

# The Core Curriculum for Cardiovascular Nurses and Allied Professionals

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This 2023 update of the Core Curriculum in Cardiovascular Nursing (2015) embraces the formation of the Association of Cardiovascular Nursing and Allied Professionals and reflects the diverse professional backgrounds of our members, including nurses, allied health professionals, and healthcare scientists (in this document referred to collectively as Nurses and Allied Professionals).

## Keywords

Curriculum • Education • Nurses and allied professions • Entrustable professional activities

## Highlights

- This presents an entirely revised core curriculum for cardiovascular nurses and allied professions.
- This is an introductory curriculum intended to support the development of core clinical skills with a focus on patient-centred care.
- This curriculum is designed to enhance student engagement, promote active learning, and prepare students to meet new challenges and opportunities in the field of cardiovascular care.

## I. Cardiology for cardiac nurses and allied professionals

This 2023 update of the Core Curriculum in Cardiovascular Nursing (2015) embraces the formation of the Association of Cardiovascular Nursing and Allied Professionals (ACNAPs) and reflects the diverse professional backgrounds of our members, including nurses, allied health professionals, and healthcare scientists (in this document referred to collectively as Nurses and Allied Professionals). The curriculum is presented in three main sections:

- (1) This chapter outlining the main training requirements and their presentation in entrustable professional activities (EPAs) (as defined by the Canadian Royal College of Physicians and Surgeons. Please see section II.iii Clinical Competencies).
- (2) A chapter outlining the general skills, knowledge, and attitudes required in cardiology.
- (3) Nine chapters outlining EPAs in the different areas of cardiology.

The core curriculum was written between 2020 and 2023 in an iterative process involving over 20 representatives from ACNAP including education experts, clinical specialists, and patients. Their views, opinions, and comments were captured in an iterative process, in-person discussions in small groups, meetings, the ACNAP board, and the European Society of Cardiology (ESC) patient forum. The final document was reviewed by the ESC education committee in March 2023.

### I.i. Cardiology as a specialty for nurses and allied professionals

Cardiovascular nurses and allied professionals deliver expert care for patients with suspected and confirmed heart and circulatory diseases. This core curriculum outlines the clinical competencies required to practise as a cardiovascular nurse or allied professional. It is designed to align to the ESC core curriculum in cardiology.<sup>1</sup>

Completion of the curriculum equips a nurse or allied professional to become proficient in the management of patients with disorders of the heart

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and circulation and to gain knowledge of how to perform risk assessment and disease prevention in their patients and their community. While we have provided summaries on sub-specialty knowledge, this is not expected to provide a comprehensive or in-depth overview on specialty practice.

## I.ii. CanMEDS roles for nurses and allied professionals

The ESC has adopted the use of the Canadian Medical Education Directions for Specialists (CanMEDS) framework for cardiologists. CanMEDS was developed by the Royal College of Physicians and Surgeons in Canada in the 1990s and most recently updated in 2015.<sup>2</sup> CanMEDS stipulates that the constructs of the professional role need to be grounded in theory and best practices, and their presentation should be practical and related to daily practice.<sup>2</sup> Although CanMEDS has had limited use to date for nurses and allied professionals, the CanMEDS framework has been evaluated for use by nurse anaesthetists,<sup>3</sup> and a recent Delphi study, including eight different healthcare professional groups (audiology, dental hygiene, nursing, midwifery, occupational therapy, podiatry, and speech therapy), suggests that the CanMEDS framework provides a good standard for competency-based education for nursing and allied professionals.<sup>4</sup> However, it is noted that this is expert consensus and will be evaluated as we embrace this framework in the new Core Curriculum for Cardiovascular Nurses and Allied Professionals.

## I.iii. Clinical competencies

Nurses and allied professionals are required to acquire clinical competencies across a wide range of fields in the specialty management of people with cardiovascular disease (CVD). Clinical competence may be determined by the professional bodies, such as the Nursing and Midwifery Council in the UK, or the Supreme Council of Nurses and Midwives in Poland. These include professional values, communication and interpersonal skills, nursing practice and decision-making; leadership, management, and team working.<sup>5</sup> Other requirements include complying with legislation in the country of registration.<sup>6</sup> While these may vary by professional background and from country to country, they are all complex abilities based on knowledge, skills, and attitudes acquired through theory and practice.<sup>5</sup>

It has been recognized that health workers acquire competence over time. In the Benner model, the healthcare professional moves from novice to expert.<sup>7</sup> Although competence is considered to have been on this continuum, practice-based proficiency and expertise are more difficult to quantify. This gap between competency-based education frameworks and clinical practice has been noted by many.<sup>8</sup> In medical education, it has become increasingly common to adopt the concept of EPAs.<sup>9</sup> One scoping review suggest that EPAs are an essential means to translate competencies into observable and measurable clinical practice.<sup>10</sup> Since EPAs have been adopted by the ESC for their core curriculum, it is appropriate that they are used for this 2023 core curriculum for nurses and allied professionals. Consistent with the major chapters of the ESC Core Curriculum for Cardiologists, the EPAs are arranged in eight chapters (Chapters 2–9) and similarly reflect the major current clinical topics present in cardiovascular patient management.

## I.iv. Patient-centred care

The curriculum is underpinned by the philosophy of patient-centred care. Healthcare is changing, for both health care providers and patients and families, with ongoing challenges to traditional roles and power balances.<sup>11</sup> Treatment and care of the patient is often organized in siloes with different specialties (e.g. cardiology, nephrology) and different health care professionals with their own codes of practice and routines. To receive treatment and care, patients often need to find their way through a fragmented health care system and adapt to the customs and usual procedures of health care organizations and professionals, rather than receiving care designed to focus on their individual patients needs, preferences, and values.<sup>12</sup> To avoid

such fragmentation, a patient-centred approach is advocated, in other words working with a model of care that respects the patient's experience, values, needs and preferences in the planning, co-ordination, and delivery of care. A central component of this model is a therapeutic relationship between the patient and the team of healthcare professionals. In a patient-centred care approach, patients are seen not as passive recipients of health services but active participants who work as partners alongside healthcare professionals and respect diversity and differences in beliefs and cultures. The implementation of a patient-centred care model has been shown to contribute to improved outcomes for patients, better use of resources, decreased costs, and increased satisfaction with care.<sup>13</sup> Throughout this curriculum, it is expected that clinicians will apply a patient-centred lens to any work that they do with patients.

## I.v. Psychosocial health

Consideration of psychosocial health is a key priority in every cardiovascular condition. Depression and anxiety are common following a cardiac event. Pre-existing mental health conditions also lead to an increased risk for cardiovascular events. For every patient, we must recognize patients for whom additional psychological/psychiatric input may be beneficial and make appropriate referrals.

## I.vi. Use of patient-reported outcome measures and patient-reported experience measures

The use of patient-reported outcome measures (PROMs) and patient reported experience measures (PREMs) is strongly advocated for each EPA. PROMs are used to collect information about how patients feel (e.g. quality of life, mental health, specific symptom burden) before and after treatments from their own perspective, while PREMs capture information about experience of care, specific reportable events, and measure what matters to patients. PROMs are direct measures of how people feel and can be added to e.g. physiological tests which often can be less sensitive and specific for each individual. Using PREMs identifies areas for improvement and allows comparison and benchmarking. With all these tools, it is essential to use an instrument that is specific to the local context and has been developed and rigorously tested and validated in the population under investigation.

## II. Entrustable professional activities

While competency describes the qualities an individual acquires through knowledge, skills, and experience, EPAs refer to the work undertaken. While an individual can become competent, the EPA is the not a quality of the person, the EPA is the activity defined as a unit of professional practice. To be classed as an EPA, the activity must have a beginning and an end, be specific and measurable, and is restricted to the professional staff who are qualified to undertake it.<sup>8</sup> A single EPA may require multiple competencies in order to successfully undertake it. Thus, EPAs can be seen as a means to translate competencies into clinical practice.<sup>10</sup>

The EPAs defined in this core curriculum are the minimum required for independent practice for cardiovascular nurses and allied professionals. The EPAs contained within this core curriculum present a framework for becoming clinically competent and, in common with the ESC Core Curriculum for Cardiology, all share the same structure, adapted from the CanMEDS competency framework (*Figure 1*).

## III. Level of independence

Within the CanMEDS framework, each EPA defines a clinical activity. Expected competence will vary across professional groups and depend



on pre-registration experience and training. The level of independence that is set within this document is recommended as the **minimum** standard cardiovascular nurses, and allied professionals would be expected to achieve on completion of the certification course for cardiovascular nursing and allied professions (*currently in development*).

## IV. Assessment of clinical competencies using entrustable professional activities

Assessment of clinical competency is an essential tenet of the EPA concept. Assessment and reassessment of EPAs can be undertaken both formatively and summatively, until trainers are satisfied that the learner has reached minimum levels of independence as defined in the curriculum and can be entrusted with the clinical activity. Assessment of EPAs should be embedded into routine clinical care. It is expected that learners will consult more experienced clinical colleagues to continuously develop independence in each EPA. Thus, assessment of EPA by a more senior colleague will depend on whether the learner can professionally, proficiently, and independently carry out the EPA.

Assessment of EPAs will depend on the precise nature of the activity. Each section of this curriculum provides exemplar assessment tools which can be used to assess the level of independence in each EPA. Assessment primarily focuses on clinical skills acquisition; however, knowledge and attitude will form part of the evaluation. Assessment should therefore be accompanied by a specific knowledge-centred examination such as the upcoming ESC ACNAP Certificate of Cardiovascular Nursing and Allied Professionals. Attitudes can be additionally evaluated by multi-source feedback given by patients, relatives, and other health care providers (*Figure 2*).

## V. Role of the trainers

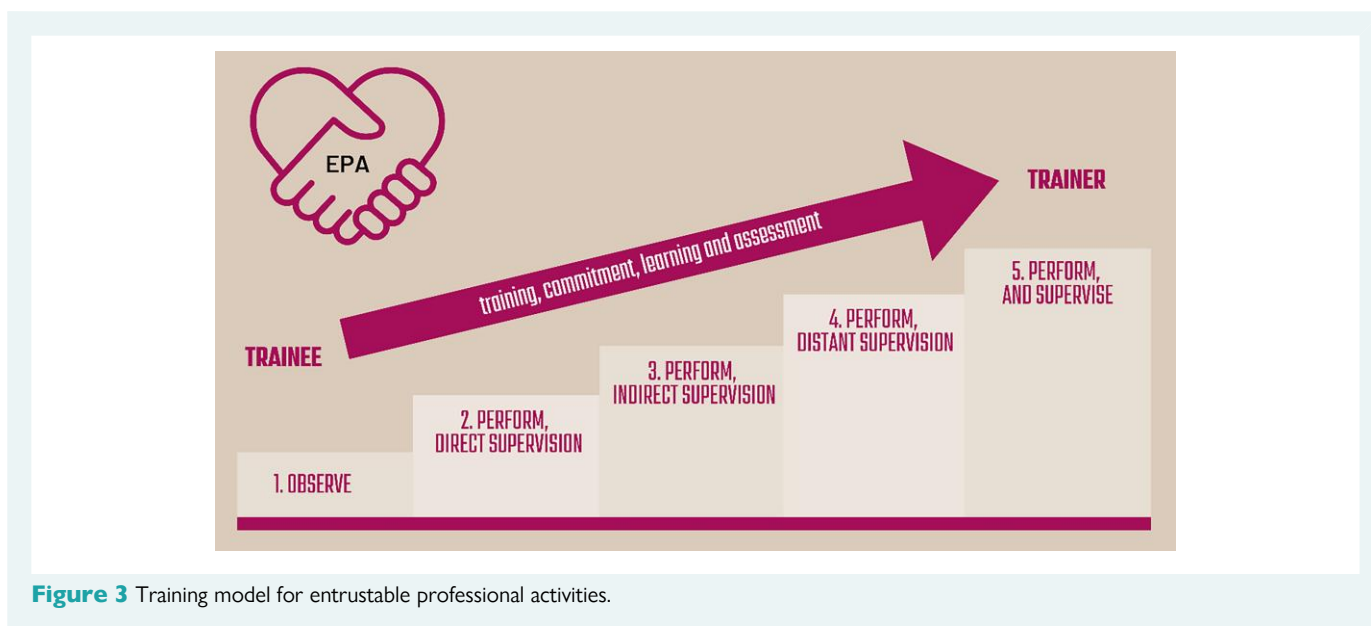
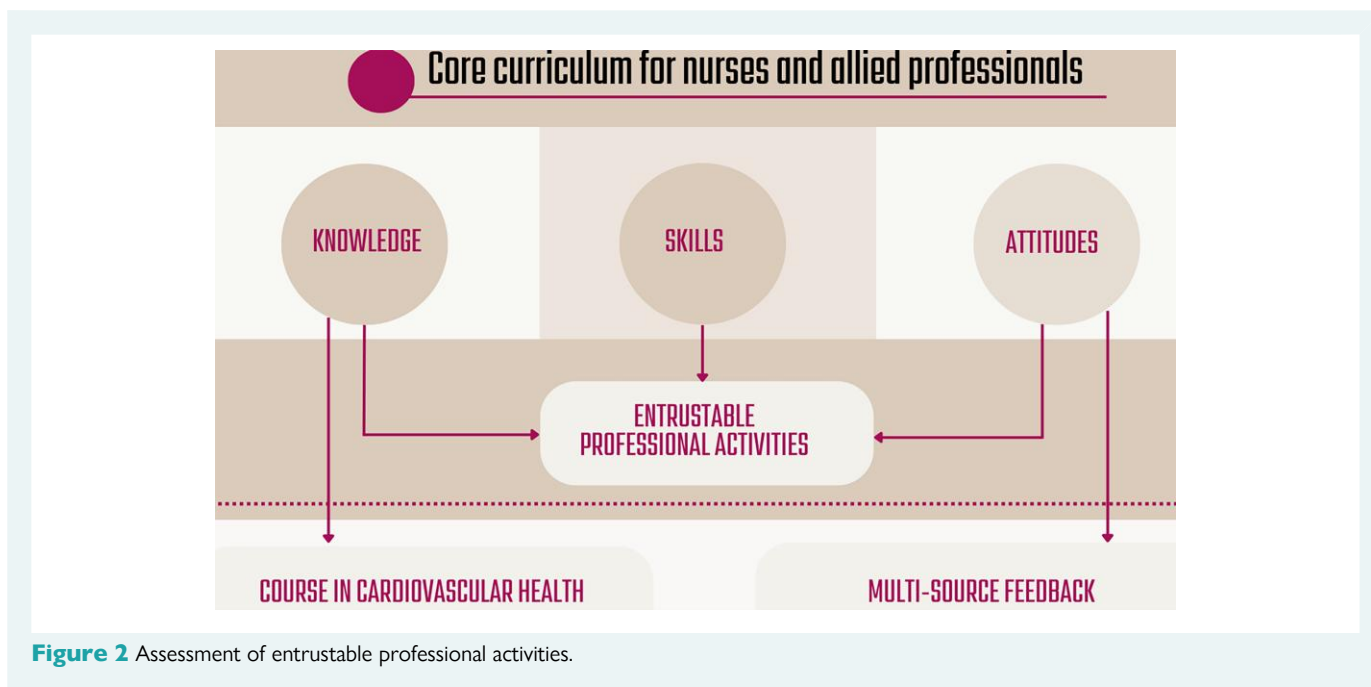
EPAs provide a mechanism to assess the ability a person has to carry out a professional activity independently, taking into account the knowledge, skills, and attitudes required to perform the activity. The EPAs move from a level of observing the EPA: to performing under direct supervision; to performing under indirect supervision; to performing under distant supervision; and to being able to perform and supervise (*Figure 3*). At the level of performing and supervising, the individual has moved from trainee to trainer and can supervise new staff to develop skills in the EPA. The trainer has a responsibility to ensure that the trainee reaches the minimum level of independence described in this core curriculum. As this curriculum is intended to cover a range of individuals from different professional backgrounds with diverse pre-registration preparation globally, the minimum standard may be below what is expected for a particular professional group upon registration. Trainers should consider the professional background of the trainee when determining the level of independence expected for the individual trainee.

### V.i Learning opportunities

Becoming a skilled nurse or allied professional in cardiovascular care requires a range of training opportunities, with exposure to a range of clinical scenarios to develop the knowledge skills and attitudes to become an independent practitioner. This process requires both formal learning and clinical practice

#### i. Knowledge

All learners should undertake personal study as a requirement of continuous professional development. In the context of the core curriculum, this includes access to textbooks, guidelines, journals, written



reviews and other teaching materials, computer-based learning including ESC e-Learning platform. Trainees should attend local, national, and international cardiology educational events to see the latest research, hear key opinion leaders, and meet their peers and trainers from other programmes.

## ii. Skills

All patient interactions are opportunities for learning clinical skills. Trainees should be encouraged to talk to patients about their daily lives and living with their heart condition. Reading about specific conditions can enhance learning. Trainees can be supervised by experienced members of the healthcare team who have a detailed knowledge of the subject area and are familiar with the content of this curriculum. There should be opportunities to discuss clinical cases through debrief or

more formal teaching. Ward rounds can also be a good opportunity for learning, and trainees should be encouraged to participate in them.

## iii. Attitudes

Undergraduate programmes for nurses and allied professionals place a great deal of emphasis on the attitudes and behaviours of healthcare professional staff. These attitudes should continue to retain a patient-centred focus and develop as the trainee gains increasing knowledge or skills.

