 5.4.3.3.2 - TOE guidance
- 5.4.4 - Rhythm Control, Antiarrhythmic Drugs
  - 5.4.4.1 - Indications and Patient Selection
  - 5.4.4.2 - Episodic Drug Therapy
  - 5.4.4.3 - Long Term Drug Therapy
  - 5.4.4.4 - Rhythm Control, Antiarrhythmic Drugs: Outcomes and Complications
- 5.4.5 - Rhythm Control, Catheter Ablation
  - 5.4.5.1 - Rhythm Control, Catheter Ablation: Indications
  - 5.4.5.2 - Rhythm Control, Catheter Ablation: Techniques and Technology
  - 5.4.5.3 - Rhythm Control, Catheter Ablation: Outcomes and Complications
- 5.4.6 - Rhythm Control, Atrial Fibrillation Surgery
  - 5.4.6.1 - Rhythm Control, Atrial Fibrillation Surgery: Indications
  - 5.4.6.2 - Rhythm Control, Atrial Fibrillation Surgery: Techniques and Technology
  - 5.4.6.3 - Rhythm Control, Atrial Fibrillation Surgery: Outcomes and Complications
- 5.4.7 - Rhythm Control, Hybrid Therapy
  - 5.4.7.1 - Atrial Fibrillation Heart Team
  - 5.4.7.2 - Combination of Drug Therapy and Ablation
  - 5.4.7.3 - Combination of Pacing and Drug Therapy/Ablation
- 5.4.99 - Rhythm Control, Other

5.5 - Atrial Fibrillation - Stroke Prevention

- 5.5.1 - Oral Anticoagulation
  - 5.5.1.1 - Oral Anticoagulation: Indications

5.5.1.2 - Long-term Treatment, Adherence, Attrition
5.5.1.3 - Oral Anticoagulant Drugs
5.5.1.4 - Bleeding Complications
5.5.2 - Left Atrial Appendage Occlusion
5.5.2.1 - Left Atrial Appendage Occlusion: Indications
5.5.2.2 - Left Atrial Appendage Occlusion: Technology and Implantation Technique
5.5.2.3 - Left Atrial Appendage Occlusion: Outcomes and Complications
5.5.99 - Atrial Fibrillation – Stroke Prevention, Other

5.6 - Atrial Fibrillation - Stroke Treatment

5.6.1 - Atrial Fibrillation - Stroke Treatment: Imaging
5.6.2 - Atrial Fibrillation - Stroke Treatment: Acute Therapy
5.6.3 - Novel Therapies for Stroke in Atrial Fibrillation
5.6.4 - Atrial Fibrillation Heart Teams for Stroke Prevention
5.6.99 - Atrial Fibrillation – Stroke Treatment, Other

5.7 - Atrial Fibrillation - Prevention

5.8 - Atrial Fibrillation - Clinical

5.99 - Atrial Fibrillation - Other

6 - Supraventricular Tachycardia (non-AF)

6.1 - Supraventricular Tachycardia (non-AF) - Pathophysiology and Mechanisms

6.1.1 - Cellular Mechanisms
6.1.2 - Genetic Aspects
6.1.99 - Supraventricular Tachycardia (non-AF): Pathophysiology and Mechanisms, Other

6.2 - Supraventricular Tachycardia (non-AF) - Epidemiology, Prognosis, Outcome

6.3 - Supraventricular Tachycardia (non-AF) - Diagnostic Methods

6.4 - Supraventricular Tachycardia (non-AF) - Treatment

6.5 - Supraventricular Tachycardia (non-AF) - Prevention

6.6 - Supraventricular Tachycardia (non-AF) - Clinical

6.99 - Supraventricular Tachycardia (non-AF) - Other

7 - Syncope and Bradycardia

7.1 - Syncope and Bradycardia - Pathophysiology and Mechanisms

7.1.1 - Bradycardia - Sinus Node Dysfunction
7.1.2 - Bradycardia - AV-Block
7.1.3 - Tachycardia
7.1.4 - Non-arrhythmogenic Mechanisms of Syncope

7.2 - Syncope and Bradycardia - Epidemiology, Prognosis, Outcome

7.2.1 - Syncope and Bradycardia - Epidemiology, Prognosis, Outcome: Epidemiology
7.2.2 - Syncope and Bradycardia - Epidemiology, Prognosis, Outcome: Prognosis and Risk Stratification

7.3 - Syncope and Bradycardia - Diagnostic Methods

7.3.1 - Ambulatory ECG Monitoring and Loop Recorders
7.3.2 - Provocation Tests, Assessment of Autonomous Nervous System
7.3.3 - Detection of Underlying Heart Disease

7.4 - Syncope and Bradycardia - Treatment

7.4.1 - Drug Treatment
7.4.2 - Pacemaker Therapy

7.5 - Syncope and Bradycardia - Prevention

7.6 - Syncope and Bradycardia - Clinical

7.99 - Syncope and Bradycardia - Other

8 - Ventricular Arrhythmias and Sudden Cardiac Death (SCD)

8.1 - Ventricular Arrhythmias and SCD - Pathophysiology and Mechanisms

8.1.1 - Coronary Artery Disease
8.1.2 - Dilated Cardiomyopathy and Non-ischemic Heart Failure

8.1.3 - Ventricular Arrhythmias and SCD - Pathophysiology and Mechanisms: Arrhythmogenic Right Ventricular Cardiomyopathy

8.1.4 - Hypertrophic Cardiomyopathy

8.1.5 - Ventricular Arrhythmias and SCD - Pathophysiology and Mechanisms: Ion Channel Disorders

