



A Cardiac Catheterisation Laboratory Core Curriculum for the Continuing Professional Development of Nurses and Allied Health Professions:

Developed by the Education working group of the Nurse and Allied Professions committee for the European Association of Percutaneous Cardiovascular Interventions (EAPCI) 2016

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1. Introduction

Jean Fajadet announced the creation of the new EAPCI Nurses and Technicians (N&T) committee in the April 2014 issue of EuroIntervention (1). An EAPCI program dedicated to Nurses and Allied Professionals (NAP) involved in the field of interventional cardiology was formed. The purpose of the program was to promote networking, to share information and knowledge among NAPs throughout Europe. Interventional cardiology has witnessed tremendous changes over the years from mainly diagnostic procedure in an elective population to critically ill patients affected by acute myocardial infarction. In this perspective, NAPs should remain up-to-date concerning the latest devices used in different clinical procedures, advanced knowledge in the pathophysiology of acute coronary syndrome and techniques to stabilize and maintain hemodynamic stability of patients with severe heart conditions.

All new devices and techniques require training and continuing education (1). Therefore, an important task for the EAPCI, Nurses and Allied Professionals committee was to create a working group with the mission to establish a sound educational foundation. The educational preparation of nurses and allied professionals working in the Cardiac Catheterization Laboratory (cath lab) across Europe is diverse, with variations in educational settings. Therefore, the first assignment was to define, develop and provide minimum training standards for NAPs in Europe.

At the PCR 2012 a survey (2) was given to develop a picture of where cath lab NAPs stand, both in education and professional development in Europe. The objectives of this survey were to gather information to assess the educational and professional requirements needed in European countries to work in the specialized area of cath labs. The EAPCI, NAP committee has used this information to help develop the aims and goals of this curriculum.

In the survey, 52% answered they needed extra qualifications beyond basic education to work in the cath lab. These extra qualifications were as follows:

- 73% need to know how to read an ECG
- 50% need at least 1 year of basic experience

- 28% needed Intensive Care Unit (ICU) experience for at least 1 year
- 54% need ACLS (advanced cardiac life support) training
- 50% also answered that you can come directly from basic education

These results were analysed and summarized with the following questions at issue:

- Are the NAPs currently working in European cath labs prepared with enough basic knowledge?
- Are the basic standards of education and training for the personnel being met?

With the increasing number of complex procedures and patients with considerable comorbidity treated in the cath lab (3), the role of nurses and allied professions is changing respectively, in the words of Jean Fajadet: *“We cannot offer the high level of care we strive for today if we do not offer the best level of education and opportunities to the nurses and allied professionals”*. (1) To meet this challenge, one of the aims for the education working group is to support the development of clinical training, with an education program for NAPs working in the field of interventional cardiology in Europe.

In the 2012 questionnaire, the basic educational training was 40% through hospital based diploma programs and 40% from programs in the university. Fifteen percent were from other types of training programs. Therefore, the goals of providing a tool of basic standards for NAPs practicing in the cath lab, a curriculum and matching competencies were developed so that all countries can use them as guidelines in their national context. The curriculum can be tailored for use according to the legislative and regulatory standards that govern practice within the health facility / country.

It should be expected that the programs for each country / facility / profession will include some specific content areas that are mandatory.

These areas should include, but not limited to: aseptic technique, blood-borne pathogens, radiation protection and safety, cardiovascular anatomy and physiology, pathophysiology, procedures & protocols for diagnostic left and right heart and vascular catheterization, cardiovascular pharmacology, interventional cardiovascular

catheterisation procedures, cardiovascular patient assessment, hemodynamic monitoring, cardiovascular cath lab complications.

Furthermore the rationale behind these basic guidelines was to provide the NAPs in Europe with the possibility to implement and create a European standard of basic knowledge, skills required to provide the best possible care and to contribute to the ESC mission “to reduce the burden of cardiovascular disease in Europe”.

2. Cardiac Cath Lab Curriculum Aims

The aim of this curriculum is to provide a standard educational guidance for specializing in interventional cardiology after initial qualification. In the best scenario the curriculum will be used to provide the basis of training and education for a university based specialty in Interventional Cardiology for NAPs. Following the lead of the EAPCI ESCeL platform we intend to develop a similar tool through educational modules. The curriculum can also be used as a basis for training NAPs on a certificate based level, and by doing so, it shall provide a validation that a NAP possesses specialty knowledge in clinical decision making, beyond the basic level (4).

Much of the work in the cath lab can be captured by tasks and responsibilities that must be entrusted to individuals. The skills and competencies in this curriculum require the professional to integrate multiple competencies from several of the domains (5). When the allied professional has required the necessary skills and attitudes to carry out the tasks in the curriculum as an individual they can then be considered to have fulfilled the basics, therefore beginning the path to expert level following the theory of Benner (6).

This curriculum is not designed to replace current modules or curricula already in use. The declaration of Bologna (7) emphasised the need for a unified programme of higher education in Europe. This curriculum is the beginning of a process for a unified, standardised education for NAPs, that we hope will take us a step closer to our goal of providing certification and online education programmes to promote continuing professional development (8).

3. Development of the Core Curriculum for Cardiac Catheterisation Laboratory Nurses and Allied Professionals

Working in the cath lab, a highly technical specialist area, requires constant updates in knowledge. This framework for NAP in the cath lab has been developed with this in mind. The curriculum is based on the framework developed by the Cardiovascular Council of Nurses and Allied Professions (CCNAP) (9) adding to it the specialty areas of knowledge needed within the cath lab, composing nine core areas of themes. The technical aspects of knowledge in this curriculum will be addressed by providing a competencies matrix for use in educational development or introduction of new staff in the cath lab. The basic foundation of educational strategies, assessment, approaches, and testing can be found in the CCNAP document (10). In addition, the basic concepts of teaching and learning discussed in the original document (9) also pertain to NAPs working in a cath lab.