## V.ii Assessment

The assessment of this core curriculum should be undertaken through a variety of tools including formal testing of knowledge by examination,

**Table 1 Entrustable professionals activities and level of independence**

EPA	Level of independence				
	1	2	3	4	5
<b>2. Imaging</b>					
2.1 Imaging of a patient using one or multiple imaging modalities					
2.2 Imaging of a patient using echocardiography					
2.3 Imaging of a patient using cardiac magnetic resonance					
2.4 Imaging of a patient using cardiac computed tomography					
2.5 Imaging of a patient using nuclear techniques					
<b>3. Coronary artery disease</b>					
3.1 The patient with symptoms suggestive of coronary artery disease					
3.2 The patient with acute coronary syndrome					
3.3 The patient with chronic coronary syndrome					
3.4 The patient undergoing coronary angiography					
<b>4. Valvular heart disease</b>					
4.1 The patient with aortic regurgitation					
4.2 The patient with aortic stenosis					
4.3 The patient with mitral regurgitation					
4.4 The patient with mitral stenosis					
4.5 The patient with tricuspid regurgitation					
4.6 The patient with tricuspid stenosis					
4.7 The patient with pulmonary regurgitation					
4.8 The patient with pulmonary stenosis					
4.9 The patient with multivalvular disease					
4.10 The patient with a prosthetic valve					
4.11 The patient with endocarditis					
<b>5. Rhythm disorders</b>					
5.1 The patient with palpitations—diagnosis					
5.2 The patient with transient loss of consciousness					
5.3 The patient with atrial fibrillation					
5.4 The patient with atrial flutter					
5.5 The patient with supraventricular tachycardia					
5.6 The patient with ventricular arrhythmia					
5.7 The patient with bradycardia					
5.8 The patient with a cardiac ion channel dysfunction					
5.9 The patient with a pacemaker					
5.10. The patient with an implantable cardioverter defibrillator					
5.11 The patient with a cardiac resynchronization therapy device					
5.12 The patient with a subcutaneous implantable cardioverter defibrillator					
<b>6. Heart failure</b>					
6.1 The patient with symptoms and signs of heart failure					
6.2 The patient with heart failure with reduced ejection fraction and mildly reduced ejection fraction					

Continued

**Table 1 Continued**

EPA	Level of independence				
	1	2	3	4	5
6.3 The patient with heart failure with reduced ejection fraction and mildly reduced ejection fraction					
6.4 The patient with acute heart failure					
6.5 The patient with cardiomyopathy					
6.6 The patient with pericardial disease—diagnosis					
6.7 The patient with right heart dysfunction					
6.8 The patient with a cardiac tumour					
6.9 The oncology patient with cardiac dysfunction					
<b>7. Acute cardiovascular care</b>					
7.1 The patient with haemodynamic instability					
7.2 The patient post-cardiac arrest					
7.3 The critically ill cardiac patient					
7.4 The patient after a percutaneous cardiovascular procedure					
7.5 The patient after cardiac surgery					
7.6 The critically ill patient—end-of-life care					
<b>8. Prevention, rehabilitation, sports</b>					
8.1 Cardiovascular aspects in an athlete					
8.2 The patient with arterial hypertension					
8.3 The patient with dyslipidaemia					
8.4 The patient with diabetes					
8.5 The individual in primary prevention					
8.6 The cardiac patient in secondary prevention					
8.7 The patient participating in a structured cardiac prevention and rehabilitation programme					
<b>9. Other cardiovascular conditions</b>					
9.1 The patient with aortic disease					
9.2 The patient with trauma to the aorta or the heart					
9.3 The patient with peripheral artery disease					
9.4 The patient with thromboembolic venous disease					
9.5 The patient with pulmonary thromboembolism					
9.6 The patient with pulmonary hypertension					
9.7 The patient with adult congenital heart disease					
9.8 The pregnant patient with cardiovascular symptoms or disease					
9.9 The patient undergoing non-cardiac surgery					

observed assessment of clinical skills, and through formal and informal discussions between trainers and trainees.

We use the same principles for assessment as the established ESC Core Curriculum for Cardiology. These aims of EPA-based assessment are to:

- focus learning by providing clarity on training requirements;
- enhance learning by providing formative feedback on performance;
- assess trainees' actual performance in the workplace;
- ensure trainees are acquiring competencies at an appropriate rate;
- identify any requirements for targeted or additional training;
- provide evidence for decisions on progression through the training programme; and
- provide objective, summative evidence that trainees have met the curriculum standards during the training programme.

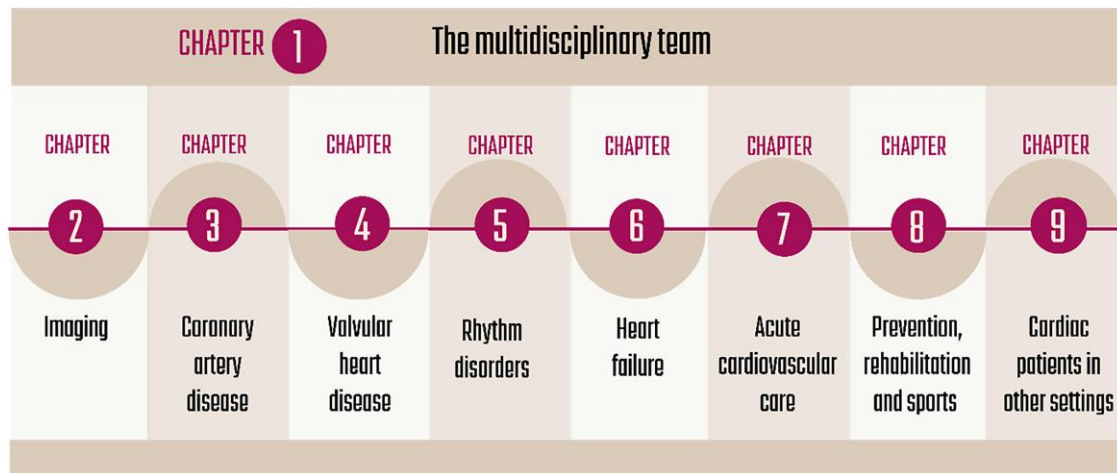


Figure 4 Chapters of the curriculum.

The Entrustable Professionals Activities for Nurses and Allied Professionals are given in Table 1. Each EPA is associated with the five levels of independence presented in Figure 4, from Observe through to Perform/Supervise.

## Chapter 1: The multidisciplinary team

This curriculum presents a framework to harmonize practice in cardiovascular care across the multidisciplinary team (MDT) amongst nurses and allied professionals globally. Nurses and allied professionals are united in their focus on patient-centred care but have diverse roles within each patient contact. To develop this curriculum, we have taken the approach of ensuring nurses and allied professionals understand the importance of each other’s role across the spectrum of patient care. Therefore, attainment of each EPA may vary depending on professional need. For example, a cardiac physiologist or sonographer may perform an echocardiogram at Level 5 of the framework, while a nurse might be expected to understand the rationale and know when to refer for echocardiogram, but not to undertake the EPA.

## 1.2. CanMEDS roles

These roles are based on the CanMEDS framework: <http://canmeds.royalcollege.ca/> <http://canmeds.royalcollege.ca/en/tools>. The roles of nurses and allied professionals described in Chapter 1 are all represented, to a variable extent, within each EPA of Chapters 2–9 but can also be assessed and taught individually. The core generic competencies outlined in Chapters 2–9 are suitable for instruction and certification. Some are core skills of the MDT and may be essential components of undergraduate or pre-registration courses; however, it is essential to practice these skills in the context of cardiovascular care. Members of the MDT will be expected to demonstrate communication, management, and leadership skills. Understanding ethical considerations in provision of care is essential to ensure safe and ethical practice. Principles of safety and quality practice are fundamentals of provision of equitable and effective healthcare, and the MDT needs to be able to audit and evaluate practice. All members of the MDT are required to demonstrate a commitment to lifelong learning and be able to critically appraise evidence to inform practice. Increasingly members of the MDT will participate and lead research studies. Understanding developing fields such as digital healthcare are fundamental, and part of professional development must include increased understanding of these fields.

Role	Description/competencies	Key competencies	Possible assessment methods	Examples of possible teaching method
Expert	As experts, members of the MDT integrate all of the CanMEDS roles applying clinical knowledge, skills, and professional values in provision of high-quality patient-centred care	(1) Practise within the defined scope of professional practice (2) Embed patient-centred care into every clinical interaction (3) Plan and perform procedures in accordance with clinical plan and defined by scope of professional practice (4) Support and develop ongoing management plans	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>Direct observation —Work-based assessment (WBA)</li> <li>Objective structured clinical exam (OSCE)</li> </ul>	<ul style="list-style-type: none"> <li>Lectures</li> <li>Reflection</li> <li>Simulation</li> <li>Clinical scenarios</li> <li>Ward-based teaching</li> <li>Individual coaching</li> </ul>

Continued

**Continued**

<b>Role</b>	<b>Description/competencies</b>	<b>Key competencies</b>	<b>Possible assessment methods</b>	<b>Examples of possible teaching method</b>
Communicator	As communicators, members of the MDT form relationships with patients and their families that facilitate the gathering and sharing of essential information for effective health care	(5) Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of healthcare quality and patient safety (1) Establish professional therapeutic relationships with patients and their families (2) Elicit and synthesize accurate and relevant information, incorporating the perspectives of patients and their families (3) Share healthcare information and plans with patients and their families (4) Engage patients and their families through shared decision-making in developing plans that reflect the patient's healthcare needs and goals (5) Document and share written and electronic information about the clinical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>Direct observation —WBA</li> <li>OSCE</li> </ul>	<ul style="list-style-type: none"> <li>Lecture</li> <li>Small group activity</li> <li>Coaching</li> <li>Presentations</li> <li>Communication courses</li> </ul>
Collaborator	As collaborators, members of the MDT work effectively in partnership with other healthcare professionals and patients to provide high-quality patient-centred care	(1) Work effectively with all members of the MDT (2) Work as a MDT to promote understanding, manage differences, and resolve conflicts (3) Facilitate smooth transition of care of the patient to other members of the MDT to facilitate continuity of high-quality and safe patient care	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>Direct observation —WBA</li> <li>OSCE</li> </ul>	<ul style="list-style-type: none"> <li>Lectures</li> <li>Reflection</li> <li>Simulation</li> <li>Clinical scenarios</li> </ul>
Leader	As leaders, members of the MDT engage with others to contribute to a vision of a high-quality healthcare system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers.	(1) Contribute to the improvement of healthcare delivery in teams, organizations, and systems (2) Engage in the stewardship of healthcare resources (3) Demonstrate leadership in professional practice	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>Direct observation —WBA</li> </ul>	<ul style="list-style-type: none"> <li>Lecture</li> <li>Small group teaching</li> <li>Self-directed learning</li> <li>Quality improvement courses</li> <li>Leadership in practice courses</li> </ul>
Health advocate	As health advocates, members of the MDT contribute their expertise and influence as they work with communities or patient populations to improve health. They work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilization of resources to effect change.	(1) Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment (2) Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>OSCE</li> <li>Portfolio</li> <li>Essays</li> <li>Direct observation —WBA</li> </ul>	<ul style="list-style-type: none"> <li>Lecture</li> <li>Reflection and discussion</li> <li>Small group learning</li> <li>Communication courses</li> <li>Leadership courses</li> </ul>
Scholar	As scholars, members of the MDT demonstrate a life-long commitment to excellence in practice through continuous learning and by teaching others, evaluating evidence, and contributing to scholarship.	(1) Engage in the continuous enhancement of their professional activities through ongoing learning (2) Teach students, junior colleagues, the public, and other members of the MDT (3) Integrate best available evidence into practice (4) Contribute to the creation and dissemination of knowledge and practices applicable to health	<ul style="list-style-type: none"> <li>Multi-source feedback</li> <li>Portfolio</li> <li>Direct observation —WBA</li> </ul>	<ul style="list-style-type: none"> <li>Lecture</li> <li>Reflection and Discussion</li> <li>Coaching</li> <li>Teaching scripts</li> <li>Train the trainer</li> <li>Health research methods</li> <li>Scientific writing courses</li> <li>Digital healthcare courses</li> </ul>

**Continued**

Role	Description/competencies	Key competencies	Possible assessment methods	Examples of possible teaching method
Professional	As professionals, members of the MDT are committed to the health and well-being of individual patients and society through ethical practice, high personal standards of behaviour, accountability to the professional body they are registered with, and society, and maintenance of personal health	<ol style="list-style-type: none"> <li>(1) Demonstrate a commitment to patients and patient-centred care by applying best practices and adhering to high ethical standards</li> <li>(2) Demonstrate a commitment to society by recognizing and responding to societal expectations in health care</li> <li>(3) Demonstrate a commitment to the appropriate professional standard by adhering to standards and participating in profession-specific registration</li> <li>(4) Demonstrate a commitment to personal health and well-being to foster optimal patient care</li> </ol>	<ul style="list-style-type: none"> <li>• Multi-source feedback</li> <li>• Portfolio</li> <li>• Direct observation —WBA</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Simulations</li> <li>• Ethics courses</li> </ul>

## Chapter 2: Imaging

### 2.1 Imaging of a patient using one or multiple imaging modalities

#### Description

Timeframe: from indication for using single or multiple cardiac imaging modalities to integration of reports in clinical context.

Setting: inpatient setting, outpatient setting, acute and elective situations.

Including: understanding basic result interpretation of multiple imaging modalities, e.g. echocardiography, computed tomography (CT) coronary, cardiovascular magnetic resonance (CMR), cardiac CT angiography, and nuclear cardiology scans.

Excluding: performing of multiple imaging modalities, e.g., echocardiography, CT coronary, CMR, Cardiac CT angiography, and nuclear cardiology scans.

#### CanMEDS roles

Communicator  
 Collaborator  
 Health advocate  
 Professional

#### Knowledge

- Describe the multiple imaging modalities that may be used to assess a CV patient.
- Understand which imaging modality may be best suited to particular CV conditions.
- Be able to recognize which imaging modality may be best used to assess:
  - Cardiac chamber size and wall thickness.
  - Measurement of left ventricular (LV) and right ventricular (RV) systolic function.

- LV and RV diastolic function.
- Native and prosthetic valves (stenosis and regurgitation). Suspected and definite infection of native and prosthetic valves.
- Coronary artery disease, including calcification of coronary arteries (calcium score); non-invasive angiography.
- The ischaemic myocardium, including regional wall motion abnormalities, scar, stunning, hibernation, perfusion, and viability.
- Myocardial and pericardial disease, including screening for cardiomyopathies.
- Cardiac tumours/masses.
- Aortic diseases.
- List common contraindications for each of the imaging modalities.
- Describe how best to inform a patient to undergo each of the imaging modalities.
- Describe how best to enable a patient to prepare to undergo each of the imaging modalities.
- Know which imaging modalities use radiation exposure.
- Know how to describe the radiation protection principles to the patient and their family/carers (where appropriate).
- Understand which results require immediate escalation.

#### Skills

- Recognize when results require immediate escalation.
- Ensure patient safety when preparing for imaging procedure.
- Be able to provide a clear and appropriate explanation of each imaging modality to the patient and their family/carers (where appropriate).

#### Attitudes

- Recognize the importance of the MDT in cardiac imaging.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy when preparing for imaging procedure.



**Assessment tools**

- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion

**Level of independence**

Level 2

- Multiple choice questionnaires (MCQs)
- Direct observation
- Work based assessment
- Clinical examination (OSCE)
- Case-based discussion

**Level of independence**

Level 2

## 2.2 Imaging of a patient using echocardiography

**Description**

Timeframe: from indication for using echocardiography until interpretation of generated reports.

Setting: inpatient setting, outpatient setting, acute, and elective situations.

Including: selection and patient preparation of a comprehensive transthoracic echocardiogram (TTE), a trans-oesophageal echocardiogram, and a stress echocardiogram.

Excluding: Complex valvular disease and complex congenital disease.

**CanMEDS roles**

- Communicator
- Collaborator
- Health advocate
- Professional

**Knowledge**

- Recognize echocardiography as the primary cardiac imaging modality including in acute and emergency situations.
- Understand the most appropriate use of transthoracic echocardiography, trans-oesophageal echocardiography, and stress echocardiography.
- List common contraindications to each of the imaging modalities.
- Describe how best to prepare/inform a patient to undergo a TTE.
- Describe how best to prepare/inform a patient to undergo a trans-oesophageal echocardiogram.
- Describe how best to prepare/inform a patient to undergo a stress echocardiogram.
- Understand which results require immediate escalation.

**Skills**

- Recognize when results require immediate escalation.
- Ensure patient safety when preparing for imaging procedure.
- Be able to provide a clear and appropriate explanation of each imaging modality to the patient and their family/family/carers (where appropriate).

**Attitudes**

- Recognize the importance of the MDT in cardiac imaging.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy when preparing for imaging procedure.

**Assessment tools**

## 2.3 Imaging of a patient using cardiac magnetic resonance

**Description**

Timeframe: from indication for cardiac magnetic resonance scans until interpretation of reports.

Setting: inpatient setting, outpatient setting, acute, and elective situations.

Including: patient preparation.

Excluding: performing of scans and interpretation of images.

**CanMEDS roles**

- Communicator
- Collaborator
- Health advocate
- Professional

**Knowledge**

- Understand the most appropriate use of cardiac magnetic resonance scans.
- List common contraindications to cardiac magnetic resonance scans.
- Describe how best to prepare/inform a patient to undergo a cardiac magnetic resonance scans.
- Understand which results require immediate escalation.

**Skills**

- Recognize when results require immediate escalation.
- Ensure patient safety when preparing for imaging procedure.
- Be able to provide a clear and appropriate explanation of cardiac magnetic resonance scans to the patient and their family/carers (where appropriate).

**Attitudes**

- Recognize the importance of the MDT in cardiac imaging.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy when preparing for imaging procedure.

**Assessment tools**

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion

**Level of independence**

Level 2

## 2.4 Imaging of a patient using cardiac computed tomography

### Description

Timeframe: from indication for cardiac CT scans until interpretation of reports.

Setting: inpatient setting, outpatient setting, acute, and elective situations.

Including: patient preparation.

Excluding: performing of scans and interpretation of images.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- Understand the most appropriate use of cardiac CT scans.
- List common contraindications to a cardiac CT scan.
- Describe how best to prepare/inform a patient to undergo a cardiac CT scan.
- Understand which results require immediate escalation.
- Demonstrate knowledge of local policies relating to ionizing radiations and how to reduce patients exposure.

### Skills

- Recognize when results require immediate escalation.
- Ensure patient safety when preparing for imaging procedure.
- Be able to provide a clear and appropriate explanation of cardiac CT scan to the patient and their family/carers (where appropriate).

### Attitudes

- Recognize the importance of the MDT in cardiac imaging.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy when preparing for imaging procedure.

### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion

### Level of independence

Level 2

Setting: inpatient setting, outpatient setting, acute, and elective situations.

Including: patient preparation.

Excluding: performing of scans and interpretation of images.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- Understand the most appropriate use of cardiac nuclear scans.
- List common contraindications to a cardiac nuclear scanning.
- Describe how best to prepare/inform a patient to undergo a cardiac nuclear scan.
- Understand which results require immediate escalation.
- Demonstrate knowledge of local policies relating to ionizing radiations and how to reduce patients exposure.

### Skills

- Recognize when results require immediate escalation.
- Ensure patient safety when preparing for imaging procedure.
- Be able to provide a clear and appropriate explanation of cardiac nuclear scan to the patient and their family/carers (where appropriate).

### Attitudes

- Recognize the importance of the MDT in cardiac imaging.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy when preparing for imaging procedure.

### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion

### Level of independence

Level 2

## Chapter 3: Coronary artery disease

### 3.1 The patient with symptoms suggestive of coronary artery disease

### Description

Timeframe: from first patient contact until end of life or exclusion of coronary artery disease or other cause.

Setting: outpatient setting, emergency department, inpatient setting.

Including: basic understanding of the structure and function of the adult human heart, aetiology of coronary artery disease, key features of initial assessment for suspected coronary artery disease, and the development, co-ordination, and on-going evaluation of a care plan

## 2.5 Imaging of a patient using nuclear techniques

### Description

Timeframe: from indication for cardiac nuclear scanning until interpretation of reports.

with tests and interventions, including psychosocial support and discharge planning.

Excluding: performing actual therapy of coronary artery disease.

#### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

#### Knowledge

- Describe the basic structure and function of the human heart.
- Compare and contrast modifiable and non-modifiable coronary risk factors.
- Recognize the common signs and symptoms suggestive of coronary artery disease and features that differentiate them from other cardiac or non-cardiac conditions.
- Describe key elements of a focused cardiac health assessment including history taking and physical assessment.
- Outline the patient pathway, including interventions and tests, required to monitor and diagnose suspected coronary artery disease safely and effectively.
- Recognize the potential emotional responses of a patient, and family/care, receiving a positive diagnosis of coronary artery disease.
- Recognize the importance of sleep and rest as an important aspect of healing.
- Describe key features of health information that people need to support them to self-manage symptoms, medicines, and lifestyle when discharged home.
- Understand the need to coordinate or care interventions and tests to allow for undisturbed sleep/rest periods.

#### Skills

- Communicate using a respectful and empathic approach to build rapport and provide support.
- Develop and document a care plan based on patient history and clinical examination which outlines care priorities.
- Record accurate clinical observations and recognize parameters for urgent escalation.
- Prepare patient for initial investigations [e.g. routine venous blood tests, arterial blood gases, chest X-ray (CXR), electrocardiogram (ECG), echocardiography].

#### Attitudes

- Recognize the patient's socioeconomic, ethnical, cultural, and religious background and the potential impact on care provision.
- Acknowledge the importance of holistic care that preserves patient dignity and meets physical and psychological needs.
- Recognize that pain is 'what the patient says it is' and should be assessed and managed to minimize suffering.
- Prioritize the involvement of patients and their family/family/carers in decisions about their healthcare.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Work-based assessment

- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 2

## 3.2 The patient with acute coronary syndrome

### Description

Timeframe: from diagnosis of an acute coronary syndrome (ACS) until effective treatment or referral.

Setting: outpatient setting, emergency department, inpatient setting.

Including: assessment by clinical history and physical examination, development, co-ordination, and on-going evaluation of a care/management plan with accurate monitoring of clinical condition and effective management of symptoms, performance, and interpretation of basic diagnostic modalities, provision of psychosocial support, discharge planning.

Excluding: performing interventional or surgical therapy.

### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

### Knowledge

- Describe the pathophysiology of ACS.
- Outline non-atherosclerotic causes of ACS.
- Define the universal definition of myocardial injury and infarction.
- Define the diagnostic criteria of ACS.
- Identify and be able to use validated ACS risk scores.
- Understand the role of different diagnostic techniques (including ECG, troponin, and other relevant biomarkers, echocardiography, and other imaging techniques).
- Describe the properties, effects, indications, contraindications and secondary effects of analgesics, anti-ischaemic drugs, anticoagulants, fibrinolytics, platelet inhibitors, statins, and other drugs administered to a patient with ACS.
- Discuss the role and timing of diagnostic coronary angiography and revascularization in the management of ACS.
- Describe the complication of ACS and subsequent management.
- Recognize which co-morbid conditions may impact on the course of ACS.
- Recognize the potential emotional responses of a patient and their family/carers (where appropriate).
- Recognize the importance of sleep and rest as an important aspect of healing.
- Describe key features of health information that people need to support them to self-manage symptoms, medicines, and lifestyle when discharged.

**Skills**

- Develop and document a care plan based on patient history and clinical examination which outlines care priorities.
- Record serial ECGs.
- Monitor a patient with ACS.
- Recognize arrhythmias due to ACS and their management.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Communicate diagnostic information in a way that the patient can understand.
- Ensure health care interventions and tests allow for undisturbed sleep/rest periods.
- Work with other members of the MDT to implement a co-ordinated pathway of patient centred care

**Attitudes**

- Recognize the patient's socioeconomic, ethnical, cultural, and religious background and the potential impact on care provision.
- Acknowledge the importance of holistic care that preserves patient dignity and meets physical and psychological needs.
- Recognize that pain is 'what the patient says it is' and should be assessed and managed to minimize suffering.
- Prioritize the involvement of patients and their carers in decisions about their healthcare.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs
- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 2

Communicator  
Collaborator  
Professional

**Knowledge**

- Know the epidemiology of and risk factors for chronic coronary syndromes.
- Know the molecular and cellular biology of chronic coronary disease.
- Know the essential features of normal coronary physiology.
- Describe the pathophysiology of myocardial ischaemia.
- Describe the events that precipitate angina.
- Discuss the prognosis of chronic coronary syndromes.
- Describe the indications for utilization of specific diagnostic procedures including ECG, ambulatory ECG, stress testing in its different modalities, echocardiography, cardiac CT angiography, cardiac magnetic resonance imaging (MRI), and invasive coronary angiography.
- Discuss the interpretation of invasive and non-invasive tests.
- Describe medical therapy of chronic stable angina.
- Consider the indications for revascularization by percutaneous coronary intervention (PCI) or coronary artery bypass graft and factors that favour one approach over the other.
- Discuss the importance of co-morbidities in the management and prognosis of chronic coronary syndromes.

**Skills**

- Communicate using a respectful and empathic approach to build rapport and provide support.
- Take a relevant history and perform an appropriate clinical examination.
- Evaluate patients and family/carers educational needs and provide individualized teaching or signpost to relevant resources.
- Identify risk factors for coronary artery disease, including lifestyle modification to optimize their cardiovascular health.
- Develop and document a care plan based on patient history and clinical examination which outlines care priorities.
- Support patients to self-manage appropriate therapies for secondary prevention and myocardial ischaemia.
- Identify and manage arrhythmias associated with chronic coronary syndromes.
- Work collaboratively with the patient and MDT to support evidence-based onward referral.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Safely manage cardiac emergency situations.
- Assess and manage co-morbidities with the help of other specialists.

**Attitudes**

- Prioritize the involvement of patients and their family/carers in decisions about their healthcare.
- Recognize the importance of shared decision-making, particularly when the outcomes of different treatment options are similar.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs

### 3.3 The patient with chronic coronary syndrome

**Description**

Timeframe: from diagnosis of chronic coronary syndrome until effective treatment or referral.

Setting: outpatient setting, emergency department, inpatient setting.

Including: performance and interpretation of basic diagnostic modalities, interpretation of additional diagnostic modalities, medical management, prevention, and indications for coronary angiography or revascularization strategies.

Excluding: performing interventional or surgical therapies.

**CanMEDS roles**

Health advocate

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 2

### 3.4 The patient undergoing coronary angiography

**Description**

Timeframe: from indication for use of coronary angiography until interpretation of generated reports.

Setting: inpatient setting, elective situations.

Including: managing the care of a patients undergoing elective diagnostic coronary angiogram and understanding of generated images and reports. Understanding of reports from other invasive diagnostic modalities.

Excluding: complex and acute situations (more complex cases would require support or referral).

**CanMEDS roles**

Communicator  
 Collaborator  
 Professional  
 Health advocate

**Knowledge**

- Discuss the indications for coronary angiography.
- Recognize the radiological anatomy of the heart, aorta, large vessels, coronary, femoral, radial, and brachial arteries.
- Compare and contrast the advantages and disadvantages of different sites, techniques of vascular access, and the ongoing care of puncture sites/closure devices.
- Outline the principles of radiation physics and safety regulations.
- Describe the management of angiography-related complications and their on-table management including, coronary spasm, acute coronary dissection, air and thrombotic embolus, coronary perforation, ventricular fibrillation, retroperitoneal haematoma, catheter kinking, acute stroke, vasovagal, and acute contrast reaction.
- Demonstrate awareness of post-procedural management.

**Skills**

- Develop and document a care plan which outlines care priorities including psychological support, pain management, puncture wound care, prevention of pressure/device-related tissue injury, and discharge advice.

- Facilitate shared decision-making and informed consent.
- Monitor vital signs, recognize complications, and manage life-threatening arrhythmias occurring during coronary angiography.
- Evaluate patients and family/carers educational needs and provide individualized teaching or signpost to relevant resources.
- Communicate diagnostic information in a way that the patient can understand.

**Attitudes**

- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.
- Recognize that pain is 'what the patient says it is' and should be assessed and managed to avoid suffering.

**Assessment tools**

- MCQs
- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 2

## Chapter 4: Valvular heart disease

### 4.1 The patient with aortic regurgitation

**Description**

Timeframe: from recognition of symptoms of aortic regurgitation through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of aortic regurgitation, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to aortic valve.

**CanMEDS roles**

Communicator  
 Collaborator  
 Health advocate  
 Professional

**Knowledge**

- List the causes of aortic regurgitation.
- Explain the pathophysiology of aortic regurgitation and its effect on the cardiovascular system.
- Describe the signs and symptoms of aortic regurgitation.
- Identify diagnostic modalities useful in assessing aortic regurgitation and their indications, contraindications, and limitations.

- List the indications for timing of follow-up of aortic regurgitation.
- Provide a brief overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with aortic regurgitation.
- Describe long-term outcomes for valve repair, prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand that pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact aortic root dilatation, associated coronary artery disease, and other co-morbidities on the management of aortic regurgitation.
- Explain guidance for endocarditis prophylaxis.

#### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in aortic regurgitation and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of aortic regurgitation within scope of practice.

#### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic regurgitation.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

3

## 4.2 The patient with aortic stenosis

### Description

Timeframe: from recognition of symptoms of aortic stenosis through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of aortic stenosis, use of diagnostic and use of medical therapy.

Excluding: performing interventions to aortic valve.

### CanMEDS roles

Communicator

Collaborator

Professional

Health advocate

### Knowledge

- List the causes of aortic stenosis.
- Explain the pathophysiology of aortic stenosis and its effect on the cardiovascular system.
- Describe the signs and symptoms of aortic stenosis.
- Identify diagnostic modalities useful in assessing aortic stenosis and their indications and limitations.
- List 'red flag' signs and symptoms of aortic stenosis that require urgent clinical review, assessment, and consideration for intervention.
- List the indications for timing of follow-up of aortic stenosis.
- Provide a brief overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with aortic stenosis.
- Describe long-term outcomes for valve repair, prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle and pharmacological management.
- Understand the pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact of aortic root dilatation, associated coronary artery disease and other co-morbidities on the management of aortic stenosis.
- Describe the lifestyle implications of aortic stenosis and any interventions undertaken including implications for pregnancy.
- Explain guidance for endocarditis prophylaxis.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in aortic stenosis and how it relates to the patient's haemodynamic status.

- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of aortic stenosis within scope of practice.

#### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and family/carer addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 3

## 4.3 The patient with mitral regurgitation

### Description

Timeframe: from recognition of symptoms of mitral regurgitation through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient and acute and critical care.

Including: recognition and assessment of symptoms of mitral regurgitation, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to mitral valve.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- List the causes of mitral regurgitation.
- Explain the pathophysiology of primary and secondary mitral regurgitation and its effect on the cardiovascular system.
- Describe the signs and symptoms of mitral regurgitation.
- Identify diagnostic modalities useful in assessing mitral regurgitation and their indications and limitations.
- List the indications for timing of follow-up of mitral regurgitation.

- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with mitral regurgitation.
- Describe long-term outcomes for valve repair or prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand that pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact of associated coronary artery disease and other co-morbidities on the management of mitral regurgitation.
- Describe the lifestyle implications of mitral regurgitation and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in mitral regurgitation and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and manage heart failure and arrhythmia as complications of mitral regurgitation.

### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in mitral regurgitation.
- Work in partnership with the patient and their partner or family/ carers addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

3

## 4.4 The patient with mitral stenosis

### Description

Timeframe: from recognition of symptoms of mitral stenosis through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient and acute and critical care.

Including: recognition and assessment of symptoms of mitral stenosis, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to mitral valve.

### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

### Knowledge

- List the causes of mitral stenosis.
- Explain the pathophysiology of mitral stenosis and its effect on the cardiovascular system.
- Describe the signs and symptoms of mitral stenosis.
- Identify diagnostic modalities useful in assessing mitral stenosis and their indications and limitations.
- List the indications for timing of follow-up of mitral stenosis.
- List 'red flag' signs and symptoms of mitral stenosis that require urgent clinical review, assessment, and consideration for intervention.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with mitral stenosis.
- Describe long-term outcomes for prosthetic mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand the pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact of associated coronary artery disease and other co-morbidities on the management of mitral stenosis.
- Describe the lifestyle implications of mitral stenosis and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in aortic stenosis and how it relates to the patient's haemodynamic status.

- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of mitral stenosis within scope of practice.

### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in mitral stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy. Work collaboratively within the MDT relevant to the patient and the aetiology of valve disease.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 3

## 4.5 The patient with tricuspid regurgitation

### Description

Timeframe: from recognition of symptoms of tricuspid regurgitation through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of mitral stenosis, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to tricuspid valve.

### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

### Knowledge

- List the causes of tricuspid regurgitation.
- Explain the pathophysiology of primary and secondary tricuspid regurgitation and its effect on the cardiovascular system.
- Describe the signs and symptoms of tricuspid regurgitation.



- Identify diagnostic modalities useful in assessing tricuspid regurgitation and their indications and limitations.
- List the indications for timing of follow-up of tricuspid regurgitation.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with tricuspid regurgitation.
- Describe long-term outcomes for prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand that pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact of co-existing valve disease, associated coronary artery disease, and other co-morbidities on the management of tricuspid regurgitation.
- Describe the lifestyle implications of tricuspid regurgitation and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

#### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in aortic stenosis and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of tricuspid regurgitation within scope of practice.

#### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in tricuspid regurgitation.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 3

## 4.6 The patient with tricuspid stenosis

#### Description

Timeframe: from recognition of symptoms of tricuspid stenosis through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of tricuspid stenosis, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to tricuspid valve.

#### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

#### Knowledge

- List the causes of tricuspid stenosis.
- Explain the pathophysiology of tricuspid stenosis and its effect on the cardiovascular system.
- Describe the signs and symptoms of tricuspid stenosis.
- Identify diagnostic modalities useful in assessing tricuspid stenosis and their indications and limitations.
- List 'red flag' signs and symptoms of tricuspid stenosis that require urgent clinical review, assessment, and consideration for intervention.
- List the indications for timing of follow-up of tricuspid stenosis.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with tricuspid stenosis
- Describe long-term outcomes for prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand the pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact of co-existing valve disease, associated coronary artery disease, and other co-morbidities on the management of tricuspid stenosis.
- Describe the lifestyle implications of tricuspid stenosis and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

#### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for

anti-coagulation, career, pregnancy, driving and other lifestyle factors.

- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in tricuspid stenosis and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of aortic stenosis within scope of practice.

#### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 3

## 4.7 The patient with pulmonary regurgitation

### Description

Timeframe: from recognition of symptoms of pulmonary regurgitation through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of pulmonary, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to pulmonary valve.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- List the causes of pulmonary regurgitation.
- Explain the pathophysiology of pulmonary regurgitation and its effect on the cardiovascular system.
- Describe the signs and symptoms of pulmonary regurgitation.
- Identify diagnostic modalities useful in assessing pulmonary regurgitation and their indications and limitations.
- List the indications for timing of follow-up of pulmonary regurgitation.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with pulmonary regurgitation.
- Describe long-term outcomes for prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle and pharmacological management.
- Understand that pathway for patients undergoing pulmonary regurgitation intervention and post-procedural care.
- Recognize the impact of co-existing valve disease, associated coronary artery disease and other co-morbidities on the management of pulmonary regurgitation.
- Describe the lifestyle implications of pulmonary regurgitation and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in pulmonary regurgitation and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of aortic stenosis within scope of practice.

### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT. Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 3

## 4.8 The patient with pulmonary stenosis

**Description**

- Timeframe: from recognition of symptoms of pulmonary stenosis through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of pulmonary stenosis, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to pulmonary valve.

**CanMEDS roles**

Communicator  
 Collaborator  
 Health advocate  
 Professional

**Knowledge**

- List the causes of pulmonary stenosis.
- Explain the pathophysiology of pulmonary stenosis and its effect on the cardiovascular system.
- Describe the signs and symptoms of pulmonary stenosis.
- Identify diagnostic modalities useful in assessing PS and their indications and limitations.
- List 'red flag' signs and symptoms of pulmonary stenosis that require urgent clinical review, assessment, and consideration for intervention.
- List the indications for timing of follow-up of pulmonary stenosis.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with pulmonary stenosis.
- Describe long-term outcomes for prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle, and pharmacological management.
- Understand the pathway for patients undergoing aortic valve intervention and post-procedural care.
- Recognize the impact aortic root dilatation, associated coronary artery disease, and other co-morbidities on the management of pulmonary stenosis.
- Describe the lifestyle implications of pulmonary stenosis and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

**Skills**

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in pulmonary regurgitation and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.
- Recognize and support the management of heart failure and arrhythmia as complications of pulmonary stenosis within scope of practice.

**Attitudes**

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

Direct observation  
 Work-based assessment  
 OSCE  
 Multi-source feedback  
 Portfolio  
 Case-based discussion

**Level of independence**

Level 3

## 4.9 The patient with multivalvular disease

**Description**

Timeframe: from recognition of symptoms of multivalvular disease through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of valve disease,

use of diagnostic, and use of medical therapy.  
Excluding: performing interventions to valve.

#### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

#### Knowledge

- Describe the spectrum of multivalvular disease.
- Provide a brief overview of the pathophysiology, haemodynamic disturbance, and interdependence of multivalvular disease.
- Describe the range of signs and symptoms related to multivalvular disease.
- Identify diagnostic modalities useful in assessing multivalvular and their indications and limitations.
- List the indications for timing of follow-up of multivalvular disease.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with multivalvular disease.
- Describe long-term outcomes for prosthetic vs. mechanical valve replacement and implications on follow-up, reintervention, lifestyle and pharmacological management.
- Understand that pathway for patients undergoing multivalvular intervention and post-procedural care.
- Recognize the impact aortic root dilatation, associated coronary artery disease and other co-morbidities on the management of multivalvular disease.
- Describe the lifestyle implications of multivalvular disease and any intervention undertaken.
- Explain guidance for endocarditis prophylaxis.

#### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in multivalvular disease and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.

#### Attitudes

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.

- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

Direct observation  
Work-based assessment  
OSCE  
Multi-source feedback  
Portfolio  
Case-based discussion

#### Level of independence

Level 3

## 4.10 The patient with a prosthetic valve

#### Description

Timeframe: from referral for intervention, post-intervention care and follow-up

Setting: outpatient, inpatient and acute and critical care

Including: initial assessment following valve implantation to ongoing assessment and follow-up

Excluding: performing interventions to valve

#### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

#### Knowledge

- Describe the pre and post-interventional management of the patient referred for prosthetic valve.
- Provide an overview of the haemodynamics associated with normal and abnormal function of prosthetic valves.
- Describe determinants of follow-up for patients with prosthetic valves.
- List lifetime complications associated with prosthetic valves.
- List the signs and symptoms associated with dysfunctional prosthetic valves.
- Describe the durability of prosthetic valves.
- Identify diagnostic modalities useful in assessing prosthetic heart valves and their indications and limitations.
- Provide an overview of the indications, benefits and risks of conservative, interventional, and surgical strategies and be able to explain these to the patient with prosthetic valves.
- Describe the use and management of anticoagulation regimes for prosthetic valves routinely, prior to interventions and in pregnancy.
- Explain guidance for endocarditis prophylaxis.