8.1.6 - Long QT Syndrome

8.1.7 - Brugada Syndrome

8.1.8 - Gene Variants

8.1.99 - Ventricular Arrhythmias and SCD: Pathophysiology and Mechanisms, Other

8.2 - Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

8.2.1 - Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome: Epidemiology

8.2.2 - Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome: Risk Factors and Risk Assessment

8.3 - Ventricular Arrhythmias and SCD - Diagnostic Methods

8.4 - Ventricular Arrhythmias and SCD - Treatment

8.4.1 - Management of Out of Hospital Cardiac Arrest

8.4.1.1 - CPR

8.4.1.2 - First Responder Help Systems

8.4.1.3 - Management of Out of Hospital Cardiac Arrest: Automated External Defibrillators

8.4.1.4 - Acute in-Hospital Management

8.4.2 - Drug Treatment of Ventricular Arrhythmias

8.4.3 - Ablation of Ventricular Arrhythmias

8.4.4 - Device Treatment of Ventricular Arrhythmias and SCD

8.4.4.1 - Wearable Defibrillators

8.4.4.2 - Device Treatment of Ventricular Arrhythmias and SCD: Automated External Defibrillators

8.4.4.3 - Implantable Defibrillators (ICD)

8.5 - Ventricular Arrhythmias and SCD - Prevention

8.6 - Ventricular Arrhythmias and SCD - Clinical

8.99 - Ventricular Arrhythmias and SCD - Other

9 - Device Therapy

9.1 - Antibradycardia Pacing

9.2 - Implantable Cardioverter / Defibrillator

9.3 - Cardiac Resynchronization Therapy

9.4 - Home and Remote Patient Monitoring

9.5 - Device Complications and Lead Extraction

9.99 - Device Therapy - Other

D - HEART FAILURE

10 - Chronic Heart Failure

10.1 - Chronic Heart Failure – Pathophysiology and Mechanisms

10.1.1 - Chronic Heart Failure - Pathophysiology

10.1.2 - Experimental Heart Failure

10.1.3 - Cardiotoxicity of Drugs and Other Therapies

10.1.4 - Hemodynamics of Heart Failure

10.1.5 - Systolic Ventricular Dysfunction

10.1.6 - Diastolic Ventricular Dysfunction

10.1.7 - Ventricular Remodeling

10.1.8 - Heart Failure with Reduced Ejection Fraction

10.1.9 - Heart Failure with Mid-range Ejection Fraction

10.1.10 - Heart Failure with Preserved Ejection Fraction

10.1.99 - Chronic Heart Failure - Pathophysiology, Other

10.2 - Chronic Heart Failure – Epidemiology, Prognosis, Outcome

10.3 - Chronic Heart Failure – Diagnostic Methods

10.3.1 - Chronic Heart Failure – Diagnostic Methods: Biomarkers

10.3.2 - Chronic Heart Failure – Diagnostic Methods: Imaging
10.3.2.1 - Chronic Heart Failure – Diagnostic Methods: Imaging - Echocardiography
10.3.2.2 - Chronic Heart Failure – Diagnostic Methods: Imaging - Cardiac Magnetic Resonance
10.3.2.99 - Chronic Heart Failure – Diagnostic Methods Imaging, Other
10.3.99 - Chronic Heart Failure: Diagnostic Methods, Other

10.4 - Chronic Heart Failure – Treatment

10.4.1 - Chronic Heart Failure: Lifestyle Modification
10.4.2 - Chronic Heart Failure: Pharmacotherapy
10.4.3 - Chronic Heart Failure: Rehabilitation
10.4.4 - Implantable Cardioverter Defibrillator (ICD)
10.4.5 - Resynchronization Therapy
10.4.6 - Ventricular Assist Devices
10.4.7 - Heart Transplantation
10.4.8 - Devices for Autonomic Modulation
10.4.9 - Chronic Heart Failure: Multidisciplinary Interventions
10.4.99 - Chronic Heart Failure: Treatment, Other

10.5 - Chronic Heart Failure – Prevention

10.6 - Chronic Heart Failure - Clinical

10.6.1 - Chronic Heart Failure: Peripheral Circulation, Metabolism, Skeletal Muscle
10.6.2 - Chronic Heart Failure: Comorbidities
10.6.2.1 - Chronic Heart Failure: Comorbidities - Anemia/Iron Deficiency
10.6.2.2 - Chronic Heart Failure: Comorbidities - Cancer
10.6.2.3 - Chronic Heart Failure: Comorbidities - Cerebrovascular disease
10.6.2.4 - Chronic Heart Failure: Comorbidities - Chronic Kidney Disease
10.6.2.5 - Chronic Heart Failure: Comorbidities - Chronic Obstructive Pulmonary Disease
10.6.2.6 - Chronic Heart Failure: Comorbidities - Dementia/Depression
10.6.2.7 - Chronic Heart Failure: Comorbidities - Diabetes
10.6.2.8 - Chronic Heart Failure: Comorbidities - Frailty
10.6.2.9 - Chronic Heart Failure: Comorbidities - Muscular Dystrophy
10.6.2.10 - Chronic Heart Failure: Comorbidities - Sleep Apnea
10.6.2.11 - Chronic Heart Failure: Comorbidities - Thyroid disease
10.6.2.99 - Chronic Heart Failure: Comorbidities - Other
10.6.99 - Chronic Heart Failure: Clinical, Other

10.99 - Chronic Heart Failure - Other

11 - Acute Heart Failure

11.1 - Acute Heart Failure – Pathophysiology and Mechanisms

11.1.1 - Acute Heart Failure: Hemodynamics
11.1.2 - Acute Heart Failure: Pathophysiology, Other