The curriculum is for use in the specialty cardiovascular setting of the cardiac cath lab. The document recognises the continuum of expertise leading to an advanced / specialist practice and is a complete framework for the level of novice to expert in the cardiac cath lab. According to the survey (11) there is variability in content, teaching, learning and evaluation methods in post registration education programmes in Europe. This curriculum has been developed with the future goal of providing certification for NAPs in interventional cardiology. The structure of this curriculum allows cath labs to start preparing and structuring their training programmes to achieve a high level of standards in the education of cath lab assistant personnel.

4. Structure

Basic training in cardiovascular knowledge should be a prerequisite for NAPs specializing in interventional cardiology (theme 1 Fundamentals of Cardiovascular Pathophysiology). When the novice has attained the knowledge of basic cardiology then they may progress onto the other themes.

4.1 Learning Objectives for the Specialty of Interventional Cardiology

1. Apply evidence based medicine and current guidelines to meet individual patient needs and characteristics.
2. Be able to understand and explain the medical procedure or surgical treatment the patient will receive, to patient and relatives.
3. Acquire the theoretical knowledge and practical skills to assist in all procedures in the cath lab.
4. Assist in pre-procedural, peri-procedural and post procedural patient care and management. .
5. Identify the optimal strategy to assist in managing procedural related complications.

4.2 Levels of Experience and Time Frames for Education/ Training

Beginner

The novice / beginner has no experience in the cath lab, limited ability to demonstrate safe practice and requires continual verbal and physical cues from a local trainer (at least at competent level). He / she are unable to use discretionary judgement (6) (12).

1. Assists in preparation of the patient for basic angiographic procedures under the supervision of a local trainer (who should be at a competent level).
2. Scrubs in on basic angiographic procedures under the supervision of a competent staff member using appropriate sterile technique.
3. Circulates during a basic angiographic procedure being responsible for the patient's well-being, assisting the scrub NAP, observing vital signs and hemodynamic monitoring during the procedure and intervening when necessary.
4. Caring for a patient after a basic angiographic procedure, observing for complications, assisting in access site compression, and giving a proper handover to the transferring ward.

After completion of these tasks the beginner should gain confidence and comprehension of the different tasks for the basic knowledge of angiographic procedures and then proceed to caring for elective angioplasty.

Advanced Beginners

The advanced beginner demonstrates marginally acceptable performance due to prior experience in actual situations. The advanced beginner is efficient and skilful in parts of the practice area, with limited experience requiring occasional supportive cues. Requires support in clinical practice from someone at least at competent level (6,13).

1. Assists in preparation of the patient for all procedures under the supervision of a local trainer (who should be at a competent level).
2. Scrubs in on all procedures under the supervision of a competent staff member using appropriate sterile technique.
3. Circulates during all procedures being responsible for the patients' well-being, assisting the scrub NAP, observing vital signs and hemodynamic monitoring during the procedure and intervening when necessary.
4. Caring for a patient after all procedures, observing for complications, assisting in access site compression, and giving a proper handover to the transferring ward.

After completion of these tasks the advanced beginner shows confidence and comprehension. When they are able to work unsupervised, they are considered competent.

Competent

The competent NAP is able to demonstrate efficiency, is coordinated and has confidence in his / her actions. For the competent trainee, a plan establishes a perspective, based on considerable conscious, abstract and analytic contemplation of the problem. The competent trainee has been encountering similar situations in the cath lab and have the ability to master and manage but still lack the speed and efficiency (6,12).

After completion, the competent NAP demonstrates skills in patient preparation, circulates, scrubs in, and cares for patients after a procedure without supervision. They develop their skills and awareness of complications that may occur and have the knowledge to assist and intervene when necessary. They are able to learn new techniques and add them to their skills.

Proficient

The proficient NAP perceives situations as a whole rather than in terms of small details and has learned from reflection on experiences in the cath lab what events to expect in a given situation and how to modify strategies in response. This holistic understanding improves decision making because the NAP now has a perspective on which aspects in the present situation are important (6,12).

After completion, the proficient NAP demonstrates skills in patient preparation, circulates, scrubs in, and cares for patients after a procedure without supervision. They develop their skills and awareness of complications that may occur and have the knowledge to assist and intervene when necessary. They are able to learn new techniques and add them to their skills. They are often the team leader. They are proficient in knowledge of guidelines and make sure they are followed during practice by all staff members. The local trainer should have achieved this level.

Expert

The expert professional has an intuitive grasp of each situation and identifies the problem without time delay. The expert operates from a deep understanding of the total situation. His / her performance becomes fluid, flexible and highly proficient. Highly skilled analytic ability is necessary for situations of no previous experience (6,12).

After completion the expert professional demonstrates skills and prepares, circulates, scrubs in, and cares for patients after a procedure without supervision. They are able to operate with ease and always have a grasp on complex situations using intuition and analytical approaches to provide the best care. The NAP at expert level is often clinical specialists whereas many countries require a master degree to be considered an expert.

| Level | Beginner | Advanced beginner | Competent | Proficient | Expert |
|------------------|--|--|---|---|--|
| Time frame | 6 months | 6 months – 1 year | 1 - 2 years | 3-5 years | 5-10 years |
| Autonomy | Major supervision | Minor supervision achieve most tasks alone, | Achieves most tasks using own judgement | Take full responsibility for own work, and that of others | Take on responsibility beyond existing standards |
| Knowledge | Minimal, not connecting it to practice in the cath lab | Working knowledge of key aspects of practice in the cath lab | Good working and background knowledge in the cath lab | Depth of understanding in the cath lab and cardiology | Deep understanding and authoritative knowledge in the cath lab |

Time frames are guidance only

5. Assessment Methods

Assessment for the procedure and technique oriented specialty of Interventional Cardiology involves self-evaluation, reflection, and assessment by competent higher level local trainers.

Competence assessment should focus on performance in caring for a patient in the cath lab. It includes the education and ongoing review as well as demonstrating documenting and integrating knowledge through skills, using the standards of care and established policies and procedures in your training institution. The competencies matrix provided in the appendix can be used as a tool kit to assess the trainees changing level of competence through repeated task oriented training.