**Skills**

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in multivalvular disease and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.

**Attitudes**

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 3

## 4.11 The patient with endocarditis

**Description**

Timeframe: from recognition of symptoms of endocarditis through to diagnosis, follow-up, referral for intervention, and post-intervention care and follow-up.

Setting: outpatient, inpatient, and acute and critical care.

Including: recognition and assessment of symptoms of endocarditis, use of diagnostic, and use of medical therapy.

Excluding: performing interventions to valve.

**CanMEDS roles**

Communicator  
Collaborator

Health advocate

Professional

**Knowledge**

- Describe the causes of endocarditis and indications for antibiotic therapy, device/lead extraction, surgical intervention.
- Describe prognosis associated with endocarditis.
- List the signs and symptoms of endocarditis.
- Describe the complications of endocarditis including extra-cardiac complications.
- State the timing of blood culture and early initiation of appropriate antibiotic therapy in line with guidance from microbiology.
- Describe determinants of follow-up for patients with endocarditis.
- List lifetime complications associated with endocarditis and associated interventions.
- Identify diagnostic modalities useful in assessing endocarditis and their indications and limitations.
- Provide an overview of the indications, benefits, and risks of interventional and surgical strategies.
- Describe your role in optimizing the haemodynamic status of the person with endocarditis.
- State the rationale for urgent referral to specialist MDT.
- Explain guidance for endocarditis prophylaxis.
- Describe follow-up for patient with endocarditis.

**Skills**

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Participate in discussions with the MDT and the patient regarding type of valve intervention, weighing implications for anti-coagulation, career, pregnancy, driving, and other lifestyle factors.
- Support the patient in informed decision-making relating to follow-up, assessment, and interventions.
- Inform patients of indications for antibiotic prophylaxis.
- Recognize a change in condition and how it relates to the patient's haemodynamic status.
- Empower the patient with information to assist them in recognizing a change in symptoms and how to escalate care.

**Attitudes**

- Provide the patient with adequate time to describe their symptoms, concerns, and care goals.
- Utilize healthcare resources appropriately to ensure investigations required are appropriate to the ongoing monitoring, assessment, and interventions in aortic stenosis.
- Work in partnership with the patient and their family addressing gaps in information that facilitates decision-making.
- Involve patients in decisions relating to their care and support access to health and social care services as required.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- Direct observation
- Work-based assessment

- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 3

## Chapter 5: Rhythm Disorders

### 5.1 The patient with palpitations-diagnosis

#### Description

Timeframe: from first patient contact until end of life or exclusion of a specific rhythm disorder.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: initial assessment based on clinical history and physical examination.

Excluding: delivery of therapy.

#### CanMEDS roles

Communicator

Collaborator

Professional

Health advocate

#### Knowledge

- Describe the arrhythmic and non-arrhythmic causes of palpitation.
- Describe the electrocardiographic features of the different arrhythmias.
- Know the high-risk features on the resting ECG in a patient with a suspected arrhythmia.
- Know the significance of structural heart diseases in a patient presenting with a suspected arrhythmia.
- Discuss the role of the 12-lead ECG and different modalities (invasive and non-invasive) of heart rhythm monitoring in patients with palpitations.
- Discuss the limitations of consumer devices for heart rate and rhythm monitoring.
- Outline the circumstances in which additional investigation, including echocardiography and blood testing, is appropriate for a patient with palpitation.

#### Skills

- Take a relevant history and perform an appropriate physical examination.
- Be able to recognize the common types of arrhythmia from the 12-lead ECG, including
  - atrial fibrillation (AF),
  - ventricular tachycardia (VT),
  - ventricular fibrillation,
  - 1st degree heart block,
  - 2nd degree heart block,

- complete heart block.

- Be able to describe electrocardiographic monitoring options including 12-lead electrocardiogram, Holter, patient activated, and implantable or wearable devices.

#### Attitudes

- Acknowledge the anxiety associated with palpitation, even when the cause is shown to be benign.
- Recognize that palpitation is an insensitive and non-specific symptom of an arrhythmia.
- Avoid over-investigation.
- Recognize that palpitation can be normal and that some rhythm disturbances are best managed with reassurance.
- Explain that self-monitoring devices are prone to over diagnosis and causing inappropriate anxiety.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion

#### Level of independence

Level 2

### 5.2 The patient with transient loss of consciousness

#### Description

Timeframe: from first patient contact until diagnosis of syncope and development of a management plan.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: initial assessment based on the clinical history, physical examination, ECG, further investigation.

Excluding: delivery of therapy.

#### CanMEDS roles

Health advocate

Communicator

Collaborator

Professional

#### Knowledge

- Define the terms transient loss of consciousness and syncope.
- List the common causes of transient loss of consciousness.
- Describe the clinical features of syncope and how they differ from other causes of transient loss of consciousness.
- Outline the diagnostic evaluation of a patient presenting with suspected syncope.
- Describe the management options including education and

reassurance, physical countermeasures, drug therapy, and device implantation for the different causes of syncope.

- Outline the national regulations on driving and high-risk activities.
- Describe the appropriate investigations for a patient with suspected syncope.
- Know the indications of syncope associated with a high risk of sudden cardiac death.

#### Skills

#### Attitudes

- Be aware of the lifestyle impact of recurrent syncope.
- Recognize that syncope can be a transient symptom, and not necessarily a disease.
- Recognize the importance of the MDT in the management of the patient.
- Interact co-operatively with the MDT. Help patients to understand that therapies are often ineffective.

#### Assessment tools

- MCQs
- Direct observation
- Case-based discussion

#### Level of independence

Level 2

- pharmacological control of ventricular rate—anti-arrhythmic drug therapy.

#### Skills

- Be able to take a relevant history and perform an appropriate physical examination.
- Analyse the ECG and monitoring devices to diagnose AF and differentiate it from other rhythm disorders.
- Use validated scores to assess the risks of thromboembolism and bleeding.
- Be able to prepare a patients for interventional procedures: catheter or AV node ablation; left atrial appendage occlusion.

#### Attitudes

- Recognize the impact on a patient's quality of life from symptoms and anxiety over anticoagulant therapy and invasive methods of management.
- Emphasize the over-riding importance of anticoagulant therapy for most patients.
- Explain the limitations and risks of anti-arrhythmic drug therapy.
- Acknowledge the importance of information and education to patients and family/carers.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Case-based discussion

#### Level of independence

Level 2

## 5.3 The patient with atrial fibrillation

### Description

Timeframe: from diagnosis until effective therapy of AF.

Setting: outpatient setting, inpatient setting, emergency department.

Including: investigation and assessment of underlying causes, stroke prevention, drug therapy for acute and long-term heart rate or heart rhythm control, cardioversion integrated care.

Excluding: performance of interventional procedures.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- Outline the epidemiology, pathophysiology, and prognosis of AF.
- Classify AF according to its causes, severity, and temporal pattern.
- Recognize the clinical and electrocardiographic features of AF.
- List the risk factors for stroke and bleeding.
- Describe the indications, contraindications, side effects, and complications of:
  - anticoagulant therapy,
  - rhythm vs. rate control therapy,

## 5.4 The patient with atrial flutter

### Description

Timeframe: from diagnosis until effective therapy of atrial flutter.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: investigation and assessment of underlying causes, acute and long-term rhythm management, stroke prevention, integrated care.

Excluding: performing interventional procedures.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- Describe predisposing conditions, and the epidemiology and pathophysiology of atrial flutter.

- Be able to differentiate between AF and atrial flutter.
- Describe the clinical features and electrocardiographic characteristics of atrial flutter.
- Explain how to assess the risk of atrial thrombosis and embolic complications.
- Discuss the indications, contraindications, side effects, and complications of atrial flutter.
- Describe appropriate Anticoagulant therapy and, when necessary, combination with antiplatelet therapy.
- Understand the pros and cons of rhythm vs. rate control therapy.

#### Skills

- Be able to describe how to take a relevant history and know how to perform an appropriate physical examination.
- Recognize atrial flutter on the ECG and differentiate it from other rhythm disorders.
- Assess the risks of thromboembolism and bleeding.

#### Attitudes

- Recognize the impact on a patient's quality of life from symptoms and anxiety over anticoagulant therapy and invasive methods of management.
- Emphasize the over-riding importance of anticoagulant therapy for most patients.
- Explain the limitations and risks of anti-arrhythmic drug therapy.
- Acknowledge the importance of information and education to patients and family/carers.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Case-based discussion

#### Level of independence

Level 2

Collaborator  
Health advocate  
Professional

#### Knowledge

- Outline the epidemiology and pathophysiology of SVTs.
- Explain the implications of co-existing structural heart diseases for management and on the outcomes of SVT.
- Discuss the complications associated with the different types of SVT.
- Discuss the differential diagnosis of wide-complex tachycardias.
- Outline the diagnostic procedures tailored to individual need.
- Understand the use of carotid sinus massage in the treatment of patients with SVT.
- Describe the risk of stroke in association with SVTs.

#### Skills

- Be able to describe how to take a relevant history and know how to perform an appropriate physical examination.
- Recognize SVT on the ECG and differentiate it from other rhythm disorders.

#### Attitudes

- Recognize the impact on a patient's quality of life from symptoms and anxiety over anticoagulant therapy and invasive methods of management.
- Acknowledge the importance of information and education to patients and family/carers.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Clinical examination (OSCE)
- Case-based discussion

#### Level of independence

Level 2

## 5.5 The patient with supraventricular tachycardia

### Description

Timeframe: from diagnosis until effective therapy of supraventricular tachycardia (SVT).

Setting: outpatient setting, inpatient setting, and emergency department.

Including: atrial tachycardia, atrioventricular re-entry tachycardia/Wolff Parkinson White syndrome.

Excluding: performing interventional procedures.

### CanMEDS roles

Communicator

## 5.6 The patient with ventricular arrhythmia

### Description

Timeframe: from diagnosis until effective therapy of ventricular arrhythmia, or life-long when appropriate.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: diagnosis and characterization; types of VT investigation.

Excluding: performing interventional procedures.

### CanMEDS roles

Communicator

Collaborator



Health advocate

Professional

### Knowledge

- Describe the different types of ventricular arrhythmia.
- Outline the epidemiology, pathophysiology, clinical features, and diagnosis of ventricular arrhythmias in patients with structurally normal and abnormal hearts.
- Outline the genetic conditions, including cardiomyopathies and ion channel disorders, associated with ventricular arrhythmias.
- Describe the clinical features and electrocardiographic criteria for the differential diagnosis of wide-complex tachycardias.
- Explain to a patient with ventricular arrhythmias in relation to high-risk occupations and competitive sports.
- Explain national regulations on driving (private and commercial) applying to patients with ventricular arrhythmias (and or a defibrillator).

### Skills

- Be able to describe how to take a relevant history and know how to perform an appropriate physical examination.
- Analyse the ECG and monitoring devices to diagnose the ventricular arrhythmia and differentiate it from other rhythm disorders.
- Assess the risk of sudden cardiac death in a patient with VT.
- Advise a patient on participation in high-risk occupation and competitive sports.

### Attitudes

- Recognize the impact on a patient's quality of life from symptoms and anxiety over anticoagulant therapy and invasive methods of management.
- Realize the implications to family/carers members of a patient with genetic diseases.
- Educate patients on the limitations and potential risks of anti-arrhythmic drug therapy.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- MCQs
- Direct observation
- Multi-source feedback
- Case-based discussion

### Level of independence

Level 2

long-term rhythm management, pacemaker implantation.

Excluding: performing pacemaker implantation.

### CanMEDS roles

Health advocate

Communicator

Collaborator

Professional

### Knowledge

- Describe the epidemiology, causes, diagnosis, and clinical features of bradycardia.
- List the common cardiovascular and other medicines that may cause or exacerbate bradycardia.
- Discuss the factors influencing the prognosis and risks associated with bradycardia.
- Describe the indications for temporary pacing and permanent pacemaker implantation.
- Describe the national regulations on driving (private and commercial) applying to patients with pacemakers.
- Know which drugs may cause bradycardia.
- Know what additional investigations may be required for a patient with bradycardia.

### Skills

- Be able to take a relevant history and know how to perform an appropriate physical examination.
- Analyse the ECG and monitoring devices to diagnose the bradycardia.
- Differentiate between different types of bradycardias.
- Manage patients presenting acutely with bradycardia.

### Attitudes

- Recognize patients' anxiety over the long-term consequences of pacemaker implantation.
- Acknowledge the importance of information and education to patients and family/carers.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- MCQs
- Direct observation
- Multi-source feedback
- Case-based discussion

### Level of independence

Level 2

## 5.7 The patient with bradycardia

### Description

Timeframe: from diagnosis until effective therapy of bradycardia.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: investigation and assessment of underlying causes, acute and

## 5.8 The patient with a cardiac ion channel dysfunction

### Description

Timeframe: presentation with symptoms to time of diagnosis and ongoing management.

Setting: outpatient, inpatient, and acute care.

Including: investigation and assessment, support of ongoing monitoring.  
Excluding: device implantation.

#### CanMEDS roles

Communicator  
Collaborator  
Leader  
Health advocate

#### Knowledge

- List the most common ion channel disorders.
- Recognize the genetics related to ion channel disorders.
- Describe the clinical presentation of:
  - Brugada syndrome,
  - long and short QT syndromes,
  - early repolarization syndrome,
  - catecholaminergic VT.
- List investigations required in the diagnosis and assessment of ion channel disorders.
- Explain pregnancy and post-partum risks and management of ion channel disorders.
- Describe importance of genetic screening.
- Explain the role of implantable cardioverter defibrillator (ICD) therapy in this patient group and risk stratification.
- Describe the basics of pharmacological management of ion channel disorders.
- Describe the lifestyle implications of an ion channel disorder including managing fever, driving, sports, contraception and pregnancy, over the counter, and prescribed medications and career.

#### Skills

- Utilize skills in history taking including family history and if within scope of practice undertake physical examination.
- Prepare the patient for investigations in the diagnostic and assessment phase.
- Perform ECG and refer information to appropriate clinician.
- Support the patient and their family through the process of genetic screening, providing advice and information as appropriate.
- Identify when patient presentation requires escalation, e.g. syncope, changes in rhythm when undertaking device monitoring, prolonged QT on ECG.
- Inform patients of importance of lifestyle modification, red flag symptoms, and discuss how you can support them.
- Support the patient in informed decisions related to cardiac implantable electronic devices including post-procedure care and lifestyle management.

#### Attitudes

- Understand the impact of ion channel disorders on the person including mental health.
- Work with the multi-disciplinary team to ensure best outcome for patients including electrophysiology, devices, genetics, obstetric specialists.
- Respect patients right to refuse or accept genetic referral or treatments.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.

- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 1

## 5.9 The patient with a pacemaker

### Description

Timeframe: presentation of symptoms to assessment, device implantation, and ongoing follow-up.

Setting: Inpatient, outpatient, acute care.

Including: assessment, investigation, management and monitoring of patient with a pacemaker.

Excluding: implantation or explantation of device.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- List the indications for a pacemaker.
- Describe the basic components and functions of a pacemaker.
- Provide a basic explanation of pacing modes.
- Describe complications of a pacemaker implantation both at time of procedure and device follow-up.
- Understand the impact of the pacemaker on procedures such as direct current cardioversion (DCCV), surgery, and security devices.
- Explain any lifestyle implications, e.g. driving, travel, pregnancy.
- Recognize indications for upgrade to cardiac resynchronization therapy.
- Be aware of the mechanism for pacemaker induced heart failure or valve dysfunction.
- Describe the monitoring of a pacemaker, including telemonitoring, and considerations at time of generator change.
- Understand the management of a pacemaker at end-of-life.

### Skills

- Carry out a relevant history and examination within scope of practice.
- Initiate the assessment or monitoring of bradyarrhythmia by ECG and refer abnormalities to a senior clinician.
- Recognize pacing rhythms on the ECG.
- Monitor pacemaker either in the outpatient setting or remotely within local guidance, escalation concerns to a senior clinician.
- Recognize clinical presentation suggestive of pacemaker dysfunction and escalate appropriately.

- Identify signs and symptoms indicative of device infection and escalate appropriately.
- Respond appropriately to generator end of life activation on pacemaker and refer to appropriate clinician for discussion about generator change or device upgrade.
- Recognize when a patient is approaching end-of-life and sensitively address any patient and family/carer concerns about pacemaker function at time of death and management afterward.

#### Attitudes

- Support patients with the concept and importance of lifelong follow-up.
- Acknowledge the challenges faced using in-person follow-up; adapt care to meet patient's needs if possible and safe.
- Actively support the patient in understanding the rationale for pacemaker and living with a pacemaker.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 1

## 5.10 The patient with an implantable cardioverter defibrillator

#### Description

Timeframe: presentation of symptoms to assessment, device implantation, and ongoing follow-up.

Setting: Inpatient, outpatient, acute care.

Including: assessment, investigation, management and monitoring of patient with an implantable cardioverter defibrillator.

Excluding: implantation or explantation of device.

#### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

#### Knowledge

- List the indications and relative contraindications for an ICD.
- Describe the basic components and functions of an ICD including pacing, anti-tachycardia pacing, and defibrillation.
- Describe complications of an ICD implantation both at time of procedure and device follow-up.
- Understand the impact of the ICD on procedures such as DCCV and surgery.

- Describe the effects of exposure to electromagnetic radiation.
- Explain any lifestyle implications, e.g., driving, travel, pregnancy, sports, and work.
- Recognize indications for upgrade to cardiac resynchronization therapy.
- Be aware of the mechanism for pacing induced heart failure or valve dysfunction.
- Describe the monitoring of an ICD, including telemonitoring, management of device shocks, and considerations at time of generator change.
- Understand the management of an ICD at end-of-life.

#### Skills

- Carry out a relevant history and examination within scope of practice.
- Initiate the assessment or monitoring of life-threatening arrhythmia by ECG and refer abnormalities to a senior clinician.
- Recognize pacing rhythms on the ECG.
- Monitor an ICD either in the outpatient setting or with telemonitoring within local guidance, escalation concerns to a senior clinician.
- Manage device activation.
- Recognize clinical presentation suggestive of ICD dysfunction and escalate appropriately.
- Identify signs and symptoms indicative of device infection and escalate appropriately.
- Respond appropriately to generator end of life activation on ICD and refer to appropriate clinician for discussion about generator change or device upgrade.
- Recognize when a patient is approaching end-of-life and sensitively address any concerns with the patient and family/carers about defibrillator deactivation.
- Recognize the need for defibrillator deactivation and management of device deactivation and management after death.