11.2 - Acute Heart Failure – Epidemiology, Prognosis, Outcome

11.3 - Acute Heart Failure – Diagnostic Methods

11.3.1 - Acute Heart Failure: Biomarkers
11.3.2 - Acute Heart Failure: Imaging
11.3.3 - Acute Heart Failure: Invasive Hemodynamic Monitoring
11.3.99 - Acute Heart Failure: Diagnostic Methods, Other

11.4 - Acute Heart Failure– Treatment

11.4.1 - Acute Heart Failure: Pharmacotherapy
11.4.2 - Acute Heart Failure: Non-pharmacological Treatment
11.4.2.1 - Circulatory Support
11.4.2.2 - Renal Replacement Therapy
11.4.3 - Acute Heart Failure: Multidisciplinary Interventions
11.4.99 - Acute Heart Failure: Treatment, Other

11.5 - Acute Heart Failure– Prevention

11.6 - Acute Heart Failure - Clinical
11.99 - Acute Heart Failure - Other

E - CORONARY ARTERY DISEASE, ACUTE CORONARY SYNDROMES, ACUTE CARDIAC CARE

12 - Coronary Artery Disease (Chronic)
12.1 - Coronary Artery Disease – Pathophysiology and Mechanisms
- 12.1.1 - Chronic Ischemia
- 12.1.2 - Coronary Circulation, Flow, and Flow Reserve
- 12.1.3 - Coronary Microcirculation and Collaterals
- 12.1.4 - Coronary Artery Disease: Inflammation and Immunity
- 12.1.5 - Hibernation
- 12.1.99 - Coronary Artery Disease: Pathophysiology, Other

12.2 - Coronary Artery Disease – Epidemiology, Prognosis, Outcome
12.3 - Coronary Artery Disease – Diagnostic Methods
- 12.3.1 - Coronary Artery Disease : Noninvasive Diagnostic Methods
- 12.3.2 - Coronary Artery Disease: Angiography, Invasive Imaging, FFR
- 12.3.3 - Coronary Artery Disease: Diagnostic Methods, Other

12.4 - Coronary Artery Disease – Treatment
- 12.4.1 - Coronary Artery Disease: Lifestyle Modification
- 12.4.2 - Coronary Artery Disease: Non-pharmacological Treatment
- 12.4.3 - Coronary Artery Disease: Pharmacotherapy
- 12.4.4 - Coronary Artery Disease: Treatment, Revascularization
  - 12.4.4.1 - Percutaneous Coronary Intervention
  - 12.4.4.2 - Coronary Artery Disease: Treatment, Revascularization: Bypass Surgery
  - 12.4.4.99 - Coronary Artery Disease: Treatment, Revascularization, Other
- 12.4.99 - Coronary Artery Disease: Treatment, Other

12.5 - Coronary Artery Disease – Prevention
12.6 - Coronary Artery Disease - Clinical
- 12.6.1 - Coronary Artery Disease and Comorbidities
- 12.6.99 - Coronary Artery Disease: Clinical, Other

12.7 - Non-Atherosclerotic Coronary Abnormalities
12.99 - Coronary Artery Disease - Other
13 - Acute Coronary Syndromes
13.1 - Acute Coronary Syndromes – Pathophysiology and Mechanisms
- 13.1.1 - Acute Myocardial Ischemia
- 13.1.2 - Thrombosis, Platelets, and Coagulation
- 13.1.3 - Acute Coronary Syndromes: Inflammation
- 13.1.4 - Vulnerable Plaque
- 13.1.5 - Vasospasm
- 13.1.6 - Reperfusion and Reperfusion Injury
- 13.1.7 - Left Ventricular Remodeling
- 13.1.8 - No Reflow
- 13.1.99 - Acute Coronary Syndromes; Pathophysiology, Other

13.2 - Acute Coronary Syndromes – Epidemiology, Prognosis, Outcome
13.3 - Acute Coronary Syndromes – Diagnostic Methods
- 13.3.1 - Acute Coronary Syndromes: Biomarkers
- 13.3.2 - Acute Coronary Syndromes: Non-invasive Imaging
- 13.3.3 - Acute Coronary Syndromes: Angiography, Invasive Imaging, FFR
- 13.3.99 - Acute Coronary Syndromes: Diagnostic Methods, Other

13.4 - Acute Coronary Syndromes – Treatment
- 13.4.1 - Acute Coronary Syndromes: Lifestyle Modification
- 13.4.2 - Acute Coronary Syndromes: Pharmacotherapy
  - 13.4.2.1 - Acute Coronary Syndromes: Antiplatelet Agents

13.4.2.2 - Acute Coronary Syndromes: Thrombolysis/Fibrinolysis
13.4.2.3 - Acute Coronary Syndromes: Statins
13.4.2.99 - Acute Coronary Syndromes: Drug Treatment, Other
13.4.3 - Acute Coronary Syndromes: Treatment, Revascularization
13.4.3.1 - Acute Coronary Syndromes: Treatment, Revascularization: Coronary Intervention
13.4.3.2 - Acute Coronary Syndromes: Treatment, Revascularization: Bypass Surgery
13.4.3.99 - Acute Coronary Syndromes - Treatment, Revascularization, Other
13.4.99 - Acute Coronary Syndromes: Treatment, Other
13.5 - Acute Coronary Syndromes – Prevention
13.6 - Acute Coronary Syndromes - Clinical
13.6.1 - Unstable Angina
13.6.2 - Non-ST-Elevation Myocardial Infarction (NSTEMI)
13.6.3 - ST-Elevation Myocardial Infarction (STEMI)
13.6.4 - Acute Coronary Syndromes: Shock
13.6.5 - Acute Coronary Syndromes: Post-Infarction Period
13.6.6 - Acute Coronary Syndromes: Myocardial Infarction with Non-obstructive Coronary Arteries
13.6.7 - Acute Coronary Syndromes: Tako-Tsubo Cardiomyopathy
13.6.99 - Acute Coronary Syndromes: Clinical, Other
13.99 - Acute Coronary Syndromes - Other
14 - Acute Cardiac Care
14.1 - Acute Cardiac Care – Resuscitation
14.2 - Acute Cardiac Care – Prehospital and Emergency Department Care
14.3 - Acute Cardiac Care – CCU, Intensive, and Critical Cardiovascular Care
14.4 - Acute Cardiac Care – Cardiogenic Shock
14.5 - Acute Cardiac Care – Cardiac Arrest
14.99 - Acute Cardiac Care – Other
F - VALVULAR, MYOCARDIAL, PERICARDIAL, PULMONARY, CONGENITAL HEART DISEASE