Parallel to the competencies training the trainee should be evaluated to see not only how they are functioning within the technical aspects of their training, but also in patient care, team work and all parts of the core curriculum.

Reflection on complications that have occurred or can occur during procedures should also be part of the assessment. This is an important step for the trainee to evaluate the trainees understanding beyond basics. A discussion should take place on what has happened and what could maybe have been done better or differently to prevent the complication from happening in the future. The trainee should also be assessed for working safety and providing a safe environment for patients and fellow colleagues.

The competencies matrix “log book” must maintain a continuous record of their participation and what their level of participation is in all areas of training. The trainees will be evaluated to see at which level of experience they are currently in. The trainer is responsible for assessment of the trainee to ascertain that they are ready to advance to the next level of experience.

The local trainer should be directly involved in observing the trainee, they should come from the same institution, and have at least achieved the level of competent. There should be regular intervals of assessment and all assessment should be documented in the competencies matrix. The records of training should be kept at the institution and all procedures done and documented in the matrix should be signed by trainee and trainer.

Some possible assessment approaches are:

Written essays

Short answer exams

Reflection

Multiple choice exams

Assessment of competence in practice

Matrix “log book” assessment

Observed structured clinical examination

6. Organization of the Training

6.1 Entry Requirements

It is recommended that applicants for specialty training in interventional cardiology for NAPs have successfully completed a degree in their profession, diploma based training will also be considered. It is recommended that the candidate be recognized by a National Society for Cardiology.

In countries where there is an advanced cardiovascular training for NAPs, this attendance will be considered in the selection process, but no specific experience in interventional cardiology is required to enter this programme.

6.2 Requirements for Training Centre

Training institutions should be recognized by a National Society for Cardiology as being competent to provide a complete training programme, either in the same centre or in collaboration with others.

It is recommended that the training centre should have an independent interventional cardiology unit, allowing the trainee to follow the patient from the admission to the completion of Interventional treatment and during follow-up.

The presence of a programme of peripheral interventions, treatment of adult congenital heart disease, performance of septal ablation for hypertrophic cardiomyopathy and valvuloplasty are useful adjuncts to the centre qualification. An electronic database of diagnostic and interventional procedures regularly audited by the National Cardiology Society is desirable to ensure that the number and types of interventions required according to the training scheme are met.

It is recommended that the interventional cardiology programme should perform at least 800 coronary angioplasties per year including acute coronary syndromes and primary angioplasty. These requirements are highly desirable but exceptional cases can be considered for skilled groups with smaller annual procedural volume or not

able to practice acute interventions because of poor departmental or country organisation of health services.

It is recommended that the training institutions 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 trainee should be provided with the opportunity to participate in basic scientific or clinical research. If basic science research facilities are not available in the training institution, collaboration with centres that offer this option should be made available for the trainee.

6.3 Requirements for Local Trainers

Trainers should be recognized by the National Training Authorities / National Societies and supervision of training should be available at all times. There should be a minimum number of expert NAPs in the training institution to ensure training in all areas included in the Core Curriculum. Ideally the number of trainees should not exceed the number of local trainers (full-time equivalent).

Delivery of the curriculum may be facilitated by a structure that includes a national training director, a local training director (or educational supervisor), and multiple local trainers. The local training directors (or someone else involved in the organization of training) should be responsible for organizing the training programme in interventional cardiology for NAPs, coordinating external rotations to referral centres, attendance at courses and congresses, and organizing structured learning.

It is recommended that most of the training should be performed by local trainers whom are permanent NAP staff and there are at least two trainers available, with an experience of at least 1,000 coronary interventions and more than five years' experience mainly dedicated to interventional cardiology.

It is recommended that the local trainer also ensures that the trainee attends formal training courses and is involved in the research and educational activities of the department.

6.4 Adjunctive Training

The following procedures are part of the core curriculum but should be considered as an “optional” part of the training programme. The trainer of the core curriculum should separately indicate whether the trainee has achieved enough experience and proficiency to perform them.

- A. Mitral, aortic and pulmonary valvuloplasty and percutaneous valve repair & Prosthetic paravalvular leak closure
- B. Closure of atrial septal defects and patent foramen ovale (possibly including closure of post MI ventricular septal defects and perivalvular leaks).
- C. Septal alcoholisation for hypertrophic cardiomyopathy
- D. Carotid stenting
- E. Renal stenting
- F. Renal Denervation
- G. Iliac stenting
- H. Subclavian stenting
- G. Other peripheral vascular procedure
- H. Left atrial appendage closure
- I. Fistulae occlusion
- J. Raskin procedure
- K. Foreign body extraction

7. Cardiac Catheterisation Laboratory Curriculum Content

The syllabus was developed by a panel of experts from various allied health professions working in the cath lab. The syllabus content is arranged in nine themes with some overlap amongst themes, basing much of the content from the original CCNAP curriculum (9). Considerations in the development were the various roles different professions have in the cath lab and the highly technical knowledge needed.

The ESC guidelines and evidence based practice are also used in the development of the curriculum.

8. Syllabus

In this section the nine themes that characterise the Cardiac Catheterisation Laboratory Core Syllabus are presented in Table 1 .