#### Attitudes

- Support patients with the concept and importance of lifelong follow-up.
- Acknowledge the challenges face with in-person follow-up and adapt care to meet the patient's needs if possible and safe to do so.
- Actively support the patient in understanding the rationale for an ICD and living with a pacemaker.
- Supportively and sensitively provide advice and care in the end-of-life management of the patient with an ICD.
- Recognize ethical considerations in end-of-life management.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 2

## 5.11 The patient with a cardiac resynchronization therapy device

### Description

Timeframe: presentation of symptoms to assessment, device implantation, and ongoing follow-up.

Setting: Inpatient, outpatient, acute care.

Including: assessment, investigation, management and monitoring of patient with a cardiac resynchronization therapy device.

Excluding: implantation or extraction of device.

### CanMEDS roles

Communicator  
Collaborator  
Health advocate  
Professional

### Knowledge

- List the indications and relative contraindications for a cardiac resynchronization therapy-pacemaker (CRT-P) or cardiac resynchronization therapy-defibrillator (CRT-D).
- Describe the basic components and functions of a CRT-P/CRT-D including pacing, anti-tachycardia pacing, and defibrillation.
- Describe complications of an cardiac resynchronization therapy (CRT) implantation both at time of procedure and device follow-up.
- Understand the impact of the CRT-P/CRT-D on procedures such as DCCV and surgery.
- Describe the effects of exposure to electromagnetic radiation.
- Explain any lifestyle implications, e.g., driving, travel, pregnancy, sports, and work.
- Identify signs and symptoms indicative of device infection and escalate appropriately.
- Recognize indications for upgrade to cardiac resynchronization therapy.
- Be aware of the mechanism for pacing induced heart failure or valve dysfunction.
- Describe the monitoring of an CRT-P/CRT-D, including telemonitoring, management of device shocks and considerations at time of generator change.
- Understand the management of a CRT-P or CRT-D at end-of-life.

### Skills

- Carry out a relevant history and examination within scope of practice.
- Initiate the assessment or monitoring of life-threatening arrhythmia by ECG and refer abnormalities to a senior clinician.
- Recognize pacing rhythms on the ECG.
- Monitor an CRT either in the outpatient setting or using telemonitoring within local guidance, escalation concerns to a senior clinician.
- Manage device activation.
- Recognize clinical presentation suggestive of CRT dysfunction and escalate appropriately.
- Identify signs and symptoms indicative of device infection and escalate appropriately.
- Respond appropriately to generator end of life activation of CRT

and refer to appropriate clinician for discussion about generator change or device downgrade.

- Recognize when a patient is approaching end-of-life and sensitively address any concerns about deactivation of defibrillator component, play your role in co-ordinating/carrying out device deactivation, and management after death.

### Attitudes

- Support patients with the concept and importance of lifelong follow-up.
- Acknowledge the challenges faced using in-person follow-up; adapt care to meet the patient's needs if possible and safe.
- Actively support the patient in understanding the rationale for an CRT-P/CRT-D and living with a device.
- Supportively and sensitively provide advice and care in the end-of-life management of the patient with a CRT-P/D.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 2

## 5.12 The patient with a subcutaneous implantable cardioverter defibrillator (S-ICD)

### Description

Timeframe: presentation of symptoms to assessment, device implantation, and ongoing follow-up.

Setting: Inpatient, outpatient, acute care.

Including: assessment, investigation, management and monitoring of patient with a subcutaneous implantable cardioverter defibrillator (S-ICD).

Excluding: implantation of device.

### CanMEDS roles

Communicator  
Collaborator  
Leader  
Health advocate  
Professional

### Knowledge

- List the indications and relative contraindications for a S-ICD.
- Describe the basic components and functions of a S-ICD.
- Describe complications of S-ICD implantation both at time of procedure and device follow-up.

- Understand the impact of the S-ICD on procedures such as DCCV and surgery.
- Describe the effects of exposure to electromagnetic radiation.
- Explain any lifestyle implications, e.g., driving, travel, pregnancy, sports, and work.
- Recognize indications for upgrade to cardiac resynchronization therapy.
- Describe the monitoring of a S-ICD, management of device shocks and considerations at time of generator change.
- Understand the management of an S-ICD at end-of-life.

#### Skills

- Carry out a relevant history and examination within scope of practice.
- Initiate the assessment or monitoring of life-threatening arrhythmia by ECG and refer abnormalities to a senior clinician.
- Recognize pacing rhythms on the ECG.
- Monitor a S-ICD either in the outpatient setting or remotely within local guidance, escalation concerns to a senior clinician.
- Manage device activation.
- Identify signs and symptoms indicative of device infection and escalate appropriately.
- Recognize clinical presentation suggestive of S-ICD dysfunction and escalate appropriately.
- Respond appropriately to generator end of life activation on S-ICD.
- Recognize when a patient is approaching end-of-life and sensitively address any concerns about defibrillator deactivation, play your role in co-ordinating/carrying out device deactivation and management after death.

#### Attitudes

- Support patients with the concept and importance of lifelong follow-up.
- Acknowledge the challenges face with in-person follow-up and adapt care to meet the patient's needs if possible and safe to do so.
- Actively support the patient in understanding the rationale for a S-ICD and living with a S-ICD.
- Supportively and sensitively provide advice and care in the end-of-life management of the patient with an S-ICD.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 2

## Chapter 6: Heart Failure

### 6.1 The patient with symptoms and signs of heart failure

#### Description

Time frame: from point of first patient contact to diagnosis or exclusion of heart failure (HF).

Setting: outpatient setting, inpatient setting, emergency department.  
Including: Initial assessment, formulation of a patient care plan, support, and information to patient and relatives.

Excluding: performing actual therapy of HF, advanced knowledge of rarer causes of the heart failure syndrome including genetic causes.

#### CanMEDS roles

Communicator  
Collaborator  
Scholar  
Professional

#### Knowledge

- Describe cardiac and non-cardiac causes of heart failure and the importance of identifying the cause.
- Define heart failure based on current ESC guidelines.
- Describe definitions of heart failure with reduced ejection fraction (HFrEF); heart failure with preserved ejection fraction (HFpEF), and heart failure with mid-range ejection fraction (HFmrEF).
- Define the epidemiology of HF.
- Describe the New York Heart Association classification of heart failure symptoms.
- Know the significance of diagnostic tests to aid the diagnosis of HF.
- Know common cut off values for diagnosis and assessment of HF [including biomarkers B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT-proBNP)] and echocardiography.
- Outline the circumstances in which additional investigation.
- Describe the presentation, assessment and management of common HF symptoms.
- Understand common co-morbid conditions in HF patients.

#### Skills

- Take a relevant history and perform an appropriate physical examination.
- Being able to explain the major diagnostic tests to patients and family.
- Being able to assess and monitor common symptoms and signs.
- Assist the patient with symptoms to be more comfortable.
- Support the patient to understand the diagnosis.
- Refer to cardiac rehabilitation.

#### Attitudes

- Understand the psychosocial effects experienced by the patient and their family.
- Understand the possible need for repetition of information on diagnosis.

- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

Level 3

## 6.2 The patient with heart failure with reduced ejection fraction and mildly reduced ejection fraction

#### Description

Time frame: From diagnosis and throughout the life course.

Setting: outpatient setting, inpatient setting, emergency department, intensive care, palliative care.

Including: diagnostic tests including ECG/telemetry, and indications for ICD or CRT.

Excluding: heart transplant, surgery and implantation of LV assist device.

#### CanMEDS roles

Communicator

Collaborator

Scholar

Professional

#### Knowledge

- Describe the cardiac and non-cardiac causes of HFrEF and HFmREF, epidemiology and clinical features.
- List the common reasons that may exacerbate symptoms.
- Discuss the factors influencing prognosis of HFrEF and HFmrEF.
- Understand key diagnostic tests including echocardiography, MRI, and biomarkers.
- Describe the New York Heart Association classification of heart failure symptoms.
- Describe evidence based treatment options for HFrEF and HFmREF including medication, device therapy, life style changes and self-care, exercise training, and advanced heart failure therapies.
- List the indications, contra-indications and common side effects of guideline directed heart failure therapies.
- List treatment goals.
- Describe symptom monitoring and symptom management.

#### Skills

- Perform a patient-centred clinical assessment.
- Interpret basic clinical assessment values [blood pressure (BP), heart rate, NTProBNP, echo].
- Formulate a care plan together with the patient and the MDT.

- Recognize the importance of an accurate diagnosis as the basis for further investigation and treatment.
- Provide patients and relatives with information to support adherence to pharmacological and self-care strategies.
- Support patients being referred for cardiac implantable electronic devices.
- Refer appropriately to the HF MDT and to relevant specialists.
- Accurately interpret and manage monitoring data and escalate appropriately to a more senior member of the HF team.
- Use appropriate PROMs and PREMs.
- Recognize acute decompensation.
- Discuss consequences of HF for daily life such as work, sexual function, travel.

#### Attitudes

- Understand the impact of HF diagnosis on patient and family.
- Recognize the importance of timely and clear communication.
- Acknowledge the different stages in the HF trajectory and support the core principles of palliative care across the trajectory.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

Level 3

## 6.3 The patient with heart failure with preserved ejection fraction

#### Description

Time frame: From diagnosis and throughout the life course.

Setting: outpatient setting, inpatient setting, emergency department, intensive care, palliative care.

Including: diagnostic tests including ECG/telemetry, ICD implantation.

Excluding: performance of advanced diagnostic tests.

#### CanMEDS roles

Communicator

Collaborator

Scholar

Professional

#### Knowledge

- Describe the cardiac and non-cardiac causes of HFpEF, epidemiology and clinical features.
- List the common reasons that may exacerbate symptoms.
- Discuss the factors influencing prognosis of HFpEF.

- Understand key diagnostic tests including echocardiography.
- Describe treatment options for HFpEF.
- List treatment goals.
- List the indications, contra-indications and common side effects of guideline directed heart failure therapies.
- Describe symptom monitoring and symptom management.
- Describe the role of comorbidities.

#### Skills

- Perform a patient-centred clinical assessment.
- Interpret basic clinical assessment values (BP), heart rate, BNP, NT-proBNP echo).
- Formulate a care plan together with the patient and the MDT.
- Recognize the importance of an accurate diagnosis as the basis for further investigation and treatment.
- Provide patients and relatives with advice on the rationale for HF therapies, support adherence and self-care strategies.
- Refer appropriately to the HF MDT and to relevant specialists.
- Accurately interpret and manage monitoring data and escalate appropriately to a more senior member of the HF team.
- Use appropriate PROMs and PREMs.
- Recognize acute decompensation.
- Discuss consequences of HF for daily life such as work, sexual function, and travel.

#### Attitudes

- Understand the impact of HF diagnosis on patient and family/carers.
- Recognize the importance of timely and clear communication and information material.
- Acknowledge the different stages in the HF trajectory and support the core principles of palliative care across the trajectory.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

Level 3

## 6.4 The patient with acute heart failure

#### Description

Time frame: from diagnosis until effective therapy of acute HF.

Setting: outpatient setting, inpatient setting, emergency department, intensive care.

Including: supporting the patient with diagnosis and ongoing care.

Excluding: surgical and interventional therapy, implantation of assist devices and ventilation.

#### CanMEDS roles

Communicator

Collaborator

Professional

Health advocate

#### Knowledge

- Recognize the signs, symptoms and urgency of the management of acute heart failure.
- Describe the diagnostic tools to support the diagnosis of acute heart failure.
- Describe indications, contraindications, actions, and side effects of the pharmacotherapy used for acute HF management.
- Understand indicators for optimal dosing of medications used in acute HF and the factors affecting individual response to drugs.
- Describe the pharmacological treatment in the palliative management of patients with HF at end of life.
- Describe the indication for continuous positive airway pressure and the clinical environment this should be initiated.
- List the advanced options for the management of acute heart failure and indications and local referral process.

#### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Recognize distress related to HF decompensation.
- Provide information on the treatment plan and seek to reduce anxiety.
- Identification of the patient and family needs.
- Ensure the patient is comfortable through measures such as positioning including sitting upright to support breathing.
- Maintain an accurate fluid balance.
- Explore with the patient their understanding of the cause of their symptoms.
- Prepare the patient for discharge acknowledging and ensure early follow-up post discharge

#### Attitudes.

- Understand the impact of acute HF on the patient and their family.
- Recognize the importance of timely information and appropriate educational resources.
- Understand the value of integrated care and working with the MDT.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

Level 3

## 6.5 The patient with cardiomyopathy

### Description

Time frame: from presentation to diagnosis and throughout life course.

Setting: outpatient setting, inpatient setting, emergency department, intensive care, palliative care.

Including: The cause and understanding the diagnosis of cardiomyopathy, including family history and need for family screening.

Excluding: surgical care and invasive interventions.

### CanMEDS roles

Communicator

Collaborator

Professional

Health advocate

### Knowledge

- Describe the epidemiology of cardiomyopathy and the different causes and implications for treatment.
- Using HF guidelines, delineate classifications of HF.
- Describe the importance of genetic screening and implication for family members.
- Understand the diagnostic tests for cardiomyopathy.
- List the indications, contra-indications and common side effects of guideline directed heart failure therapies.
- Be aware of specialist services for cardiomyopathy management and understand how to refer when appropriate.
- List indications for cardiac implantable electronic devices, surgery, and advanced heart failure therapies.
- Describe the lifestyle implications for patients with a cardiomyopathy including exercise, travel, family planning and work.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Help the patient to be more comfortable.
- Recognize the need to support access to information regarding the course and prognosis of cardiomyopathy and management options.
- Implement interventions and transferring data to an experienced member of the HF team.
- Perform a comprehensive identification of the patient's needs.
- Provide information to support adherence to pharmacological therapies and lifestyle advice.
- Refer as appropriate to other services such as social work.

### Attitudes

- Understand the anxiety associated with a diagnosis of cardiomyopathy.
- Recognize the importance of timely information and education.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation

- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

### Level of independence

Level 2

## 6.6 The patient with pericardial disease—diagnosis

### Description

Time frame: from presentation to effective management.

Setting: outpatient setting, inpatient setting, emergency department.

Including: managing symptoms of pericardial disease, awareness of management of tamponade.

Excluding: surgical management.

### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

### Knowledge

- Describe the signs and symptoms of pericardial disease.
- Understand what investigations are used to make diagnosis.
  - ECG
  - Echocardiography
  - Other cardiac imaging
  - Invasive investigations
- Discuss the treatment and management of pericardial diseases.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Recognize acute tamponade and escalate care urgently.
- Ensure the patient has appropriate analgesia and any other prescribed medications, e.g. antibiotics.
- Position the patient to minimize breathlessness:
  - Recognize signs of deterioration
  - Monitor vital signs 4 hourly
  - Support the patient with breathing exercises

### Attitudes

- Be able to support the patient and the family.
- Ensure clear communication.
- Work with the MDT to support early identification.
- Ensure the patient is comfortable.
- Be alert to signs of tamponade.



- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

Level 3

## 6.7 The patient with right heart dysfunction

### Description

Time frame: from presentation throughout the life course.  
 Setting: outpatient setting, inpatient setting, emergency department, intensive care, palliative care.  
 Including: evaluate and recognize the needs of patients and family/ carers identify needs and provide a professional support recommend evidence-based interventions in context.  
 Excluding: Interventional and surgical management.

### CanMEDS roles

Communicator  
 Collaborator  
 Professional  
 Health advocate

### Knowledge

- Describe the causes of right heart failure.
- Describe the common signs and symptoms and assessment of the patient presenting with right heart failure.
- Understand key diagnostic tests including ECG, BNP, NT-proBNP, and echocardiography.
- Describe treatment options and self-care strategies for right heart failure.
- Be aware of the role of respiratory disease, pulmonary hypertension (PH), and left-sided heart disease as a consequence of right heart failure.

### Skills

- Take a relevant history and undertake observations and examination within scope of practice.
- Prepare patient for initial investigations (e.g. routine venous blood tests, arterial blood gases, CXR, ECG, echocardiography).
- Formulate a care plan together with the patient and the MDT.
- Recognize the importance of an accurate diagnosis as the basis for further investigation and treatment.
- Refer appropriately to the HF MDT and where relevant to specialists in respiratory, PH, cardio-oncology, congenital heart disease.

- Accurately interpret and manage monitoring data and escalate appropriately to a more senior member of the HF team.
- Inform the patient of the treatment options available, indications and side-effects to support adherence and improve outcomes.
- Use appropriate PROMs and PREMs.

### Attitudes

- Understand the impact of right heart failure on the patient and their family.
- Accept and acknowledge patient views and feelings.
- Respect for the dignity and autonomy of the HF patient.
- Recognize that the patient is central to self-monitoring of symptoms.
- Understand the importance of timely provision of educational material.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

### Level of independence

Level 2

## 6.8 The patient with a cardiac tumour

### Description

Timeframe: from initial presentation until effective treatment or palliation.  
 Setting: outpatient, inpatient, emergency department, intensive care.  
 Including: monitoring and supporting a patient with a cardiac tumour.  
 Excluding: surgical setting, delivering radiotherapy, chemotherapy, or other oncological treatments.

### CanMEDS roles

Communicator  
 Collaborator  
 Scholar  
 Professional  
 Health advocate

### Knowledge

- Be aware of major types of cardiac tumours.
- List the diagnostic tools for the diagnosis and assessment of cardiac tumours.
- Understand the difference between benign and malignant cardiac tumours.
- List the main treatments for cardiac tumour.

**Skills**

- Undertake a relevant clinical history and physical examination.
- Prepare the patient for the following investigations and recognize abnormalities in the report that require escalation:
  - ECG
  - TTE
  - CXR
  - Trans-oesophageal echocardiography
  - Cardiac catheterization
  - Coronary angiography
  - Cardiac CT
  - Cardiac magnetic resonance (MR)
- Liaise with the MDT to form an appropriate care plan.
- Provide the patient and their family with relevant and timely information.
- Carry out appropriate cardiovascular monitoring and respond appropriately to findings.
- Include the palliative care team as required.

**Attitudes**

- Be aware of the adverse psychosocial effects on the patient and their family.
- Support the patient to maintain physical activity and refer to cardiac rehabilitation.
- Understand the importance of timely provision of educational material.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs
- Direct observation
- Case-based discussion
- Self-assessment

**Level of independence**

Level 1

## Professional

## Health advocate

**Knowledge**

- Describe the symptoms and signs of cardiac dysfunction in an oncology patient.
- Be aware of other causes for symptoms in an oncology patient.
- Describe the investigations that an oncology patient will have to explore cardiac dysfunction.
- Be aware of the treatment for cancer and how it can lead to cardiac dysfunction.
- Describe the cardiac treatment options for cardiac dysfunction in the oncology patient.

**Skills**

- Include history of oncology treatment in routine cardiovascular care.
- Provide timely communication to patient and their family and provide relevant educational resources.
- Work with the MDT to support the patient to minimize symptoms.
- Provide information on the therapies used to improve cardiac dysfunction in the oncology patient.
- Sensitively and with senior clinicians, discuss the impact cardiac dysfunction can have on ongoing oncology treatments.
- Conduct an assessment of anxiety and depression.
- Involve the palliative care team as necessary.