15 - Valvular Heart Disease
15.1 - Valvular Heart Disease – Pathophysiology and Mechanisms
15.2 - Valvular Heart Disease – Epidemiology, Prognosis, Outcome
15.3 - Valvular Heart Disease – Diagnostic Methods
15.4 - Valvular Heart Disease – Treatment
15.4.1 - Valvular Heart Disease: Pharmacotherapy
15.4.2 - Valvular Heart Disease: Intervention
15.4.2.1 - Aortic Stenosis
15.4.2.2 - Aortic Regurgitation
15.4.2.3 - Mitral Stenosis
15.4.2.4 - Mitral Regurgitation
15.4.2.5 - Pulmonary Valve Stenosis
15.4.2.6 - Pulmonary Valve Regurgitation
15.4.2.7 - Tricuspid Valve Stenosis
15.4.2.8 - Tricuspid Valve Regurgitation
15.4.2.99 - Valvular Heart Disease: Intervention, Other
15.4.3 - Valvular Heart Disease: Surgery
15.4.99 - Valvular Heart Disease: Treatment, Other
15.5 - Valvular Heart Disease – Prevention
15.6 - Valvular Heart Disease – Clinical
15.6.1 - Aortic Valve Stenosis
15.6.2 - Aortic Valve Regurgitation
15.6.3 - Aortic Valve Disease, Other
15.6.4 - Mitral Valve Stenosis
15.6.5 - Mitral Valve Regurgitation
15.6.5.1 - Primary Mitral Valve Regurgitation

15.6.5.2 - Secondary Mitral Valve Regurgitation
15.6.5.99 - Mitral Valve Regurgitation, Other
15.6.6 - Mitral Valve Prolapse
15.6.7 - Mitral Valve Disease, Other
15.6.8 - Tricuspid Valve Disease
15.6.9 - Pulmonary Valve Disease
15.6.10 - Rheumatic Heart Disease
15.6.11 - Prosthetic Heart Valves
15.6.99 - Valvular Heart Disease: Clinical, Other
15.99 - Valvular Heart Disease - Other
16 - Infective Endocarditis
16.1 - Infective Endocarditis – Pathophysiology and Mechanisms
16.2 - Infective Endocarditis – Epidemiology, Prognosis, Outcome
16.3 - Infective Endocarditis – Diagnostic Methods
16.3.1 - Infective Endocarditis – Diagnostic Methods: Imaging
16.3.2 - Infective Endocarditis – Diagnostic Methods: Microbiology
16.3.99 - Infective Endocarditis: Diagnostic Methods, Other
16.4 - Infective Endocarditis – Treatment
16.4.1 - Infective Endocarditis: Pharmacotherapy
16.4.2 - Infective Endocarditis: Surgery
16.4.99 - Infective Endocarditis: Treatment, Other
16.5 - Infective Endocarditis – Prevention
16.6 - Infective Endocarditis – Clinical
16.7 - Cardiac Implantable Device-related Endocarditis
16.99 - Infective Endocarditis - Other
17 - Myocardial Disease
17.1 - Myocardial Disease – Pathophysiology and Mechanisms
17.2 - Myocardial Disease – Epidemiology, Prognosis, Outcome
17.3 - Myocardial Disease – Diagnostic Methods
17.4 - Myocardial Disease – Treatment
17.4.1 - Myocardial Disease: Pharmacotherapy
17.4.2 - Myocardial Disease: Treatment, Other
17.5 - Myocardial Disease – Prevention
17.6 - Myocardial Disease – Clinical
17.6.1 - Myocarditis
17.6.2 - Hypertrophic Cardiomyopathy
17.6.3 - Dilative Cardiomyopathy
17.6.4 - Restrictive Cardiomyopathy and Loeffler´s Disease
17.6.5 - Myocardial Disease – Clinical: Arrhythmogenic Right Ventricular Cardiomyopathy
17.6.6 - Hypertensive Heart Disease
17.6.7 - Infiltrative Myocardial Disease
17.6.7.1 - Amyloid Heart Disease
17.6.7.2 - Cardiac Sarcoidosis
17.6.7.3 - Fabry´s Disease
17.6.7.4 - Mucopolysaccharidosis (MPS)
17.6.7.99 - Infiltrative Myocardial Disease, Other
17.6.8 - Chagas Disease
17.6.9 - Tako-Tsubo Cardiomyopathy
17.6.10 - Peripartum Cardiomyopathy
17.6.11 - Ventricular Non-compaction
17.6.99 - Myocardial Disease: Clinical, Other
17.99 - Myocardial Disease - Other
18 - Pericardial Disease
18.1 - Pericardial Disease – Pathophysiology and Mechanisms