Table 1. Cath Lab Core Syllabus Themes and Indicative Content

| | | |
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| FUNDAMENTALS OF CARDIOVASCULAR PATHOPHYSIOLOGY | 1.1 Coronary | <ul style="list-style-type: none"> • Coronary Artery Anatomy and Physiology • Flow Dynamics – Cardiac Circle • Ischemic Heart Disease (ACS, SCS) |
| | 1.2 Non Coronary | <ul style="list-style-type: none"> • Valvular Heart Disease • Heart Failure and Cardiogenic Shock • Conduction (Arrhythmias) • Vascular Diseases (Carotid and Peripheral) • Cardiomyopathies and Pericardial Diseases • Infectious Diseases • Congenital Heart Diseases • Abdominal and Thoracic Aortic Aneurisms & Dissections • Parasympathetic & Sympathetic Nervous System • Renal Regulation of Blood Pressure |
| PROCEDURES AND TECHNIQUES | 2.1 Aseptic Technique | <ul style="list-style-type: none"> • Pathogens • Hand Washing and Universal Precautions (PPE, gloving, isolation) • Methods of Sterilization and Disinfection • Sterile Table Setup (sterile field), Maintenance and Percutaneous Access, Sterile Draping |
| | 2.2 Vascular Access | <ul style="list-style-type: none"> • Access site evaluation, choosing & positioning (Allens test) • Closure Techniques (manual compression, devices, closing) • Detection and Treatment of vascular site complications |
| | 2.3 Coronary, Valvular, and Structural Diagnostic Procedures and Materials | <ul style="list-style-type: none"> • Angiography Techniques (native coronaries, grafts, LIMA's, RIMA's, vasospasm, collateral circulation) • Types of lesions and QCA – Vessel Measurement • Left Ventriculography • Aortography • Left / Right Catheterization • Hemodynamics (pressures, values, blood flow, cardiac output, wave forms) • IVUS • OCT • ICE |

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| | 2.4 Coronary Angioplasty Procedures and Materials | <ul style="list-style-type: none"> • PCI Techniques (preparation of lesion, complex, occlusions) • Appropriate Catheter Selection • Types of Angioplasty Guidewires Types of Balloons (semi compliant, non-compliant, DEB, cutting) • Types of Stents (BMS, DES, Scaffolds, self-expandable, covered) • CTO (devices) |
| | 2.5 Special Techniques | <ul style="list-style-type: none"> • FFR/ iFR/ PdPa • Rotational Atherectomy • Anti-Embolic Protection Devices (filters, proximal devices) • Thrombectomy Devices (manual, automatic) • Occlusive Balloons? • Target Temperature Management/ Therapeutic Hypothermia • PVAD (Impella) • IABP • Temporary Pacing • Pericardiocentesis |
| | 2.6 Structural Heart Disease | <ul style="list-style-type: none"> • Mitral, Aortic and Pulmonary Valvuloplasty • Congenital Interventions (PFO, ASD, Coils, VSD closure) • Percutaneous Paravalvular Leak Closure and LAAO • TAVR • Mitral Clips • TMV • Septal Closure with Alcohol |
| | 2.7 Peripheral Interventions | <ul style="list-style-type: none"> • Carotid Artery Angiography and Stenting (filters, moma) • Peripheral Arteriography and Angioplasty • Renal Intervention • Neurological Interventions for Stroke Events (optional) |
| | RADIATION AND IMAGING | 3.1 Radiation Physics and Terminology |
| | 3.2 Radiation Risks and Protection | <ul style="list-style-type: none"> • Biological effects of radiation (injuries) • Radiation Safety/ Protection (patients and personnel) • Dose Reduction Techniques • Radiation Exposure Monitoring and Limits |
| | 3.3 Injectors and Lesion Visualization | <ul style="list-style-type: none"> • Contrast Injection Systems and Techniques • Digital imaging systems and flat panels |
| | 3.4 Intra Coronary Imaging Modalities | <ul style="list-style-type: none"> • OCT /OFDI • IVUS • ICE • NIRS • Intermodality (imaging) |

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| | | <ul style="list-style-type: none"> • TEE |
| OPTIMISING CARDIOVASCULAR HEALTH IN THE CATH LAB | 4.1 Cardiovascular Risk Factors | <ul style="list-style-type: none"> • CVD Burden and Statistics • Modifiable and Non-modifiable Risk Factors • Emerging Risk Factors |
| | 4.2 Individualized Risk Factors | <ul style="list-style-type: none"> • Risk SCORE System • Prevention Strategies |
| ASSESSMENT, PLANNING AND MANAGING PATIENT CARE IN INTERVENTIONAL CARDIOLOGY | 5.1 Patient Preparation | <ul style="list-style-type: none"> • Medical Records • Physicians orders |
| | 5.2 Basic Assessment Techniques | <ul style="list-style-type: none"> • History and Physical exam • Vital signs • Central Nervous System (CNS) Assessment • Respiratory System Assessment • Cardiovascular Assessment • ECG Monitoring & Interpretation • Peripheral Vascular Assessment • Procedural Risk Assessment |
| | 5.3 Interpretation of Laboratory Studies | <ul style="list-style-type: none"> • Chemistries, Cardiac Enzymes, Troponin • Electrolytes • Haematology & Coagulation Studies • Lipid Panel |
| | 5.4 IV Therapy | <ul style="list-style-type: none"> • IV Insertion • IV Assessment & Maintenance |
| | 5.5 Post Procedure Patient Care | <ul style="list-style-type: none"> • Haemostasis • Documentation • Handover • Transport |
| | 5.6 Patient Management during Procedure | <ul style="list-style-type: none"> • Point of care testing - ACT, Oximetry • Patient positioning • High Risk Patient |
| | 5.7 Complications & Emergencies | <ul style="list-style-type: none"> • Shock • Anaphylaxis • Coronary Complications • Tamponade |
| | 5.8 Life Support Skills | <ul style="list-style-type: none"> • ACLS & BCLS |
| PHARMACOLOGY AND APPROPRIATE USE OF MEDICATIONS IN THE CATH LAB | 6.1 Pharmacokinetics & Pharmacodynamics | <ul style="list-style-type: none"> • Antiplatelet Agents (IIb/IIIa receptors antagonists, P2Y₁₂ inhibitors) • Anticoagulants (Heparin and Low Molecular Heparins) • Direct Thrombin Inhibitors (Bivalirudin) • Thrombolytic • Contrast Media • Antiarrhythmic • Nitrates • Other antianginals • Cardiac Glycosides • Vasopressors & Vasodilators • Calcium channel blockers |