**Attitudes**

- Understand the psychosocial distress experienced by the patient and their family.
- Understand the importance of timely provision of educational material.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs
- Direct observation
- Case-based discussion
- Self-assessment

**Level of independence**

Level 1

## 6.9 The oncology patient with cardiac dysfunction

**Description**

Timeframe: from diagnosis until effective therapy of cardiac dysfunction in oncology patients and ongoing care as indicated.

Setting: outpatient setting, inpatient setting, and emergency department.

Including: understanding the cause of cardiac dysfunction due to cancer directly, its sequelae, or treatment and monitoring of medical therapy.

Excluding: interventional and surgical therapy.

**CanMEDS roles**

Communicator  
Collaborator

## Chapter 7: Acute Cardiovascular Care

### 7.1 The patient with haemodynamic instability

**Description**

Time frame: from first contact with the unstable patient until transition of care.

Setting: outpatient setting, emergency department, inpatient setting.

intensive care.

Including: assessment, investigation, management, and monitoring of patient with haemodynamic instability.

Excluding: during interventional and surgical procedures.

#### CanMEDS roles

Communicator

Collaborator

Leader

Scholar

Professional

#### Knowledge

- Describe the principles and processes required to develop and evaluate a comprehensive, patient centred, plan of care for a haemodynamically unstable patient.
- Describe the pathophysiology, clinical, haemodynamic and laboratory findings of cardiogenic, hypovolaemic and septic shock.
- Describe the principles of treatment of hypotension in a patient with cardiogenic shock, massive pulmonary embolism, pericardial tamponade, RV infarction, and hyper trophic obstructive cardiomyopathy.
- Identify haemodynamic and physical parameters and recognizes a haemodynamically deteriorating patient.
- Identify the limitations and complications of invasive and non-invasive monitoring and characteristic findings of haemodynamic instability.
- Describe abnormal arterial blood gas (ABG) results and the indications for oxygen supplementation.
- Identify the difficulty of good communication, describe the barriers and facilitators that exist in an acute care setting, and what can be done to help develop trust with patients and their families.
- Identify relevant clinical guidelines and consider how these might be implemented in clinical practice.

#### Skills

- Demonstrate the ability to prepare the patient, environment and equipment required to establish venous and/or arterial access, non-invasive (BP) and invasive monitoring (pulmonary wedge pressure).
- Demonstrate the ability to correctly prepare the patient, environment and equipment for cardiac examinations and cardiac interventions.
- Demonstrate the ability to provide safe, effective, and compassionate nursing care reflected in accurate documentation for patients undergoing interventions and invasive and non-invasive diagnostic tests.
- Assist in care of unstable patients with arrhythmias, hypertension, and hypotension.
- Recognize normal ranges of physiological parameters and distinguish between those that are normal, abnormal, and life-threatening, and take appropriate action in response to alterations.
- Demonstrate the safe administration of cardiac/pain medications, managing intravenous infusion therapies of haemodynamic supportive medications.
- Assists with obtaining an ECG, laboratory tests, and assessment of the results intervening when needed.
- Informs the patient and family about the planned treatment and all

procedures, explaining the condition and why it is occurring in an understandable way.

#### Attitudes

- Demonstrates team ethics and good communication during the patient's entire hospitalization.
- Works effectively as a member of a MDT to promote effective communication to optimize symptom management.
- Provides regular and up to date information to the patient and family in an unhurried manner.
- Maintains patient privacy, dignity, and confidentiality.
- Accept and acknowledge patient and family views and feelings.
- Communicate in a consistent way using terms that can be easily understood.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

2

## 7.2 The patient post-cardiac arrest

#### Description

Timeframe: from time of return of spontaneous circulation until transition of care.

Setting: pre-hospital setting, emergency department, inpatient setting, intensive care.

Including: assessment, investigation, management, and monitoring of patient after a resuscitated cardiac arrest including life-threatening arrhythmias, patient therapeutic hypothermia protocols respiratory, renal, and haemodynamic support.

Excluding: paediatric patients, advanced critical care expertise, extracorporeal life support.

#### CanMEDS roles

Communicator

Collaborator

Professional

#### Knowledge

- Understand the pathophysiology, clinical presentation, predisposing conditions, of cardiorespiratory arrest.
- Recognizes the peri-arrest arrhythmias of cardiorespiratory arrest and expected ECG findings.
- Demonstrates a working knowledge of the algorithms and guidelines of basic life support, including airway management, appropriate drug use defibrillation and vascular access.

- Identify the main drugs used for management of cardiac arrest, including the actions indications and contraindications.
- Explain the principal indications and application of target thermal control (therapeutic hypothermia) post-cardiac arrest.
- Describes the methods for neurological assessment.
- Identifies the recommendations for primary and secondary prevention for sudden cardiac death (SCD).
- Is aware of the basic legal and ethical issues relating to organ donation.
- Describe emotional and coping responses after cardiac arrest and interventions to support emotional and spiritual well-being.

#### Skills

- Recognizes signs and symptoms of impending cardiac arrest.
- Recognize and manage emergencies; seek assistance appropriately.
- Accurately measure and document physiological parameters and take appropriate action in response to alterations in physiological parameters.
- Starts resuscitation in a timely manner and demonstrate effective life support skills.
- Performs the set up and initiates infusion therapy with IV pumps.
- Assesses patients' neurological status (Glasgow coma scale) and documents, updates any changes.
- Initiates appropriate hypothermia protocols in survivors of cardiac arrest when indicated.
- Support relatives witnessing an arrest, explain life-sustaining therapies and their expected outcome in a comprehensible manner. In addition, prepare relatives in expected outcomes post-discharge, including the risk of cognitive impairment and fatigue.

#### Attitudes

- Works effectively as a member of a MDT to promote effective communication to optimize patient management.
- Provides regular and up to date information to the patient and family in an unhurried manner.
- Display a non-judgemental attitude and respect the patient' or families' wishes, values, priorities, perspectives, and choice to consent to or refuse treatment, acknowledging patient and family views and feelings.
- Demonstrate the ability to establish a therapeutic relationship that places people at its centre and promotes physical comfort, emotional support for family and friends.
- Communicate to patient and family in a consistent way using terms that can be easily understood.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Case-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

2

## 7.3 The critically ill cardiac patient

### Description

Timeframe: from admission of a patient until transition of care.

Setting: emergency department, inpatient setting

Including: assessment, investigation, management and monitoring of patient with underlying cardiac disease, and its potential contribution to the critical state of the patient and non-cardiac organ failure/dysfunction.

Excluding: performing intubation and invasive ventilation.

### CanMEDS roles

Communicator

Collaborator

Leader

Professional

### Knowledge

- Discuss the criteria for admission and discharge from intensive cardiac care unit (ICCU)/cardiac intensive care unit (CICU).
- Describe the interventions that, when used together, significantly improve outcomes (SOPs) commonly used in ICCU/CICU.
- Summarize the principles of risk/benefit of interventions.
- Discuss common sources of error and factors contributing to critical incidents (during an acute change in patients' status).
- Summarize the principles of and prevention of hospital-acquired infections.
- Define reflective practice and consider how this process facilitates evidence-based care.

### Skills

- Recognize normal ranges of physiological parameters and distinguish between those that are normal, abnormal, and life-threatening.
- Accurately measure and document physiological parameters and take appropriate action in response to alternations in physiological parameter.
- Promotes interdisciplinary co-management of a critically ill patient.
- Adheres to guidelines and protocols.
- Obtain and utilize resources to gain information from trials and relevant professional societies.
- Apply clinical protocols where appropriate.

### Attitudes

- Display a non-judgemental attitude and respect the patient's wishes, values, priorities, perspectives, and choice to consent to or refuse treatment.
- Assess, evaluate and intervene according to clinical response of the patient.
- Prevent hospital-acquired infections and other complications by focusing on safety, participates in hospital quality and safety initiatives.
- Gives attention the physical and psychosocial consequences of critical illness for a patient and their family.
- Addresses relevant cultural, ethnic and socioeconomic backgrounds

as well as patient preferences and values in order to determine the best ongoing management and communication strategy.

- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Case-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

#### Level of independence

2

## 7.4 The patient after a percutaneous cardiovascular procedure

### Description

Timeframe: from immediate post-interventional care after percutaneous cardiovascular procedure until effective transition of care.

Setting: inpatient setting, ICU, and ICCU.

Including: assessment, management and monitoring of patient after routine post percutaneous interventional procedure.

Excluding: during interventional or surgical procedures.

### CanMEDS roles

Communicator

Collaborator

Leader

Professional

### Knowledge

- Understand normal and altered anatomy and physiology of coronary arteries and valves.
- Describes the procedural process and early complications of catheter-based techniques after a percutaneous procedure: electrophysiology (EP), PCI, transcatheter aortic valve implantation (TAVI).
- Explains the risks of complication in relation to percutaneous cardiovascular procedures and how to care for tamponade, excessive bleeding, arrhythmias.
- Describes types of angina and access site pain that may be expected after PCI.
- Describe the risk of major bleeding in patients treated with anti-thrombotic medications after percutaneous cardiovascular procedures.
- Explain the indications and contraindications and clinical pharmacology of anticoagulant, antiplatelet and fibrinolytic agents used after percutaneous cardiovascular procedures with a focus on dual antiplatelet therapy (DAPT).
- Describes how to care for radial and femoral access after percutaneous cardiovascular procedures.

- Describes how to assess the formation of a haematoma after a radial or femoral percutaneous cardiovascular intervention and interventions to control bleeding.
- Describes contrast induced nephropathy, who is at risk for its development.
- Describes recommended mobility allowed and after care for access site following a PCI.
- Describe what ECG changes that can occur after percutaneous cardiovascular procedures and which ECG changes are abnormal.

### Skills

- Evaluate for and manage patient haemodynamic instability following percutaneous cardiovascular procedures.
- Recognize, evaluate, and alleviate pain through the safe administration of pharmacological and non-pharmacological interventions.
- Demonstrates how to manage patients with acute bleeding from access site after percutaneous cardiovascular procedures.
- Demonstrate the ability to correctly prepare the patient, environment and equipment required to establish venous and/or arterial occlusion after percutaneous interventions.
- Assesses limbs post procedure and is aware of changes that happen with acute limb ischaemia.
- Identifies patients with allergic reaction to contrast, worsening renal function, symptoms of stroke post-intervention.
- Demonstrate the safe administration of anticoagulant, antiplatelet, and fibrinolytic medications.
- Recognize normal ranges of physiological parameters and distinguish between those that are normal, abnormal, and life-threatening taking appropriate action in response to alternations in physiological parameters.
- Choose relevant content for health information and deliver in a timely way in an accessible format in partnership with the patient and family, using interactive approaches for their health education post intervention.
- Collect feedback from patients and their families, using validated measures (PREMS and PROMs), to evaluate care experiences and inform service improvement.
- Utilize depression risk assessment when appropriate for patient management and counselling.

### Attitudes

- Inform the MDT, patient, and family members of the procedural outcome in a timely manner.
- Inform the patient and family members of the next steps of management and timing of discharge from the ICU/ICCU.
- Appreciate the importance of continuing to review knowledge of pathophysiological principles.
- Maintain patient privacy, dignity, and confidentiality.
- Accept and acknowledge patient and family views and feelings.
- Recognize the boundaries of your own scope of practice.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment

- MCQs
- Direct observation
- Case-based discussion

- Documentation competency based/skills records work sheets
- Self-assessment

### Level of independence

Level 2

## 7.5 The patient after cardiac surgery

### Description

Timeframe: from immediately after cardiac surgery until transition of care.

Setting: inpatient setting, ICU, and ICCU.

Including: assessment, management, and monitoring of postoperative adult cardiac patient recently operated.

Excluding: VAD and transplant patients, adult congenital heart disease patients.

### CanMEDS roles

Communicator

Collaborator

Leader

Professional

### Knowledge

- Discuss the indications for coronary angiography.
- Recognize the radiological anatomy of the heart, aorta, large vessels, coronary, femoral, radial, and brachial arteries.
- Compare and contrast the advantages and disadvantages of different sites, techniques of vascular access and the ongoing care of puncture sites/closure devices.
- Outline the principles of radiation physics and safety regulations.
- Describe the management of angiography related complications and their on-table management including, coronary spasm, acute coronary dissection, air and thrombotic embolus, coronary perforation, ventricular fibrillation, retroperitoneal haematoma, catheter kinking, acute stroke, vasovagal, and acute contrast reaction.
- Demonstrate awareness of post-procedural management.

### Skills

- Understand normal and altered anatomy and physiology of coronary arteries and valves.
- Describe the procedural process, risks, and early complications of cardiac, aortic, and vascular surgical procedures.
- Identify target treatment levels of anticoagulation/anti-thrombotic agents following cardiac surgery.
- Describe the indications, contraindications, and clinical pharmacology of anticoagulant, antiplatelet, and anti-fibrinolytic agents used after cardiac, aortic, and vascular surgical procedures.
- Describe expected/possible ECG and findings after cardiac surgery.

- Accurately measure and document physiological parameters and take appropriate action in response to changes of deterioration.
- Identify, recognize, evaluate and alleviate pain through the safe administration of pharmacological and non-pharmacological interventions.
- Describes how to assess surgical site and provide wound care.
- Identify strategies to prevent and manage arrhythmias and post-operative delirium.
- Describes normal transition of oxygenation and expected ABGs.
- Describes how a chest tube functions and normal amounts of drainage and type of drainage that is expected.
- Identify screening and outcome assessment tools designed to measure psychological status and health related quality of life.
- Recognize normal ranges of physiological parameters and distinguish between those that are normal, abnormal, and life-threatening following cardiac surgery.
- Demonstrate the ability to correctly prepare the patient, environment and equipment required to haemodynamically monitor the patient.
- Recognize the signs of a patient with haemorrhage following cardiac surgery.
- Assesses neurological signs and reports and documents any changes
- Recognizes when patient is having ECG changes and prepares for cardioversion/pacing.
- Frequently evaluates tissue perfusion by monitoring peripheral pulses, capillary refill, skin temperature, and colour.
- Use validated pain scales to assess and manage pain to promote patient comfort.
- Use validated scales to assess other common symptoms (such as dyspnoea, fatigue, appetite).
- Demonstrate the safe administration of cardiac pain and antithrombotic medications.
- Demonstrate effective life support skills.

### Attitudes

- Inform the team, patient, and family members of the outcome of the procedure in a timely manner.
- Inform the patient and family members of the next steps of management and timing of discharge.
- Informs patient and family of the possibility of a normal post-operative depression that should pass quickly.
- Consider the patient's ability to express pain and allow sufficient time to describe symptoms in their own words.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

### Level of independence

Level 2

## 7.6 The critically ill patient— end-of-life care

### Description

Timeframe: from recognizing a possible end-of-life situation until effective support for patient and family achieved.

Setting: inpatient setting.

Including: Assessment, management and support, of cardiac patient and their family in end-of-life care.

Excluding: end of life in children palliative in an ICCU.

### CanMEDS roles

Communicator

Collaborator

Leader

Professional

### Knowledge

- Describe the various settings in which patients and families may access palliative care.
- Describe the issues of device management (pacemaker, ICD, CRT) at end of patient's life.
- List approaches for screening and basic history taking of spirituality, religion, existential issues, and issues of meaning and purpose.
- Describe interventions to support emotional and spiritual well-being and communication techniques to provide psychosocial support.
- Discuss the 5 phases of grief Kübler-Ross.
- Describe issues involving cultural sensitivity and diversity that affect access to and utilization of hospice and palliative care.
- Discuss ethical principles and how they apply to end-of-life care.
- Describe the national laws that impact the withdrawal of advanced life-sustaining therapies.
- Understand the local institutional policies relevant to the process of withdrawal of advanced life-sustaining therapies.
- Describe the process and symptom burden of withdrawal of various advanced life-sustaining therapies.
- Describe common challenges for end-of-life care.

### Skills

- Recognize when further medical care is futile.
- Review the pharmacological, non-pharmacological, and procedural approaches (along with referral services) to manage pain and anxiety.
- Identifies how patient and family spiritual, religious, and existential beliefs and values affect medical decision-making and the provision of health care to each patient and family.
- Engage with palliative care processes.
- Facilitate discussions with a patient and/or family regarding goals of care and preparation for withdrawal of advanced LST.
- Recognize and manage adverse effects of medications, devices and other therapies.
- Recognize psychosocial and spiritual distress including anticipatory grief and bereavement responses from families.
- Make the death pronouncement in a sensitive, respectful way in the presence of the family in a proper environment.

- Adhere to evidence-based standards to ensure optimal end of life care.

### Attitudes

- Provide compassionate presence and listening skills.
- Value the key roles of collaboration with colleagues and maintenance of professional boundaries in managing end of life.
- Provide care in a way that promotes positive health related quality of life at end of life.
- Supports privacy, dignity and confidentiality for patient and family.
- Ability to understand the emotional needs, and concerns of patient and family.
- Appreciate the complex interplay between physical and other domains of suffering and the role of the palliative care team.
- Be open to working with spiritual providers of diverse backgrounds and belief systems.
- Appreciate the importance and time sensitivity in providing care for the imminently dying patient and their family.
- Acknowledge the individual experience of dying for each patient and family member.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Case-based discussion
- Entrustment-based discussion
- Documentation competency based/skills records work sheets
- Self-assessment

### Level of independence

Level 3

## Chapter 8: Prevention, rehabilitation, sports

### 8.1 Cardiovascular aspects in an athlete

#### Description

Scope: For every individual with CVD who identifies as an athlete.

Timeframe: from initial patient contact to formulating recommendations until regular follow-up  
Setting: inpatient setting, outpatient setting, and sports arena.

Including: assessment of status quo, identification of risk factors, knowledge of genetic testing using basic and advanced tools for investigation.

Excluding: performing interventional or surgical procedures.

#### CanMEDS roles

Communicator

Collaborator

Leader

Health advocate

Scholar

Professional

**Knowledge**

- Describe the effects of exercise and sports on cardiovascular structure and physiology
- Recognize the characteristics of the athlete's heart and explain how diagnostic criteria are influenced by high-intensity sport.
- Describe the diagnostic criteria and appropriate investigations in professional or recreational athletes with CVD.
- Describe the role of pre-participation screening for CVD in competitive and recreational athletes, pros and cons, and choice of investigations.
- Identify contraindications to exercise or competition, and the provision of appropriate medical certification.
- Describe the risk factors for and mechanisms of SCD during and after strenuous exercise.
- Describe the cause, mechanism, and frequency of SCD in athletes and in the population at large.
- Review the mechanisms and side effects of illicit performance-enhancing drugs.
- Describe how to make recommendations for professional and recreational sports participation according to patient pathophysiology.
- Identify the latest evidence-based guidelines for managing cardiovascular aspects in the athlete.

**Skills**

- Use recommendations for eligibility for participation in competitive sports.
- Explore patient expectations, values, and priorities.
- Recognize when results require immediate escalation.
- Be able to provide a clear and appropriate explanation of any investigations indicated to the patient and their family/carers (where appropriate).