18.2 - Pericardial Disease – Epidemiology, Prognosis, Outcome
18.3 - Pericardial Disease – Diagnostic Methods
18.4 - Pericardial Disease – Treatment
    18.4.1 - Pericardial Disease: Pharmacotherapy
    18.4.2 - Pericardial Disease: Intervention and Surgery
    18.4.99 - Pericardial Disease: Treatment, Other
18.5 - Pericardial Disease – Prevention
18.6 - Pericardial Disease – Clinical
    18.6.1 - Pericarditis
    18.6.2 - Pericardial Effusion
    18.6.3 - Pericardial Constriction
    18.6.99 - Pericardial Disease: Clinical, Other
18.99 - Pericardial Disease - Other
19 - Tumors of the Heart
19.1 - Tumors of the Heart – Pathophysiology and Mechanisms
19.2 - Tumors of the Heart – Epidemiology, Prognosis, Outcome
19.3 - Tumors of the Heart – Diagnostic Methods
19.4 - Tumors of the Heart – Treatment
19.5 - Tumors of the Heart – Prevention
19.6 - Tumors of the Heart – Clinical
    19.6.1 - Myxoma
    19.6.99 - Tumors of the Heart: Clinical, Other
19.99 - Tumors of the Heart - Other
20 - Congenital Heart Disease and Pediatric Cardiology
20.1 - Congenital Heart Disease – Pathophysiology and Mechanisms
20.2 - Congenital Heart Disease – Epidemiology, Prognosis, Outcome
20.3 - Congenital Heart Disease – Diagnostic Methods
    20.3.1 - Congenital Heart Disease: Echocardiography
    20.3.2 - Congenital Heart Disease: CMR
    20.3.99 - Congenital Heart Disease: Diagnostic Methods, Other
20.4 - Congenital Heart Disease – Treatment
    20.4.1 - Congenital Heart Disease: Lifestyle Modification
    20.4.2 - Congenital Heart Disease: Pharmacotherapy
    20.4.3 - Congenital Heart Disease: Intervention
    20.4.4 - Congenital Heart Disease: Surgery
    20.4.99 - Congenital Heart Disease: Treatment, Other
20.5 - Congenital Heart Disease – Prevention
20.6 - Congenital Heart Disease – Clinical
    20.6.1 - Fetal Heart Disease
    20.6.2 - Adult Congenital Heart Disease, Clinical
    20.6.99 - Congenital Heart Disease: Clinical, Other
20.7 - Pediatric Cardiology
20.99 - Congenital Heart Disease and Pediatric Cardiology - Other
21 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure
21.1 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure – Pathophysiology and Mechanisms
21.2 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure – Epidemiology, Prognosis, Outcome
21.3 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure – Diagnostic Methods
21.4 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure - Treatment
        21.4.1 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure: Pharmacotherapy
        21.4.2 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure: Intervention
        21.4.3 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure: Surgery
        21.4.99 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure: Treatment, Other

21.5 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure - Prevention
21.6 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure – Clinical
    21.6.1 - Pulmonary Embolism
    21.6.2 - Venous Thromboembolism
    21.6.3 - Pulmonary Hypertension
    21.6.99 - Pulmonary Circulation, Clinical, Other
21.99 - Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure - Other

G - AORTIC DISEASE, PERIPHERAL VASCULAR DISEASE, STROKE
22 - Aortic Disease
22.1 - Aortic Disease – Pathophysiology and Mechanisms
22.2 - Aortic Disease – Epidemiology, Prognosis, Outcome
22.3 - Aortic Disease – Diagnostic Methods
    22.3.1 - Aortic Disease: Echocardiography
    22.3.2 - Aortic Disease: Computed Tomography
    22.3.3 - Aortic Disease: CMR
    22.3.99 - Aortic Disease: Diagnostic Methods, Other
22.4 - Aortic Disease - Treatment
    22.4.1 - Aortic Disease: Lifestyle Modification
    22.4.2 - Aortic Disease: Pharmacotherapy
    22.4.3 - Aortic Disease: Intervention
    22.4.4 - Aortic Disease: Surgery
    22.4.99 - Aortic Disease: Treatment, Other
22.5 - Aortic Disease – Prevention
22.6 - Aortic Disease – Clinical
    22.6.1 - Acute Aortic Syndromes, Aortic Dissection
    22.6.2 - Aortic Aneurysm, Thoracic
    22.6.3 - Aortic Aneurysm, Abdominal
    22.6.4 - Inflammatory Aortic Disease
    22.6.5 - Traumatic Injury of the Aorta
    22.6.99 - Aortic Disease: Clinical, Other
22.99 - Aortic Disease - Other
23 - Peripheral Vascular and Cerebrovascular Disease
23.1 - Peripheral Vascular and Cerebrovascular Disease – Pathophysiology and Mechanisms

23.2 - Peripheral Vascular and Cerebrovascular Disease – Epidemiology, Prognosis, Outcome

23.3 - Peripheral Vascular and Cerebrovascular Disease – Diagnostic Methods
23.4 - Peripheral Vascular and Cerebrovascular Disease - Treatment
    23.4.1 - Peripheral Vascular and Cerebrovascular Disease: Lifestyle Modification

    23.4.2 - Peripheral Vascular and Cerebrovascular Disease: Pharmacotherapy
    23.4.3 - Peripheral Vascular and Cerebrovascular Disease: Intervention
    23.4.4 - Peripheral Vascular and Cerebrovascular Disease: Surgery
    23.4.99 - Peripheral Vascular and Cerebrovascular Disease: Treatment, Other
23.5 - Peripheral Vascular and Cerebrovascular Disease – Prevention
23.6 - Peripheral Vascular and Cerebrovascular Disease – Clinical
    23.6.1 - Peripheral Artery Disease
    23.6.2 - Carotid Disease
    23.6.3 - Venous Disease
    23.6.99 - Peripheral Vascular and Cerebrovascular Disease: Clinical, Other
23.99 - Peripheral Vascular and Cerebrovascular Disease - Other
24 - Stroke
24.1 - Stroke – Pathophysiology and Mechanisms