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| | | <ul style="list-style-type: none"> • ACE inhibitors, Angiotensin Receptor blockers (ARB's) Aldosterone Antagonist • Beta blockers • Other antihypertensive agents • Sedatives and Reversal agents • Analgesics and reversal medications • Antibiotics • Antiemetic's • Steroids • Antihistamines • Cholesterol lowering agents • Oxygen • IV inotropes |
| | 6.2 Medications & Polypharmacy | <ul style="list-style-type: none"> • Uses in the cath lab • Level of significance for interactions • Known interactions with commonly used medications in the cath lab • Relative vs absolute contraindication • Beers Criteria |
| | 6.3 Routes of Administration | <ul style="list-style-type: none"> • Intracoronary (IC) • Intra-arterial (IA) • Intravenous (IV) • Sublingual (SL) • Subcutaneous (SQ) • Oral (PO) • Topical |
| | 6.4 Proper Documentation of Medications & Medical and Legal Aspects | <ul style="list-style-type: none"> • Risk / Benefit of medication • Compliance issues • 5 Rights: patient , method , dose, drug & route • Electronic & paper charting • Local standard & policies of medication administration |
| | 6.5 Drug and IV Infusion Calculations | <ul style="list-style-type: none"> • Basic calculations • IV drips units / hour • IV drips microgram / min • IV medication preparation / correct mixing solutions |
| | 6.6 Conscious Sedation | <ul style="list-style-type: none"> • Aldrete Score • Monitoring • Hospital standards • Agents used |
| | 6.7 ACLS Medications | <ul style="list-style-type: none"> • ACLS algorithms • 1st line drugs • 2nd line drugs |
| PRINCIPLES AND PRACTICES OF PERSON AND FAMILY CARE AND EMOTIONAL CARE | 7.1 Shared Decision Making | <ul style="list-style-type: none"> • Tools & approaches • Communication Skills • Reflective practice |
| | 7.2 Person and family centered health care | <ul style="list-style-type: none"> • Professionalism • Ethics • Therapeutic Relationships |

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| PHYSICAL WELL-BEING AND COMFORT IN THE CATH LAB | 8.1 Patient rights & Safety | <ul style="list-style-type: none"> • Informed consents • Hospital standards for the cath lab • Psychosocial, physical and environmental needs |
| | 8.2 Symptom Assessment | <ul style="list-style-type: none"> • Safe care of sedated , unconscious patients • Management of acute chest pain and symptoms |
| | 8.3 End of life Care | <ul style="list-style-type: none"> • Patient care with dignity and confidentiality |
| EVALUATION OF THE QUALITY OF CARE AND RESEARCH IN INTERVENTIONAL CARDIOLOGY | 9.1 Quality care & Quality indicators | <ul style="list-style-type: none"> • Systems and Organizational theory • Hospital standards • Measurement of Quality Care |
| | 9.2 Risk Assessment | <ul style="list-style-type: none"> • Audit & Inspections • Evaluation • IT skills, Electronic Health Records |
| | 9.3 Research and Investigation | <ul style="list-style-type: none"> • Investigation and Research Methodologies Overview • Articles and Publications Modalities • Landmark Studies of Interventional Cardiology |

Acronym Table

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| Acute Coronary Syndrome (ACS) | Intra Vascular Ultrasound (IVUS) |
| Activated Clotting Time (ACT) | Left Atrial Appendage Occlusion (LAAO) |
| Advanced Cardiac Life Support (ACLS) | Near-Infrared Spectroscopy (NIRS) |
| Atrial Septal defect (ASD) | Optical Coherence tomography (OCT) |
| Basic Cardiac Life Support (BLS) | Optical Frequency Domain Imaging (OFDI) |
| Bare Metal Stent (BMS) | Patent Forum Ovalle (PFO) |
| Cardio Vascular Disease (CVD) | Percutaneous Ventricular Assist Device (PVDA) |
| Chronic Total Occlusions (CTO) | Personal Protection Equipment (PPE) |
| Drug Eluting Balloon (DEB) | Proximal Aortic pressure (Pd) Distal Coronary Pressure (Pa) (PdPa) |
| Drug Eluting Stent (DES) | Quantitative Coronary Stenosis Assessment (QCA) |
| Fractional Flow Reserve (FFR) | Stable Coronary Syndrome (SCS) |
| Instant Wave-Free Ratio (iFR) | Transvascular Aortic Valve Replacement (TAVR) |
| Intra- Aortic Balloon pump (IABP) | Trans Mitral Valve (TMV) |
| Intra Cardiac Echo (ICE) | Ventricle Septal Defect (VSD) |

9. Core Curriculum Themes

In this section the core curriculum themes will be presented with learning objectives, knowledge, skills, attitudes and behaviours

9.1 Theme 1- Fundamentals of Cardiovascular Pathophysiology

Content will include learning about coronary and non-coronary anatomy, pathophysiology and physical manifestations of cardiovascular conditions and clinical manifestations of diseases that are commonly treated by interventional cardiovascular procedures which will be arranged in two broad groupings. (Table1).

Objectives

- Understand normal anatomy and physiology of cardiovascular system.
- Understand the fundamentals of the pathophysiological changes and clinical manifestations of common coronary and non-coronary conditions.
- Develop expertise in assessing, treating and caring of patients submitted to cardiovascular interventions.

Knowledge

- Anatomy and physiology of cardiovascular system (including renal control of blood pressure).
- Pathophysiology and clinical manifestations of common coronary (IHD) and non-coronary conditions (valvular, congenital, infectious, conduction, muscle and aneurisms).
- Classification of coronary, carotid and peripheral segments, types of lesions and cardiac cycle.
- General knowledge on the diagnosis of the common coronary and non-coronary conditions.
- General knowledge on the different procedures and techniques used in interventional cardiology.
- General knowledge of the most relevant guidelines and consensus documents produced by both the ESC and EAPCI on management of common cardiovascular and coronary diseases.