**Attitudes**

- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Recognize the role of exercise and sport in the promotion of mental and physical health.
- Consult athletes with cardiac disease regarding career decisions.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

**Level of independence**

Level 3

## 8.2 The patient with arterial hypertension

**Description**

Scope: For every individual with arterial hypertension.

Timeframe: from diagnosis until effective treatment of hypertension.

Setting: inpatient setting, outpatient setting, emergency department and community-based settings Including: identification of causes and differential diagnosis of hypertension, identification of diagnostic modalities, preparation for diagnostic modalities, identification of core medical therapies, and lifestyle measures.

Excluding: prescription of pharmacological therapies, performing interventional or surgical procedures.

**CanMEDS roles**

Communicator

Collaborator

Leader

Health advocate

Scholar

Professional

**Knowledge**

- Define hypertension.
- Discuss how to diagnose hypertension from office measurement, home measurement and ambulatory BP measurement.
- Describe the pathophysiology of hypertension.
- Describe how to differentiate primary from secondary hypertension.
- Describe the types of hypertension and potential organ damage.
- Explain the use of investigations to diagnose the cardiac complications of hypertension.
- Describe the BP targets for antihypertensive treatment according to age and other risk factors.
- Describe non-pharmacological approaches to lowering BP (e.g. lifestyle modification).
- Describe the pharmacological properties of the drugs used to treat hypertension, their indications, and side effects.
- Describe how to tailor antihypertensive treatment to the patient's age, sex, and co-morbidities.
- Define refractory hypertension.
- Describe the management of refractory hypertension.
- Outline the indications for interventional and surgical treatment in hypertensive patients
- Define malignant hypertension.
- Describe the management of malignant hypertension.
- Describe how to manage hypertensive emergencies.
- Describe the following evaluative modalities: comprehensive blood testing, renal function, proteinuria and microalbuminuria, diabetes screening, cardiac MR, vascular ultrasound, central BP assessment, ankle brachial index, funduscopy.
- Identify the latest evidence-based guidelines for managing hypertension.



**Skills**

- Obtain a relevant history.
- Measure and interpret BP obtained with manual and automatic office devices, and ambulatory and home BP monitors.
- Evaluate the global cardiovascular risk of a patient with hypertension using an appropriate risk score.
- Explore patient expectations, values, and priorities.
- Recognize when results require immediate escalation.
- Recognize when a patient should be referred to another speciality.
- Select the target BP according to the cardiovascular risk.
- Prepare a patient for the following diagnostic modalities: electrocardiogram, exercise ECG, echocardiography, vascular ultrasound, fundoscopy.
- Provide appropriate lifestyle advice to reduce global cardiovascular risk in a patient with hypertension.

**Attitudes**

- Identify hypertension as a major risk factor for CVD.
- Advocate for opportunistic screening and regular follow-up.
- Appreciate the systemic nature of hypertension and its health-related consequences.
- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Motivate the patient to maintain long-term compliance with antihypertensive therapy and lifestyle measures.
- Encourage the use of home BP monitoring using approved devices.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

**Level of independence**

Level 3

Excluding: prescription of pharmacological therapies, performing interventional or surgical procedures.

**CanMEDS roles**

Communicator  
 Collaborator  
 Leader  
 Health advocate  
 Scholar  
 Professional

**Knowledge**

- Describe how to diagnose the different forms of dyslipidaemia.
- Outline the physiopathology of dyslipidaemia and relation to initiation of atherosclerosis.
- Describe how to assess the cardiac and extracardiac complications of dyslipidaemia.
- Describe the targets for dyslipidaemia treatment.
- Describe the role of non-pharmacological approaches (e.g. diet).
- Describe pharmacological treatment: the indications, side effects, and pharmacological properties of the different lipid-lowering drugs.
- Describe how to assess and manage the side effects of treatment.
- Explain how to tailor treatment to the individual patient.
- Describe the management options for patients with intolerance to treatment.
- Describe common evaluation strategies for a patient with dyslipidaemia, including:
  - Comprehensive blood testing of triglycerides, high-density lipoprotein cholesterol low-density lipoprotein cholesterol, Apolipoprotein A1, Apolipoprotein B, Lp(a).
  - Screening for other associated risk factors such as diabetes.
  - Genetic testing and screening of relatives if there is suspicion of familial disease.
- Describe the following evaluative modalities: comprehensive blood testing, renal function, proteinuria and microalbuminuria, diabetes screening, cardiac MR, vascular ultrasound, central BP assessment, ankle brachial index, fundoscopy.
- Identify the latest evidence-based guidelines for managing individuals with dyslipidaemia.

**Skills**

- Obtain a relevant history (including family history).
- Evaluate the global cardiovascular risk of a patient with dyslipidaemia using an appropriate risk score.
- Explore patient expectations, values, and priorities.
- Recognize when results require immediate escalation.
- Recognize when a patient should be referred to another speciality.
- Select the appropriate lipid target for treatment according to the cardiovascular risk.
- Provide appropriate lifestyle advice to reduce global cardiovascular risk in a patient with dyslipidaemia.

**Attitudes**

- Recognize dyslipidaemia as a major risk factor for CVD.
- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Advocate for opportunistic screening and regular follow-up.

## 8.3 The patient with dyslipidaemia

**Description**

Scope: For every individual with dyslipidaemia.

Timeframe: from diagnosis until effective treatment of dyslipidaemia.

Setting: inpatient setting, outpatient setting, emergency department and community-based settings Including: identification of causes and differential diagnosis, identification of diagnostic modalities, preparation for diagnostic modalities, identification of core medical therapies, and lifestyle measures.

- Motivate the patient to maintain long-term compliance with lipid-lowering therapy and lifestyle measures.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

#### Level of independence

Level 3

## 8.4 The patient with diabetes

#### Setting

Scope: for every individual living with diabetes.

Timeframe: from diagnosis until effective treatment of a cardiovascular problem in a patient with diabetes.

Setting: inpatient setting, outpatient setting, emergency department and community-based settings.

Including: identification of causes and differential diagnosis, identification of complications, identification of diagnostic modalities, preparation for diagnostic modalities, identification of core medical therapies and lifestyle measures.

Excluding: prescription of pharmacological therapies, performing interventional or surgical procedures.

#### CanMEDS roles

Communicator  
 Collaborator  
 Health advocate  
 Scholar  
 Professional

#### Knowledge

- Describe how to diagnose type 1 and type 2 diabetes, and potential diabetes.
- Outline the basic aetiology and pathophysiology of types 1 and 2 diabetes.
- Describe how to evaluate a patient with diabetes, including comprehensive blood testing.
- Describe the recognition, diagnosis, and assessment of cardiac complications.
- Describe the recognition, diagnosis, and assessment of extracardiac complications.
- Describe the non-pharmacological treatment of diabetes.
- Describe the pharmacology of drugs used to treat diabetes: their indications, side effects, and potential for unwanted cardiovascular effects.

- Describe the prevention and treatment of hypoglycaemia in a cardiac patient with diabetes.
- Outline the continuum from impaired glucose metabolism to overt diabetes that ultimately may become insulin-dependent.
- Describe the following evaluative modalities: comprehensive blood testing, stress echocardiography, vascular ultrasound, fundoscopy.
- Identify the latest evidence-based guidelines for managing individuals with diabetes.

#### Skills

- Obtain a relevant history.
- Evaluate the global cardiovascular risk of a patient with diabetes using an appropriate risk score.
- Explore patient expectations, values, and priorities.
- Recognize when results require immediate escalation.
- Recognize when a patient should be referred to another speciality.
- Select the appropriate blood glucose and HbA1c targets for treatment according to the cardiovascular risk.
- Provide appropriate lifestyle advice to reduce global cardiovascular risk in a patient living with diabetes.

#### Attitudes

- Recognize diabetes as a major risk factor for CVD.
- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Advocate for opportunistic screening and regular follow-up.
- Motivate the patient and their family to maintain long-term compliance with diabetes treatment therapy and lifestyle measures.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

#### Level of independence

Level 3

## 8.5 The individual in primary prevention

#### Description

Scope: for every individual with known or suspected cardiovascular risk

Timeframe: From initial patient contact until formulating recommendations for primary prevention.

Setting: primary care setting, in-patient setting, out-patient setting, emergency department, community setting, workplace, virtual, residential care.

Including: baseline assessment, identification of single or multiple risk

factors and multi-morbidity.

Identification of individualized targets for CVD prevention using basic tools for investigation, lifestyle recommendations, guideline-directed medical therapy, referral, follow-up.

Excluding: performing specialist investigations or interventional or surgical procedures.

#### CanMEDS roles

Communicator

Collaborator

Leader

Health advocate

Scholar

Professional

#### Knowledge

- Demonstrate an understanding of strategies for the reduction of CV risk across the life course.
- Describe the priorities for population screening for cardiovascular risk.
- Describe the importance of lifestyle (smoking, diet, narcotics, alcohol, exercise) in CVD and its prevention.
- List the risks associated with smoking.
- Describe the treatment options for smoking cessation.
- Consider the risks associated with obesity.
- Describe the effect of different types of diet on metabolic profile and clinical outcome.
- Identify the protective components of diet.
- Consider the risks associated with a sedentary lifestyle and the benefits to be derived from exercise.
- Describe the difference between physical activity, exercise, and sports.
- Describe how to evaluate physical activity and targets for physical activity.
- Describe how to determine targets for body weight and nutrition.
- Discuss the emerging risk factors (social, economic, stress, depression, personality type).
- Describe how to evaluate cardiovascular risk for an individual patient and identify patients with potentially high risk (using appropriate tables).
- Describe how to develop recommendations (holistic approach) to prevent CVD in an individual patient, in particular elderly patients and those with diabetes, CKD, and cerebrovascular disease.
- List the investigations used to diagnose multifactorial risk profiles.
- Identify the latest evidence-based guidelines for managing individuals with multifactorial CV risk profiles.

#### Skills

- Obtain a personal and family history.
- Assess for cardiovascular risk factors.
- Explore patient expectations, values, and priorities.
- Perform a comprehensive CV risk assessment using appropriate risk calculators.
- Interpret scores in risk estimation.
- Recognize when referral is needed for additional tests, if necessary [blood tests, resting and exercise electrocardiography (ECG), cardiopulmonary exercise testing (CPET), CV imaging].
- Provide personalized lifestyle advice for smoking cessation, physical

activity and exercise, nutrition and diet, stress management, and psychological health.

- Participate as an MDT member, working collaboratively with general practitioners, nurses, dietitians, physiotherapists, sports scientists, psychologists, occupational therapists, pharmacists, and other professionals involved in CVD prevention.
- Apply effective communication and motivational skills to support the patient in making positive lifestyle and behaviour modifications.
- Communicate with family and social environment to provide support and enhance changes.
- Demonstrate core communication skills in making every contact count.
- Carry out brief interventions.
- Signposting and referral to appropriate preventive intervention opportunities/services.

#### Attitudes

- Adopt a non-judgemental attitude regarding individual lifestyle.
- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Recognize the importance of primary prevention in individuals, communities, and populations.
- Exemplify appropriate lifestyle in personal behaviour.
- Communicate to ensure a collaborative approach with general practitioners, health and social care practitioners, community services, etc.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

#### Level of independence

Level 3

## 8.6 The cardiac patient in secondary prevention

### Description

Scope: for every individual who can benefit from secondary prevention

Timeframe: from identifying a patient for secondary prevention to formulating recommendations until regular follow-up.

Setting: in-patient setting, out-patient setting, community setting, home-based setting, virtual.

Including: assessment of status quo and identification of risk factors, identification of target for secondary prevention using basic tools for investigation, non-pharmacological treatment, and medical therapy.

Excluding: Prescription of pharmacological therapies, performing

specialist investigations or interventional or surgical procedures, acute or unstable condition, acute settings.

#### CanMEDS roles

Communicator  
 Collaborator  
 Leader  
 Health advocate  
 Scholar  
 Professional

#### Knowledge

- Identify patients for secondary prevention.
- Describe optimal targets for secondary prevention (BP, lipids, diabetes, physical activity, body weight, nutrition).
- Describe how to establish a global strategy for reduction of CV risk in secondary prevention.
- Understand the pharmacology of drugs used in secondary prevention.

#### Skills

- Obtain a personal and family history.
- Assess for cardiovascular risk factors.
- Explore patient expectations, values, and priorities.
- Perform a comprehensive CV risk assessment using appropriate risk calculators.
- Interpret scores in risk estimation.
- Recognize when referral is needed for additional tests, if necessary [blood tests, resting and exercise electrocardiography (ECG), cardiopulmonary exercise testing (CPET), CV imaging].
- Provide personalized lifestyle advice for smoking cessation, physical activity and exercise, nutrition and diet, stress management, and psychological health.
- Participate as an interdisciplinary team member, working collaboratively with general practitioners, nurses, dietitians, physiotherapists, sports scientists, psychologists, occupational therapists, pharmacists, and other professionals involved in CVD prevention.
- Apply effective communication and motivational skills to support the patient in making positive lifestyle and behaviour modifications.
- Communicate with family and social environment to provide support and enhance changes.

#### Attitudes

- Adopt a non-judgemental attitude regarding individual lifestyle.
- Adopt a shared decision approach by actively engaging the patient in management decisions based on individual values, preferences, and associated conditions and co-morbidities.
- Exemplify appropriate lifestyle in personal behaviour.
- Communicate to ensure a collaborative approach with general practitioners, health and social care practitioners, community services, etc.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)

- Multi-source feedback
- Case-based discussion
- Documentation records

#### Level of independence

Level 3

## 8.7 The patient participating in a structured comprehensive cardiovascular prevention and rehabilitation programme

#### Description

Scope: for every individual who can benefit from a structured cardiovascular prevention and rehabilitation programme.

Timeframe: from identifying a patient in need of a cardiovascular rehabilitation programme and referral until follow-up after a structured programme.

Setting: in-patient setting, out-patient setting, community setting, home-based setting, virtual.

Including: identification of risk factors and resources (e.g. patient, other healthcare professionals), interpretation of reports from basic diagnostic modalities, motivational conversation with patient.

Excluding: performing specialist investigations or interventional or surgical procedures, acute or unstable condition, acute settings. Prescription of pharmacological therapies.

#### CanMEDS roles

Communicator  
 Collaborator  
 Health advocate  
 Scholar  
 Professional

#### Knowledge

- Describe the indications for a structured cardiovascular prevention and rehabilitation programme.
- Describe current evidence and expected benefits of comprehensive cardiovascular prevention and rehabilitation in a range of formats.
- Outline the main core components of comprehensive cardiovascular prevention and rehabilitation programmes.
- Outline the composition and relationships of the interdisciplinary cardiovascular prevention and rehabilitation staff.
- Describe how to perform a comprehensive assessment of cardiovascular risk factors (including lifestyle risk factors, psychosocial risk factors, medical risk factors, and determinants).
- Identify indications for further investigations based on assessment findings.
- Describe the values and limitations of diagnostic modalities for determining exercise capacity.
- Describe how to prescribe a comprehensive patient-centred rehabilitation programme that addresses all core components tailored to individual assessment findings.
- Identify the principles of counselling for secondary prevention.

- Describe the principles of health behaviour change and education management (empowerment, self-management, self-efficacy, adherence promotion).
- Discuss the new technologies and their use for remote monitoring, programme delivery, and education.
- Outline the role of the family and social support for CVD patients.
- Describe key assessment modalities (e.g. lifestyle-related risk factor scores, medical risk factor control, psychological health scores, psychosocial status, health-behaviour change status, ECG exercise testing, CPET, sub-maximal cardiorespiratory fitness tests, echocardiography)
- Describe the purpose of risk stratification using indicated tests.
- Identify the latest cardiovascular prevention and rehabilitation practice guidelines.
- Identify how to detect for clinical concerns and co-morbidities and refer as necessary.

#### Skills

- Obtain a relevant history.
- Effectively communicate the potential advantage of a rehabilitation programme with a patient and obtain their commitment to participate.
- Assess for patient preference to programme modality; ensuring timely referral and follow-up where indicated.
- Refer, communicate and collaborate with other specialists to provide a comprehensive prevention and rehabilitation programme that addresses all core components and achieves intensive risk factor control and long-term management.
- Explore patient expectations, values and priorities.
- Implement a family-centred shared decision-making approach.
- Apply adult learning, patient-driven and family centred approaches to health promotion interventions.
- Motivate a patient to ensure long-term adherence to lifestyle related changes and guideline-directed medical therapy (GDMT).
- Apply effective communication and behavioural change techniques (e.g. motivational interviewing and patient education).
- Organize the follow-up, links with general practitioners and/or cardiologists, and other health professionals.
- Recognize and treat emergency cases.

#### Attitudes

- Advocate rehabilitation as an essential component of cardiac care, especially in coronary artery disease and congestive HF patients.
- Recognize the importance of rehabilitation and secondary prevention for professional, personal and social life amongst patients with heart disease, the interplay of physical and psychological aspects of heart disease, and the positive influence of exercise on cardiovascular risk factors.
- Adopt a non-judgemental attitude regarding individual lifestyle choices.
- Demonstrate support, empathy, applied encouragement and collaboration to the patient and their family to enable and empower long-term self-management.
- Motivate patient to sustain long term adherence with lifestyle, psychological, and medical-related therapy.
- Actively involve the patient in shared decision-making to promote optimal self-management and long-term adherence to behaviour change.

- Advocate comprehensive CV prevention and rehabilitation programmes to include all high-risk patients.
- Recognize the importance of patient and family/carer education and the role of other professionals in rehabilitation.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.
- Lifestyle modification, through smoking cessation, nutritional, physical activity, and psycho-social counselling.
- Exercise prescription, exercise training structuring and supervision.
- Evaluation of cardiorespiratory performance.
- Initiation of guideline-directed medical therapy implementation.
- Understand behavioural change and self-management.
- Organization and optimization of a patient and family education programme.
- Organization of long-term follow-up.

#### Assessment tools

- MCQs
- Direct observation
- Clinical examination (OSCE)
- Multi-source feedback
- Case-based discussion
- Documentation records

#### Level of independence

Level 3

## Chapter 9: Other cardiovascular conditions

### 9.1 The patient with aortic disease

#### Description

Timeframe: presentation with signs and symptoms of aortic disease, assessment, establishment of effective treatment, rehabilitation, and on-going follow-up.

Setting: outpatient, inpatient, and acute care.

Including: assessment, investigation, management, and follow-up of the person with acute and chronic aortic disease.

Excluding: performing aortic intervention or surgery.