24.2 - Stroke – Epidemiology, Prognosis, Outcome
24.3 - Stroke - Diagnostic Methods
24.4 - Stroke - Treatment
    24.4.1 - Stroke: Lifestyle Modification
    24.4.2 - Stroke: Pharmacotherapy
    24.4.3 - Stroke: Acute Intervention
    24.4.4 - Stroke: Surgery
    24.4.99 - Stroke: Treatment, Other
24.5 - Stroke - Prevention
24.6 - Stroke – Clinical
    24.6.1 - Stroke: Carotid Stenosis
    24.6.2 - Stroke: Persistent Foramen Ovale and PFO closure
    24.6.3 - Stroke: Cardiogenic Embolism
        24.6.3.1 - Stroke: Atrial Fibrillation
        24.6.3.2 - Stroke: LAA and LAA closure
        24.6.3.99 - Stroke: Cardiogenic Embolism, Other
    24.6.99 - Stroke: Clinical, Other
24.7 - Heart and Brain Interaction
24.99 - Stroke - Other
H - INTERVENTIONAL CARDIOLOGY AND CARDIOVASCULAR SURGERY
25 - Interventional Cardiology
25.1 - Invasive Imaging and Functional Assessment
    25.1.1 - Invasive Hemodynamic Assessment/Right Heart Catheterization
    25.1.2 - Coronary Angiography
    25.1.3 - Peripheral Angiography
    25.1.4 - Intracoronary Ultrasound
    25.1.5 - Optical Coherence Tomography
    25.1.6 - Fractional Flow Reserve
    25.1.7 - Coronary Flow Reserve
    25.1.99 - Invasive Imaging, Other
25.2 - Coronary Intervention
    25.2.1 - Coronary Intervention: Vascular Access
    25.2.2 - Coronary Intervention: Devices
    25.2.3 - Coronary Intervention: Stents
    25.2.4 - Coronary Intervention: Technique
    25.2.5 - Coronary Intervention: Complications
    25.2.6 - Coronary Intervention: Primary and Acute PCI
    25.2.7 - Coronary Intervention: CTO
    25.2.8 - Coronary Intervention: Adjunctive Pharmacotherapy
    25.2.9 - Coronary Intervention: Mechanical Circulatory Support
    25.2.10 - Coronary Intervention: Restenosis
    25.2.11 - Coronary Intervention: Stent Thrombosis
    25.2.12 - Coronary Intervention: Outcome
    25.2.99 - Coronary Intervention, Other
25.3 - Non-coronary Cardiac Intervention
    25.3.1 - Aortic Valve Intervention
    25.3.2 - Mitral Valve Intervention
    25.3.3 - Tricuspid Valve Intervention
    25.3.4 - Pulmonary Valve Intervention
    25.3.5 - PFO/ASD Closure
    25.3.6 - LAA Closure
    25.3.99 - Non-Coronary Cardiac Intervention, Other
25.99 - Interventional Cardiology - Other
26 - Cardiovascular Surgery

26.1 - Cardiovascular Surgery – Coronary Arteries
26.2 - Cardiovascular Surgery – Valves
26.3 - Cardiovascular Surgery – Congenital Heart Disease
26.4 - Cardiovascular Surgery – Aorta
26.5 - Cardiovascular Surgery – Carotid and Peripheral Arteries
26.6 - Cardiovascular Surgery – Ventricular Assist Devices and Artificial Heart
26.7 - Cardiovascular Surgery - Circulatory Support
26.8 - Cardiovascular Surgery - Transplantation
26.9 - Cardiovascular Surgery – Arrhythmias
26.10 - Cardiovascular Surgery – Minimally Invasive Surgery
26.99 - Cardiovascular Surgery - Other
I - HYPERTENSION
27 - Hypertension
27.1 - Hypertension – Pathophysiology and Mechanisms
    27.1.1 - Target Organ Damage/ Left Ventricular Hypertrophy
    27.1.2 - Renin-Angiotensin System
    27.1.3 - Endocrine Hypertension
    27.1.4 - Renal Artery Stenosis / Autonomic Nervous System
    27.1.99 - Secondary Hypertension, Other
27.2 - Hypertension – Epidemiology, Prognosis, Outcome
27.3 - Hypertension – Diagnostic Methods
    27.3.1 - Blood Pressure Measurement
    27.3.2 - Hypertension: Diagnostic Methods, Other
27.4 - Hypertension – Treatment
    27.4.1 - Hypertension: Lifestyle Modification
    27.4.2 - Hypertension: Pharmacotherapy
    27.4.3 - Hypertension: Device Treatment and Intervention
        27.4.3.1 - Renal Denervation
        27.4.3.2 - Hypertension: Device Treatment and Intervention, Other
    27.4.4 - Hypertension: Treatment, Other
27.5 - Hypertension – Prevention
27.6 - Hypertension – Clinical
27.99 - Hypertension - Other
"J - PREVENTIVE CARDIOLOGY
"
28 - Risk Factors and Prevention
28.1 - Risk Factors and Prevention – Epidemiology
28.2 - Risk Factors and Prevention – Cardiovascular Risk Assessment
    28.2.1 - Prevention – Cardiovascular Risk Assessment: Scores
    28.2.2 - Prevention – Cardiovascular Risk Assessment: Biomarkers
    28.2.3 - Prevention – Cardiovascular Risk Assessment: Imaging
    28.2.4 - Prevention – Cardiovascular Risk Assessment, Other
28.3 - Secondary Prevention
28.4 - Lipids
    28.4.1 - Lipids: Drug therapy
    28.4.99 - Lipids, Other
28.5 - Tobacco
28.6 - Obesity
28.7 - Diabetes and the Heart
    28.7.1 - Diabetes and the Heart: Pathophysiology
    28.7.2 - Metabolic Syndrome, Insulin, Insulin Resistance
    28.7.3 - Diabetes and the Heart: Pharmacotherapy
    28.7.4 - Diabetes and the Heart: PCI and Surgery
    28.7.99 - Diabetes and the Heart, Other