Skills - Ability to Describe, Understand, be Aware

- Be able to use knowledge of anatomy, physiology and pathophysiology, in clinical practice, and recognise the clinical manifestations of coronary and non-coronary conditions.
- Recognise normal ranges of physiological parameters and distinguish between those that are normal, abnormal and life-threatening.
- Be able to understand and use the classification of coronary, carotid and peripheral segments, types of lesions and cardiac cycle.
- Understand the rationale behind the use of invasive and non-invasive diagnostic and therapeutic procedures.
- Understand the prognosis of the different coronary and non-coronary conditions.
- Ability to measure and document physiological parameters and take appropriate action in response to alternations in physiological parameters.
- Be able to assess, treat and care for patients undergoing cardiovascular interventions. Establish a proper relationship with patient's family and relatives.

Attitudes & Behaviours

- To be alert to all changes in physiological parameters, and communicate them to the rest of the team in a timely fashion.
- Collaborate with the multidisciplinary team in the interventional cardiovascular procedures decisions.
- Evaluate the urgency/emergency and priorities and take appropriate actions needed for each condition and procedure.
- Recognise the importance of managing the theoretical and practical concepts in order to become an expert nurse within an expert team.
- Participate in department's organization, development of health care protocols, database management and research.
- Appreciate the importance of Continue Nursing & Allied Professions Education (CNAPE) and of Continue Nursing & Allied Professions Development (CNAPD) to review knowledge of pathophysiological principles.

9.2 Theme 2 - Fundamentals of Procedure & Technique

Content will include learning about the need to identify the optimal strategy of interventional treatment including device and technique selection, development of alternative strategies in case of failure of the initially chosen approach, and handling of unexpected complications (Table1).

Objectives

- Have a solid knowledge base, in all techniques and materials used in the cath lab to be able to function properly in the role of scrub person and circulator.
- Understand the use of and different types of materials and techniques needed for coronary, structural heart and peripheral interventions.

Knowledge

- Understand the use of aseptic technique
- Identify, describe, and characterize all accesses sites and closure techniques
- Understands the impact on outcomes from different types of bleeding complications (access site and non-access site)
- Describe coronary and valvular diagnostic procedures and materials
- Describe coronary angioplasty procedures and techniques
- Describe special techniques and materials
- Describe structural heart interventions, procedures and materials
- Describe peripheral interventions and materials

Skills

- Ability to manage a sterile table setup
- Ability to manage vascular complications
- Ability to perform a modified Allen test, and use pulse oximetry
- Ability to manage radial artery access complications, such as spasm or occlusion
- Describe the pros and cons of the radial and femoral approaches
- Identifies the different types of catheters, guide wires, balloons, stents, other devices and how to use and select them properly

- Be able to suggest proper materials according to vascular access site and coronary anatomy.
- Describe the basic guide wire structure, characteristics and classification and uses.
- Identify the basic principles of assisting in safe guide wire manipulation and different wiring techniques.
- Describe the basic characteristics of different balloon catheter designs and their applications.
- Describe how to adequately use balloon catheter systems
- Identify strengths and limitations of balloon angioplasty, as well as its complications.
- Identify the types of stents in current use
- Describe the current indications for all type of stents, and beware of their limitations
- Describe/Deal with the possible complications associated with stent use and how to manage them
- Identify structural interventions' devices and use them correctly

Attitudes and Behaviours

- Communicate to the patient the different options of vascular access that are available and their related complications.
- Respect the patient's decisions
- Explain to patient the different techniques and procedures available in a non-bias environment
- Work within your professional boundaries and competencies
- Adequate the knowledge to what each intervention requires

9.3 Theme 3 - Fundamentals of Radiation & Imaging

Content will include learning about the fundamentals of radiation physics, radiation risks and injury, radiation safety, including a glossary of radiological terms and methods to control radiation exposure for patients, and health professionals. Also specific imaging techniques in interventional cardiology, such as quantitative

angiography, intravascular ultrasonography and optical coherence tomography along with other intracoronary and intracardiac imaging modalities will be discussed. (Table1).

Objectives

- Understand the main radiation protection used in the cath lab
- Describe methods to control exposure to X-ray
- Describe the optimal projections for lesion visualisation
- Discuss the intra coronary imaging modalities

Knowledge

- Understand radiation physics and terminology
- Describe radiation risks and protection modalities
- Understand what is needed for radiation safety
- Describe methods to control exposure
- Describe injector systems and optimal projections for lesion visualisation with
- Identify Intra coronary imaging modalities, IVUS, OCT, NIRS, etc.

Skills

- Describe the physical and biological basis of radiation damage
- Recognize the deterministic and stochastic risks of radiation
- Be aware of appropriate use of different injectors and projections for optimal lesion visualization
- Describe how to minimize exposure to radiation
- Identify the principles underlying the different modalities of intracoronary imaging, as well as the advantages and limitations derived from them.
- Be aware the limitations of coronary angiography and how intracoronary imaging can be used to overcome them.
- Ability to use intracoronary imaging as diagnostic tools with regard to plaque size estimation, plaque component characterization, functional impact of coronary stenosis, long-term assessment of coronary interventions and research purposes.

- Ability to discuss intracoronary imaging as a guidance tool during PCI to optimize its results or to identify peri-procedural problems.
- Ability to use intracoronary imaging as a guidance tool during structural interventions.

Attitudes and Behaviour

- Promotes safe use of radiation
- Protects the patient and cath lab team from radiation
- Define your role in avoiding radiation injury
- Optimizes the use intracoronary imaging

9.4 Theme 4 - Optimising Cardiovascular Risk Factors Control in the Cath Lab

Content will address cardiovascular risk assessment and interventions using the opportunity to support primary and secondary prevention in the cath lab. (Table 1.)

Objectives

- Recognise individual cardiovascular risk factors and demonstrate a working knowledge of ECS guidelines on prevention
- Estimation of total risk SCORE and definition of priorities of preventive efforts.
- Implement evidence based effective strategies to prevent and modify cardiovascular risk factors
- Identify risk factors associated with *CVD and recognise the impact of health inequalities

Knowledge

- The burden of CVD locally and globally.
- The main modifiable cardiovascular risk factors (such as tobacco, dyslipidaemia, diabetes and metabolic syndrome, hypertension and lifestyle).
- The main non-modifiable risk factors (genetics, age and gender).