#### CanMEDS roles

Communicator  
 Collaborator  
 Health advocate  
 Professional

#### Knowledge

- Describe the anatomy and function of the aorta.
- List the signs and symptoms of aortic diseases.
- Demonstrate awareness of the aetiology, genetics, and pathophysiology of aortic diseases, including:
  - aneurysms of the aorta,

- dissection of the aorta,
- aortitis,
- aortic atheromatous disease,
- aortoiliac occlusive disease,
- genetic syndromes associated with aortic pathologies, e.g. Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers Danlos syndrome, Turners syndrome.
- List key questions required to elicit 'red flags' in the patient's history including obtaining a relevant family history.
- Classify the types of aortic dissection.
- Relate the clinical presentation to the underlying aortic disease.
- Describe the imaging modalities required in the diagnosis and monitoring of aortic disease.
- Understand the rationale for medical, interventional, and surgical strategies for managing aortic disease.
- Explain the follow-up required of aortic disease.
- Describe the MDT required in the management of aortic disease.
- Acknowledge the biopsychosocial impact of aortic disease and the associated monitoring and interventions for the patient and their family.
- Define your role as a professional in the management of aortic disease relevant to your setting.

#### Skills

- Recognize acute presentations of aortic disease.
- Carry out routine observations including assessment of peripheral pulses and four limb BP.
- Obtain a comprehensive family history and identify circumstances that require consideration and referral for genetic screening.
- Support the management of patients with aortic disease through timely assessment, observation, management.
- Prepare and inform the patient and family for investigations related to presentation.
- Prepare and inform the patient and family for interventions related to aortic disease.
- Recognize when to escalate care.
- Co-ordinate with the MDT members in the management and rehabilitation for patients with aortic disease and refer as appropriate.
- Provide foundation lifestyle advice to patients and families to support living well with aortic disease and refer to appropriate members of the MDT for specialist input, e.g. exercise, travel, sexual activity, pregnancy, genetics, psychological distress, ongoing follow-up, and possible reintervention.

#### Attitudes

- Acknowledge the urgency required in the assessment, diagnosis, and management of aortic disease.
- Advocate for patients to have equitable access to professionals and services to support living with aortic disease.
- Appreciate the role of education for patients and their families in managing presentation.
- Promote increased awareness of presentations and management of aortic disease for healthcare professionals to support early recognition of aortic disease and appropriate escalation of care.
- Recognize the importance of the MDT.

- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 2

## 9.2 The patient with trauma to the aorta or the heart

#### Description

Timeframe: presentation with trauma to the aorta or heart, treatment, and follow-up.

Setting: acute care, inpatient, and outpatient.

Including: assessment, investigation, management, and follow-up of the person with acute and chronic aortic disease.

Excluding: performing aortic intervention or surgery.

#### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

#### Knowledge

- Describe causes of trauma to the aorta and the heart including:
  - genetics associated with aortic disease,
  - cardiac contusion,
  - rupture or dissection of major vessels,
  - acute myocardial infarction.
- Awareness of the potential consequences of trauma to the aorta or heart e.g. hypotension, arrhythmia, circulatory collapse.
- Familiar with imaging modalities required in the assessment of trauma to the aorta or heart.
- Understands the aims of medical, interventional and surgical interventions.

#### Skills

- Carry out routine observations and adapt to the patient presenting with trauma to the aorta or heart.
- Obtain a relevant history of presentation and relevant medical, social and family history.
- Provide rationale for investigations (e.g. ECG, CXR, echo, CT) and escalate any concerns in the results.
- Support the initiation of treatment in a timely manner.
- Recognize change in patient condition and escalate in a timely manner.
- Communicate information to the patient and their family in a clear, concise manner.

- Co-ordinate the multi-disciplinary team relevant to the patients presentation and your role.

#### Attitudes

- Acknowledge the urgency required in the assessment, diagnosis, and management of trauma to the aorta or heart.
- Appreciate the importance of timely communication with the patient and family members.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 2

## 9.3 The patient with peripheral artery disease

### Description

Timeframe: from presentation with signs and symptoms of peripheral artery disease (PAD) to the assessment, management and monitoring of PAD.

Setting: outpatient and inpatient.

Includes: assessing a patient with PAD, identifying associated co-morbidities, implementing medical therapy and lifestyle changes, referring a patient to a specialist (e.g. diabetologist, interventional radiologist, vascular surgeon).

Excluding: performing interventional or surgical treatment.

### CanMEDS roles

Communicator  
 Collaborator  
 Leader  
 Health advocate  
 Scholar  
 Professional

### Knowledge

- List the risk factors for the development of PAD.
- Describe the techniques used to assess and diagnose PAD.
- Describe the lifestyle modifications and therapies available for the treatment of PAD.
- Describe the link between CVD, erectile dysfunction, and treatments.
- List indications for interventions to manage PAD.
- Recognize the signs of acute limb ischaemia.

### Skills

- Obtain a relevant history and within scope of practice carry out an appropriate physical examination including peripheral pulses.
- Prepare the patient for investigations related to diagnosis and assessment of PAD including ultrasound, X-ray, invasive, CR, or MRI angiography.
- Provide appropriate counselling related to lifestyle factors that cause or contribute to PAD and link with relevant service to support the patient in lifestyle change.

### Attitudes

- Understand the potential for systemic atherosclerotic complications in the patient with PAD.
- Provide lifestyle modification advice in a non-judgmental manner respecting the patients autonomy.
- Work collaboratively with the multi-disciplinary team to facilitate timely assessment, diagnosis, treatment, monitoring and behaviour change.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 2

## 9.4 The patient with thromboembolic venous disease

### Description

Timeframe: from presentation with symptoms to the assessment, diagnosis, treatment, and ongoing monitoring.

Setting: inpatient, outpatient and acute care.

Including: assessment, facilitating diagnostics, implementing treatment in line with care plan and secondary prevention of deep vein thrombosis (DVT) and pulmonary embolism (PE).

Excluding: Intervention or surgery.

### CanMEDS roles

Communicator  
 Collaborator  
 Health advocate  
 Professional

### Knowledge

- List the risk factors for the development of DVT and PE.
- Describe the clinical presentation of:
  - uperficial vein thrombosis,
  - VT,

- E.
- Describe the investigations required for the diagnosis of DVT and PE including Doppler and CT.
- Describe the treatments available for PE and any contraindications including:
  - anticoagulation,
  - thrombolysis,
  - embolectomy
- Understand the link between chronic PE and PH and indication for thrombo endarterectomy.
- Consider the implications for the patient with a diagnosis of thromboembolic venous disease.

#### Skills

- Undertake relevant history and assessment within scope of practice including routine observations.
- Prepare the patient for the following diagnostics including supporting the consent process. Recognize abnormalities in the report and escalate appropriately:
  - ECG
  - TTE
  - Transoesophageal echocardiogram (TOE)
  - CXR
  - Bloods including D-dimer and troponin
  - CT angiography
  - Pulmonary angiography
  - CT angiography
  - MR angiography
  - Ventilation perfusion scanning
- Recognize acute presentations of venous thromboembolism (VTE) and PE and initiate appropriate monitoring and treatments while escalating to a senior clinician.
- Counsel the patient on the indications and management of anticoagulation, supporting them to manage the regime.
- Provide the patient with 'red flag' symptoms of recurrence of DVT or PE and of adverse events related to anticoagulation regime.

#### Attitudes

- Ensure the patient and their family are supported with information about the disease, management plan, lifestyle implications, and follow-up.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

#### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

#### Level of independence

Level 1

## 9.5 The patient with pulmonary thromboembolism

### Description

Timeframe: from presentation with symptoms to assessment, diagnosis, management and follow-up.

Setting: inpatient, outpatient, and acute care.

Including: assessment, supporting the implementation of the diagnostic and treatment plan.

Excluding: Intervention or surgical management.

### CanMEDS roles

Communicator

Collaborator

Leader

Health advocate

Scholar

Professional

### Knowledge

- List the risk factors for PE.
- Describe the cardiovascular consequences of pulmonary thromboembolism.
- List the signs and symptoms of pulmonary thromboembolism and how this relates to haemodynamic compromise of pulmonary thromboembolism.
- Explain the role of D-dimer.
- List the diagnostics available for the diagnosis of pulmonary thromboembolism including: ECG, ABG, bloods (e.g. troponin), echocardiography, VQ-scan, pulmonary angiography.
- Discuss the management options for pulmonary thromboembolism and what the patient needs to know.
- Describe the preventative measure the patient should know for thromboembolic disease.

### Skills

- Obtain a relevant history and examination within scope of practice including routine observations.
- Within your role implement the management plan for the patient with pulmonary thromboembolism including ensuring the patient is informed throughout.
- Counsel the patient on the indications and management of anticoagulation, supporting them to manage the regime.
- Provide the patient with 'red flag' symptoms of recurrence of DVT or PE and of adverse events related to anticoagulation regime.

### Attitudes

- Support the prevention of pulmonary thromboembolism.
- Ensure the patient and their family are supported with information about the disease, management plan, lifestyle implications, and follow-up.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.



**Assessment tools**

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 1

## 9.6 The patient with pulmonary hypertension

**Description**

Timeframe: from patient presentation with symptoms to assessment, diagnosis, management, and follow-up.

Setting: inpatient, outpatient, and acute care.

Including: assessing patient with PH, implementing management plan, recognizing patients who require input from specialist PH centre.

Excluding: interventions.

**CanMEDS roles**

Communicator  
 Collaborator  
 Health advocate  
 Professional

**Knowledge**

- Define PH and demonstrate awareness of the different clinical classifications.
- Provide a basic overview of the aetiologies for PH.
- Describe the signs and symptoms that may point to PH as a cause for the patients presentation.
- List the co-morbidities associated with PH.
- List 'red flag' presentations for the patient with PH that require urgent escalation in care.
- Demonstrate awareness that there are different pharmacological treatments for PH.
- Understand there are medical, surgical, and interventional ways to manage PH.
- Describe abnormalities in routine clinical results that may be normal for the patient with PH.
- Understand that the patient will likely be an expert in their condition and listen to what they describe as normal for them.
- List complications of PH and recognize those that require urgent escalation in care.

**Skills**

- Obtain a relevant history and examination within scope of practice including routine observations.
- Prepare the patient for the following diagnostics including

supporting the consent process. Recognize abnormalities in the report and escalate appropriately:

- ECG
- 6-minute walk test
- Exercise ECG
- Cardiopulmonary exercise testing
- TTE
- TOE
- CXR
- Bloods including D-dimer, troponin, and arterial blood gases
- Pulmonary function tests
- Right and left heart catheterization
- CT angiography
- Pulmonary angiography
- CT angiography
- MR angiography
- Liver ultrasound
- Ventilation-perfusion-scanning
- Work within the management plan.
- Recognize when you need advice from a senior clinician.
- Support the patient and their family, recognizing the lifestyle implications of PH and the importance of facilitating expert advice on contraception and pregnancy, travel, genetics, and anticipatory care planning.
- Listen to the patient/family when they explain what is normal and not normal for them.
- Support palliative management and end-of-life care.

**Attitudes**

- Support the person to live with a life-limiting condition.
- Acknowledge your own limitations in the management of PH and escalate concerns early to a senior clinician.
- Listen to the patient and their family.
- Ensure the patient and their family are supported with information about the disease, management plan, lifestyle implications, and follow-up.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

**Assessment tools**

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

**Level of independence**

Level 1

## 9.7 The patient with adult congenital heart disease

### Description

Timeframe: presentation to adult service with congenital heart disease, assessment, establishment of effective treatment referral to expert centre, rehabilitation, and on-going follow-up.

Setting: outpatient, inpatient, and acute care.

Including: assessment, investigation, management, and follow-up of the person with acute and chronic presentations of congenital heart disease.

Excluding: performing aortic intervention or surgery.

### CanMEDS roles

Communicator

Collaborator

Health advocate

Professional

### Knowledge

- Understand foetal development and aetiology of congenital heart disease.
- Describe the basic anatomy of the heart, veins and great vessels, and major congenital malformations of these.
- Recognize that patients with congenital heart disease who have had interventions are not cured and require lifelong follow-up with timing relevant to their condition.
- Describe the most common congenital heart conditions and adjustments made to routine observations or assessments.
- Recognize 'red flags' in the presentation of patients with congenital heart disease that require urgent assessment, treatment, and communication with specialists in adult congenital heart disease.
- Demonstrate awareness of the lifestyle, social, and psychological implications of living with a congenital heart defect.
- Recognize which coronary heart disease conditions require expert input before non-cardiac surgery or management of co-morbidities.
- Recognize the increased risk of infective endocarditis.
- Describe abnormalities in routine clinical results that may be normal for the patient with congenital heart disease either due to previous surgical interventions or complications such as PH.
- Understand that the patient will likely be an expert in their condition and listen to what they describe as normal for them.

### Skills

- Obtain a relevant history and examination within scope of practice including routine observations.
- Alter routine observations to the patient with congenital heart disease relevant to their underlying condition and surgical interventions.
- Prepare the patient for the following diagnostics including supporting the consent process. Recognize abnormalities in the report and escalate appropriately:
  - ECG
  - 6-minute walk test

- Exercise ECG
- Cardiopulmonary exercise testing
- TTE
- TOE
- CXR
- Bloods
- Pulmonary function tests
- Right and left heart catheterization
- CT
- MRI
- Liver ultrasound
- Work within the management plan.
- Recognize when you need advice from a senior clinician.
- Recognize signs and symptoms of endocarditis and facilitate initial review and assessment.
- Recognize and manage complications of congenital heart disease such as heart failure, arrhythmia, thromboembolic events and cyanosis.
- Provide patients and relative with information on importance of long-term follow-up.
- Recognize the importance of transition from paediatric to adult care and the impact on the patient and their families.
- Provide advice on endocarditis prophylaxis.
- Support the patient and their family, recognizing the lifestyle implications of congenital heart disease and the importance of facilitating advice on contraception and pregnancy, career, driving, travel, genetics and anticipatory care planning.
- Listen to the patient/family when they explain what is normal and not normal for them.
- Support palliative management and end-of-life care.

### Attitudes

- Support the person to live with a life-limiting condition.
- Acknowledge your own limitations in the management of congenital heart disease and escalate concerns early to a senior clinician.
- Listen to the patient and their family.
- Ensure the patient and their family are supported with information about the disease, management plan, lifestyle implications, and follow-up.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 2

## 9.8 The pregnant patient with cardiovascular symptoms or disease

### Description

Timeframe: presentation with signs and symptoms of CVD in pregnancy, assessment, establishment of effective treatment, rehabilitation, and on-going follow-up.

Setting: outpatient, inpatient, and acute care.

Including: assessment, investigation, management, and follow-up of the person with acute and chronic aortic disease.

Excluding: foetal assessment.

### CanMEDS roles

Communicator

Collaborator

Leader

Health advocate

Scholar

Professional

### Knowledge

- Describe the physiological changes in pregnancy and the potential impact on a woman with CVD.
- Identify the modified World Health Organization classification of maternal cardiovascular risk in pregnancy and CVD that are moderate-high risk.
- Understand normal symptoms in pregnancy and list 'red flag' symptoms of CVD in pregnancy in women with or without known CVD prior to pregnancy.
- List the multi-disciplinary team members involved in the care of pregnant women
- Identify CV risk factors related to pregnancy.
- Describe why changes to pharmacological therapy during pregnancy and breast feeding requires specialist input.
- Explain the importance of preconception care and counselling and your role in that.
- Explain why oestrogen containing contraceptives are cautioned or contraindicated for some women with CVD.

### Skills

- Provide contraceptive advice to women of reproductive age with CVD.
- Identify a woman's CVD risk in pregnancy as low moderate or high and support access to advice regarding pregnancy.
- Prepare the patient for the following diagnostics including supporting the consent process ensuring balance of risk is considered for woman and foetus. Recognize abnormalities in the report and escalate appropriately:
  - ECG
  - TTE
  - CXR
  - Bloods
  - CT
  - MRI

- Recognize signs and symptoms of CVD in pregnancy, differentiating physiological and pathological and escalate care appropriately in patient with or without known CVD prior to pregnancy.
- Support meticulous anti-coagulation administration and monitoring in line with plan from pregnancy MDT.
- Support appropriate administration of pharmacological therapy in pregnancy and breastfeeding.
- Ensure drugs are not withheld without appropriate discussion with pregnancy MDT.
- Liaise with midwifery and obstetrics to support appropriate foetal monitoring.
- Ensure ongoing management of co-morbidities during pregnancy.
- Facilitate breastfeeding.
- Ensure appropriate post-pregnancy follow-up and access to further preconception counselling.
- Support access to psychological support if required.

### Attitudes

- Acknowledge your own limitations in the management of CVD in pregnancy/post-partum and escalate concerns early to a senior clinician.
- Listen to the patient and their family.
- Ensure the patient and their family are supported with information about the disease, management plan, lifestyle implications, and follow-up.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 1

## 9.9 The patient undergoing non-cardiac surgery

### Description

Timeframe: presentation with signs and symptoms of CVD in a patient without a known CV diagnosis, patients with CVD under routine follow-up, patients with CVD who present with a change in symptoms, prior to interventions, assessment of patients prior to non-cardiac interventions.

Setting: inpatient, outpatient, and acute care.

Including: prevention, assessment, and management of CVD in patients with or without a known CVD.

Excluding: intervention or surgical treatment.

### CanMEDS roles

Communicator

Collaborator  
Health advocate  
Professional

### Knowledge

- Understand the cardiovascular stress response to surgery.
- Describe the risk of cardiovascular complications of surgery for patients with CVD including infarction, arrhythmia, thromboembolism, and heart failure.
- List risk factors that increase risk of non-cardiac surgery including CVD risk and co-morbidities.
- Explain indication for pre-surgery evaluation of CVD including ECG, echo, CV stress testing, coronary angiography.
- Describe the importance of the involvement of the patient's CV team with non-cardiac surgical team in surgical planning.
- Understand the indications for non-cardiac surgery and support the patient in decision-making.
- Describe the importance of management of anticoagulation during the pre-, peri-, and post-operative phases.
- Describe the importance of evaluation of renal function in patients with CVD and implications for medical therapy and interventions.
- Highlight the importance of optimal recognition and management of co-morbidities, frailty, in the patient with CVD.

### Skills

- Use risk stratification tools in assessment of patient with CVD before surgery.
- Perform and interpret within scope of practice the non-invasive diagnostic tests before surgery:
  - ECG
  - Exercise ECG
  - Transthoracic echocardiography
  - CXR
  - Trans-oesophageal echocardiography
  - Vascular ultrasound screening of carotid arteries
  - Cardiac catheterization
- Follow clinical management plan for management of CVD and co-morbidities prior to surgery including management of anti-coagulation.
- Assess frailty in the patient undergoing non-cardiac surgery or in the management of CVD and co-morbidities
- Support appropriate follow-up post-surgery.
- Ensure provision of appropriate advice for patients and their families throughout the surgical pathway.
- Take opportunities to reduce CVD risk factors.

### Attitudes

- Support anticipatory care planning.
- Support the patient and their family throughout the assessment process.
- Recognize the importance of the MDT.
- Interact co-operatively with the MDT.
- Respect patient modesty and privacy.

### Assessment tools

- Direct observation
- Work-based assessment
- OSCE
- Multi-source feedback
- Portfolio
- Case-based discussion

### Level of independence

Level 2

**Conflict of interest:** The authors report that there are no conflicts of interest in relation to this work.

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