28.8 - Environmental and Occupational Aspects of Heart Disease
    28.8.1 - Environmental Aspects of Heart Disease
    28.8.2 - Occupational Aspects of Heart Disease
    28.8.99 - Environmental and Occupational Aspects of Heart Disease, Other
28.9 - Stress, Psycho-Social and Cultural Aspects of Heart Disease
28.10 - Depression and Heart Disease
28.11 - Nutrition, Malnutrition and Heart Disease
28.12 - Physical Inactivity and Exercise
    28.12.1 - Prevention: Physical Inactivity
    28.12.2 - Prevention: Exercise
    28.12.99 - Prevention: Physical Inactivity and Exercise, Other
28.13 - Sleep Disorders
    28.13.1 - Sleep Apnea
    28.13.99 - Sleep Disorders, Other
28.99 - Risk Factors and Prevention - Other
29 - Rehabilitation and Sports Cardiology
29.1 - Exercise Testing
    29.1.1 - Spiroergometry
    29.1.99 - Exercise Testing, Other
29.2 - Cardiovascular Rehabilitation
    29.2.1 - Rehabilitation: Exercise Programmes
    29.2.2 - Rehabilitation: Education
    29.2.3 - Rehabilitation: Outcomes
    29.2.99 - Cardiovascular Rehabilitation, Other
29.3 - Sports Cardiology
    29.3.1 - Athlete´s Heart
    29.3.2 - Sports Cardiology: Electrocardiography (ECG)
    29.3.3 - Sports Cardiology: Arrhythmias
    29.3.4 - Sudden Death in Sports
    29.3.5 - Pre-Competition Screening and Sports Eligibilty
    29.3.6 - Cardiovascular Effects of Substance Abuse/Doping
    29.3.99 - Sports Cardiology, Other
29.99 - Rehabilitation and Sports Cardiology - Other
K - CARDIOVASCULAR DISEASE IN SPECIAL POPULATIONS
30 - Cardiovascular Disease in Special Populations
30.1 - Cardiovascular Disease in Primary Care
30.2 - Cardiovascular Disease in Women
30.3 - Cardiovascular Disease in Special Populations: Pediatric Cardiology
30.4 - Non-cardiac Surgery/Pre-surgical Assessment
30.5 - Cardiovascular Disease in the Elderly
30.6 - Cardio-Oncology
30.7 - Pregnancy and Cardiovascular Disease
30.8 - HIV and Cardiovascular Disease
30.9 - Renal Failure and Cardiovascular Disease
30.10 - Neurologic Disorders and Heart Disease
30.11 - Psychiatric Disorders and Heart Disease
30.12 - Autoimmune/Chronic Inflammatory Disorders and Heart Disease
30.13 - Substance Abuse and Cardiovascular Disease
30.99 - Cardiovascular Disease in Special Populations - Other
L - CARDIOVASCULAR PHARMACOLOGY
31 - Pharmacology and Pharmacotherapy
31.1 - Cardiovascular Pharmacotherapy
    31.1.1 - Aldosterone Antagonists
    31.1.2 - Antiarrhythmic Pharmacotherapy

31.1.3 - Angiotensin-Renin-Bradykinine System
31.1.4 - Anticoagulants
31.1.5 - Antiplatelet Drugs
31.1.6 - Beta Blockers
31.1.7 - Calcium Channel Blockers
31.1.8 - Diuretics
31.1.9 - Nitrates
31.1.10 - Lipid-Lowering Agents
31.1.10.1 - Statins
31.1.10.2 - Cholesterol Resorption Antagonists
31.1.10.3 - LDL-Receptor Antagonists
31.1.10.4 - PCSK9-Antagonists
31.1.10.99 - Lipid-Lowering Agents, Other
31.1.11 - Anti-Diabetic Pharmacotherapy
31.1.99 - Cardiovascular Drug Therapy, Other
31.2 - Pharmacogenetics
31.3 - Biotherapies
31.4 - Cardiotoxicity of Drugs
31.99 - Pharmacology and Pharmacotherapy - Other
M - CARDIOVASCULAR NURSING
32 - Cardiovascular Nursing
32.1 - Acute Nursing Care
32.2 - Chronic Nursing Care
32.99 - Cardiovascular Nursing - Other
N - E-CARDIOLOGY / DIGITAL HEALTH, PUBLIC HEALTH, HEALTH ECONOMICS, RESEARCH METHODOLOGY

33 - e-Cardiology / Digital Health
33.1 - Image Processing and Imaging Standards
33.2 - Cardiovascular Signal Processing
33.2.1 - ECG and Arrhythmia Analysis
33.2.99 - Cardiovascular Signal Processing, Other
33.3 - Computer Modeling and Simulation
33.4 - Digital Health
33.4.1 - Remote Patient Monitoring and Telemedicine
33.4.2 - Hospital Information Systems
33.4.3 - Digital Health: Big Data Analysis
33.4.4 - e-Health
33.4.5 - m-Health
33.4.99 - Digital Health, Other
33.99 - e-Cardiology - Other
34 - Public Health and Health Economics
34.1 - Public Health
34.2 - Health Policy
34.3 - Health Economics
34.99 - Public Health and Health Economics - Other
35 - Research Methodology
35.1 - Biostatistics
35.2 - Research Methodology: Big Data Analysis
35.3 - Cardiovascular Epidemiology
35.4 - Trial Design
35.5 - Research Ethics
35.99 - Research Methodology - Other
O - BASIC SCIENCE
36 - Basic Science