- Emerging cardiovascular risk factors (psychosocial, biomarkers, hormones, diseases).
- Evidence based strategies for cardiovascular prevention (effective communication).

Skills

- The ability to use effective interview skills, collects and selects relevant patient history and identify cardiovascular risk factors.
- Ability to educate the patient and family about the importance of risk factor management and support self-management of healthy lifestyle changes and the development of strategies to control risk factors after discharge.
- Ability to verify if the patient adheres to prescribed medications and recommendations.
- Demonstrates how to assess risk rapidly and with sufficient accuracy through the SCORE system accordingly to the country.
- Demonstrates how to inform the patient and the patient's family about measures of cardiovascular prevention.
- Describes how to identify patients at risk for unnecessary hospitalisations and readmissions.

Attitudes & Behaviours

- Display a polite and professional attitude towards the patient and the patient's family regardless of lifestyle choices, ethnicity, culture, age or gender.
- Provide effective communication to the patient and family about managing *CV risk factors.
- Promote effective communication between team members
- Promote multidisciplinary team work in optimising cardiovascular health and implementing additional strategies.
- Display a polite and professional attitude towards the other health professionals.
- Recognise the role of the nurse (actual and potential) in the implementation of *EBP

- Contribute implementing a nurse-co-ordinated prevention programme (discharge regimen).

*CV Cardiovascular, *CVD Cardiovascular Disease, *EBP Evidence Based Practice.

9.5 Theme 5 - Assessment, Planning and Managing Care in Interventional Cardiology

Content covered in this chapter will focus on assessment, planning and management of patients having an acute cardiovascular or chronic cardiovascular condition where assessment or treatment of the condition is needed in the cath lab. (Table1).

Objectives

- Demonstrate the ability to undertake a full cardiac history and assessment of a patient based on immediate condition and anticipation of further needs.
- Determine nursing diagnosis or health related issues from initial assessment
- Describe common diagnostic tests for investigation of cardiac disease
- Demonstrate the ability to analyse findings for further investigation
- Implement an evidence based plan of care and evaluate the results
- Understand what advance life support skills are required to manage a cardiac patient in the cath lab

Knowledge

- Apply the above to conditions listed below
 - Atherosclerotic disease of the heart: Emergency and elective revascularisation approaches. Life support skills
 - Heart rhythm and conduction disorders
 - Structural abnormalities: Valvuloplasty, valve replacement, congenital and structural repairs

- Describe how to undertake a complete and accurate assessment of an acute, elective, complex, high risk patient with ACS / CVD
- Describe principles and safe practice of invasive and non-invasive* haemodynamic monitoring and know how to interpret them correctly.
- Describe the key test a cardiac patient is likely to have and how you would prepare the patient and family for this, also describe the environment and equipment required.
- Describe what advanced life support skills are required for the treatment of a Cardiac patient in line with clinical practice and ESC guidelines of advanced cardiac life support
- Explain how to plan , implement and evaluate care for this group of patients
- Discuss and relevant clinical guidelines and explain how they might influenced nursing care of the cardiac patient

Skills

- Ability to take a full clinical history of a cardiac patient, undertake physical and psychosocial health assessment, in a structured manner
- Describe the principles and process of evaluating the plan of care following initial assessment
- Demonstrate the ability to prepare the patient and environment for relevant - invasive tests
- Demonstrate the ability of interpreting ECG and laboratory studies correctly
- Demonstrate the ability to prepare the patient and environment for relevant invasive procedure and*non-invasive tests
- Demonstrate the ability to provide safe , effective and compassionate care reflected in accurate documentation for patients undergoing investigations
- Demonstrate effective advance life support skills
- Ability to anticipates, detect and know how to deal with complications

- Demonstrate and understanding of the appropriate end of life care in cardiac patients

Attitudes and Behaviours

- Allow sufficient time of the assessment of a patient , ensuring that sufficient time is given to describe their symptoms in their own words in a structured manner
- Expect patients socio-economic, ethnical, cultural and religious background
- Maintain privacy, dignity and confidentiality
- Work within the boundaries of your scope of practice
- Medicines administration in line with national and local policies
- Documentation of all invasive and non-invasive tests

*We have assumed a basic knowledge of safely and accurately recording and interpreting vital signs (temperature, pulse, BP, oxygen saturation, neurological status and fluid balance).

9.6 Theme 6- Basic Understanding of Pharmacology & Appropriate Use of Medications in the Cath Lab Setting

Content will include the broad area of pharmacokinetics & pharmacodynamics of medications used in the cath lab, their indications for use, contraindications, dosages, routes of administration and side effects. Proper documentation of medications and legal aspects of giving medications in a cath lab setting will also be included. (Table1).

Objectives

- Understand the reason for use, mechanism of action, normal dosages, side effects and interactions of medications used in the cath lab. Aware of patient care considerations when receiving medications used in the cath lab
- Recognize positive and negative reactions from medications
- Discuss the possible effects from the medications used in the cath lab
- Identify the routes of administration of medications

- Ability to correctly calculate medication dosage and IV infusion rates, and follow pre-calculated dosage charts
- Understand the medical and legal aspects of documentation of medications
- Demonstrate the ability to perform BLS or ACLS (according to hospital standards)
- Recognise the role of the nurse in conscious sedation

Knowledge

- Understands the pharmacokinetics and pharmacodynamics of all medications used in the cath lab (please refer to list)
- Understand the mechanism of action, preparation, administration route and conditions of use for medications used in the lab
- Understands how to calculate and use the Aldrete Score
- Describe where to collect data on correct use of medications
- Define the tools that can be used for administration of medications
- Describe your role in administration of medications
- Identify hospital standards for your institution for medication administration
- Describe 1st and 2nd line drugs used in ACLS
- Understands monitoring protocol and hospital standards for conscious sedation in the cath lab
- Discuss the common pharmacological agents used and the treatment of Cardiac disease, including why they are given, mode of action and associated side effects

Skills

- Use calculations for correct dosing of medication
- Ability to set up & monitor a perfusor and infusomat appropriately
- Ability to recognise the need for emergency drugs
- Demonstrate safe administration of cardiac related medications
- Demonstrate the ability to correctly prepare the patient and equipment, required to establish venous and or arterial access for cardiac/ pain/ sedation/ medications

Attitudes and Behaviours

- Has a fast reaction to preparing medications in an emergency situation
- Proactively thinks ahead of which medications need to be prepared for different cases

9.7 Theme 7 - Principles and Practices of Person and Family centred Care & Emotional Care

The content in this domain links person and family care with emotional care of patients and families. Content will focus upon nursing interventions to enhance emotional and spiritual well-being in people with cardiovascular disease in the cath lab setting. This theme focuses upon the concept of person and family centred care and shared decision making. (Table1).

Objectives

- Demonstrate an understanding of the meaning and significance of person and family centred care and potential barriers and facilitators to this process.
- Recognise the emotional impact that a cardiac diagnosis may have upon patients and their families.
- Consider the significance of religion and spirituality as moderators of well-being.
- Demonstrate an understanding of patients' rights.
- Recognise the emotional impact that an emergency procedure has upon the patients and their families.
- Demonstrates a professional work ethic at all times.
- Recognises the importance of a proper consent procedure before interventions and procedures.

Knowledge

- Define the terms person centred care and shared decision making
- Describe the barriers and facilitators that exist in the development of a collaborative partnership with patients and their families
- Identify tools and approaches that can be used in clinical practice to support person centred care and shared decision making

- Define reflective practice and consider how this process facilitates evidence based care
- Describe nursing interventions to support emotional and spiritual well-being
- Describes methods to keep patient safe in the cathlab

Skills

- Apply the principles of person and family centred care to deliver individualized care
- Ability to recognise and understand the emotions, needs, and concerns of patients and their families and refer on for additional professional support when required
- Ability to certify if the consent document is signed
- Maintaining ESC guidelines and other high quality evidence to promote the emotional and spiritual well-being of those in your care
- Ability to make sure the consent has been properly signed before a procedure

Attitudes & Behaviours

- Display a non-judgemental attitude and respects the patient's wishes, values, priorities, perspectives and choice to consent to, or refuse treatment
- Provide equitable care for all with respect to individual difference regardless of ethnicity, age and gender
- Respect and accommodate diversity in patients' and their families' religious and spiritual beliefs
- Strive to provide care that maintains patient dignity, involves family/significant other and communicates compassion
- Promote patient advocacy-keeping patients safe during procedure

*Therapeutic relationship defined as a helping alliance based upon mutual trust, empathy, respect and compassion which characterises the provision of care to meet physical, emotional and spiritual needs.

9.8 Theme 8 - Physical Well-being and Comfort

Content will focus upon nursing interventions to enhance physical, emotional and spiritual well-being for people with cardiovascular disease in the cath lab, considering patients' rights & safety. (Table1).

Objectives

- Enhancing patient safety during cardiac procedure
- Promote physical well-being and comfort during cardiac assessment and investigation
- Identify and recognise common symptoms of Cardiac vascular system disease
- Identify and evaluate complex physical and psychosocial need of a patient

Knowledge

- Describe the presentation, assessment and management of common cardiac symptoms
- Identify relevant guidelines and discuss how these might be implemented in clinical practice
- Describe your role in ensuring patient safety during cardiac treatment

Skills

- Ability to deliver care to a patient to promote physical comfort and well being
- Ability to verify the informed consent
- Ability to implement evidence based guidelines in clinical practice
- Ability to assess and manage a cardiac patient through all aspects of their care pathway

Attitudes and Behaviours

- Recognise that symptoms are a subjective experience

- Respect differences in beliefs and culture that may influence the expression of symptoms
- Maintain Privacy, dignity and confidentiality. Ensuring patient safety at all times
- Promote effective communication with the multidisciplinary team to optimise patient safety
- Delivers evidence based practice

9.9 Theme 9 - Evaluation of the Quality of Care and Research in Interventional Cardiology

This content will support learning about systems and organisational theory that underpins quality care. The principles and practices of a quality improvement framework will be applied to processes in care in the cath lab setting to demonstrate the link between care processes and patient outcomes. The principles of evidence based medicine and research methodologies will be demonstrated. (Table1).

Objectives

- Define quality care
- Define the measurement of quality indicators for nursing care in the cath lab
- Have a broad knowledge of factors that influence care coordination and successful transition throughout the patient journey
- Recognise the potential of emerging technologies for quality and safety in supportive care.
- Discuss the role of teamwork, communication, and work environment in patient safety
- Recognizes the importance of training and in-services on the various equipment and the need for yearly updates
- Collaborate in research and investigation

Knowledge

- Is familiar with key principles of risk assessment, patient safety, audit and evaluation of adverse events: integrating care (which includes interception of errors by others-near misses).
- Has knowledge of standards of care and challenges within your organisation
- Has knowledge of ways to integrate the patients' perspectives in audit and quality improvement efforts.
- Describe the role of technology in quality care.
- Has knowledge of the "directions for use" and ability to use the various technical equipment and machines in the cath lab.
- Be aware of investigation and research methodology and keep updated on relevant studies and guidelines.

Skills

- Identify, develop and enhance activities that promote a culture of safety
- Ability to use basic and advanced IT skills applied to electronic health records
- Initiate safety measures based on evidence based guidelines
- Can apply audit and evaluation to improve design and implement quality care
- Adhere to evidence based standards to ensure optimal care
- Updates knowledge on technical equipment, and documents in-services and competencies on each piece of equipment used
- Participates in and promotes research in the cath lab

Attitudes & Behaviours

- Keep abreast of current evidence and adhere to guidelines to avoid ritualistic practice
- Adhere to professional commitment to do no harm and report poor practice
- Contribute to a culture of safety as a member of multidisciplinary team
- Verbalize and demonstrate a commitment to learning, willingness to question and to change practice when indicated
- Works within their competency level
- Convey a proactive culture of quality and safety when precepting and mentoring in clinical practice
- Collaborates in investigations and or clinical research

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