36.1 - Basic Science - Cardiovascular Development and Anatomy
- 36.1.1 - Basic Science - Cardiovascular Development and Anatomy: Stem Cells, Cell Cycle, Cell Senescence, Cell Death
- 36.1.2 - Basic Science - Cardiovascular Development and Anatomy: Genetics, Epigenetics, ncRNA
- 36.1.99 - Cardiovascular Development and Anatomy, Other

36.2 - Basic Science - Cardiac Biology and Physiology
- 36.2.1 - Stem Cells, Cell Cycle, Cell Senescence, Cell Death
- 36.2.2 - Basic Science - Cardiac Biology and Physiology: Genetics, Epigenetics, ncRNA
- 36.2.3 - Basic Science - Cardiac Biology and Physiology: Signal Transduction, Mechano-Transduction
- 36.2.4 - Basic Science - Cardiac Biology and Physiology: Ion Channels, Electrophysiology
- 36.2.5 - Basic Science - Cardiac Biology and Physiology: Mitochondria
- 36.2.6 - Basic Science - Cardiac Biology and Physiology: Microvesicles, Exosomes
- 36.2.7 - Basic Science - Cardiac Biology and Physiology: Metabolism
- 36.2.8 - Basic Science - Cardiac Biology and Physiology: Leukocytes, Inflammation, Immunity
- 36.2.9 - Basic Science - Cardiac Biology and Physiology: Biomaterials, Tissue Engineering
- 36.2.99 - Cardiac Biology and Physiology, Other

36.3 - Basic Science - Cardiac Diseases
- 36.3.1 - Ischemia, Infarction, Cardioprotection
- 36.3.2 - Basic Science - Cardiac Diseases: Cardiac Hypertrophy
- 36.3.3 - Basic Science - Cardiac Diseases:Heart Failure
- 36.3.4 - Basic Science - Cardiac Diseases: Arrhythmias
- 36.3.5 - Basic Science - Cardiac Diseases: Cardiomyopathies
- 36.3.6 - Basic Science - Cardiac Diseases: Valvular Heart Disease
- 36.3.7 - Basic Science - Cardiac Diseases: Congenital Heart Disease
- 36.3.8 - Basic Science - Cardiac Diseases: Leukocytes, Inflammation, Immunity
- 36.3.9 - Basic Science - Cardiac Diseases: Fibrosis
- 36.3.10 - Basic Science - Cardiac Diseases: Drugs, Drug Targets
- 36.3.11 - Basic Science - Cardiac Diseases: Gene Therapy, Cell Therapy
- 36.3.12 - Basic Science - Cardiac Diseases: Biomarkers
- 36.3.99 - Cardiac Diseases, Other

36.4 - Basic Science - Vascular Biology and Physiology
- 36.4.1 - Stem Cells, Cell Cycle, Cell Senescence, Cell Death
- 36.4.2 - Basic Science - Vascular Biology and Physiology: Genetics, Epigenetics, ncRNA
- 36.4.3 - Basic Science - Vascular Biology and Physiology: Signal Transduction, Mechano-Transduction
- 36.4.4 - Vascular Tone, Permeability, Microcirculation
- 36.4.5 - Vascular Biology and Physiology: Ion Channels, Electrophysiology
- 36.4.6 - Basic Science - Vascular Biology and Physiology: Mitochondria
- 36.4.7 - Basic Science - Vascular Biology and Physiology: Microvesicles, Exosomes
- 36.4.8 - Lipids, Metabolism
- 36.4.9 - Platelets, Haemostasis, Coagulation
- 36.4.10 - Basic Science - Vascular Biology and Physiology: Leukocytes, Inflammation, Immunity
- 36.4.11 - Basic Science - Vascular Biology and Physiology: Biomaterials, Tissue Engineering

36.4.99 - Vascular Biology and Physiology, Other
36.5 - Basic Science - Vascular Diseases
36.5.1 - Microcirculation, Angiogenesis, Arteriogenesis
36.5.2 - Atherosclerosis, Cerebrovascular Diseases, Aneurysm, Restenosis
36.5.3 - Hypertension, Pulmonary Hypertension
36.5.4 - Thrombosis, Bleeding
36.5.5 - Lipid Metabolism, Metabolic Syndrome, Diabetes
36.5.6 - Basic Science - Vascular Diseases: Leukocytes, Inflammation, Immunity
36.5.7 - Basic Science - Vascular Diseases: Fibrosis
36.5.8 - Basic Science - Vascular Diseases: Drugs, Drug Targets
36.5.9 - Basic Science - Vascular Diseases: Gene Therapy, Cell Therapy
36.5.10 - Basic Science - Vascular Diseases: Biomarkers
36.5.99 - Vascular Diseases, Other
36.99 - Basic Science - Other
P - OTHER
80 - Training and Education
90 - European Society of Cardiology
90.1 - Acute Cardiovascular Care Association
90.2 - Heart Failure Association
90.3 - European Heart Rhythm Association
90.4 - European Association of Percutaneous Cardiovascular Intervention
90.5 - European Association of Preventive Cardiology
90.6 - European Association of Cardiovascular Imaging
90.7 - Councils
90.8 - Working Groups
90.9 - ESC Board
90.10 - ESC Committees
90.11 - European Heart House
90.12 - European Heart Agency
90.13 - EURObservational Research Programme
90.14 - Education and Certification
90.99 - European Society of Cardiology - Other
99 - Other