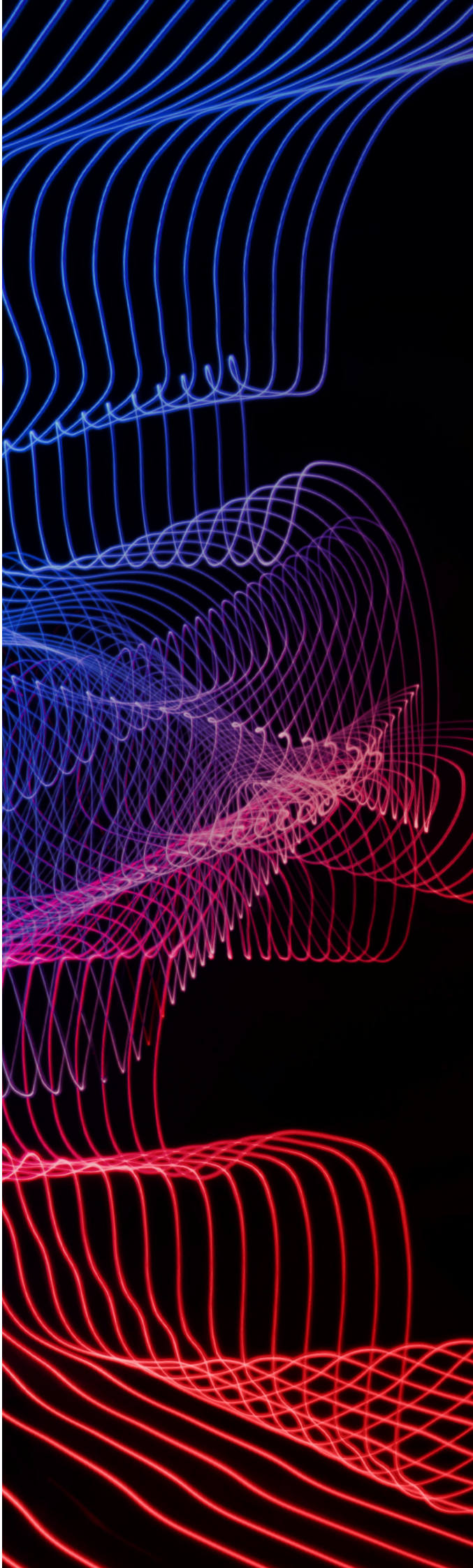
ANZSVS

Australian and New Zealand Society for Vascular Surgery

Vascular Surgery
Curriculum



Royal Australasian College of Surgeons

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Preface

We are very excited to invite feedback on the new Vascular Surgery SET Curriculum. This project is the product of two years development and consultation by the vascular training board curriculum design team.

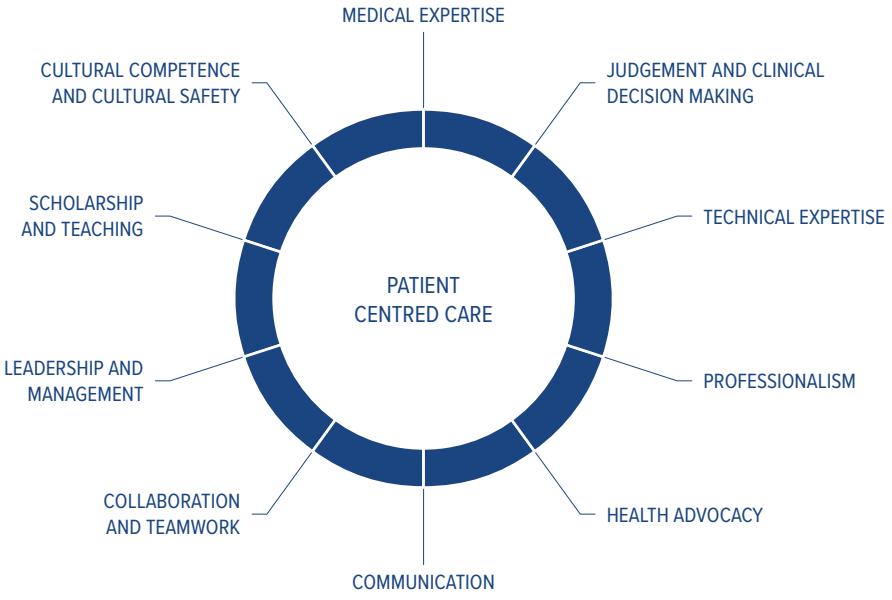
The remit of the curriculum design project was to:

1. Conduct a review of the existing vascular syllabus and teaching modules in the Vascular SET Program
2. Create a comprehensive competency-based curriculum that is linked to existing assessment methods and the RACS competencies
3. Develop an effective implementation and evaluation strategy including online videoconference tutorials oriented around the curriculum

During the initial development of the curriculum document, engagement and feedback has been sought from selected current vascular trainees, surgical supervisors, members of the ANZSVS, and vascular training examination boards. Further input is now sought from all members of the ANZSVS, ANZSVN and other specialty groups.

Until now, a comprehensive document outlining the core learning objectives and graduate competencies has not existed for vascular SET training. Vascular trainees and supervisors have relied on the vascular e-modules, textbooks, and past exam papers. In medical education terms, these methods may be considered a loose syllabus, with a list of topics to be covered by the end of training. This means that trainees and supervisors were missing guidance as to the depth of knowledge or skill needed for each stage of training (level of competence) and key milestones for assessing progression through training. A more defined and directive approach was required to ensure ongoing alignment of the vascular training program with the educational direction of RACS and to ensure accreditation of the SET program with the Australian Medical Council.

In 2020, RACS launched the updated Surgical Competence and Performance Guide, introducing the new competency of 'cultural competence and cultural safety', with competencies centred around patient-centred care. This vascular curriculum document links learning objectives to these ten competencies, recognising that becoming a competent and proficient surgeon involves attaining skills that are both technical (medical expertise, judgement and clinical decision making, technical expertise) and non-technical (leadership and management, health advocacy, professionalism, communication, cultural competency and safety, education and teaching, and collaboration and teamwork)



This newly developed curriculum document provides more specific guidance to trainees and supervisors on the knowledge and skills at different stages of the SET training program. It is intended that this document will help to monitor the progress of trainees though the training program and evaluate their suitability to become independent vascular surgeons towards the end of training. In contrast to time-based training models, it is recognised that in a competency-based training pathway, trainees may progress through stages at different rates, and some trainees will achieve competency at different stages than others. With this in mind, the curriculum document is divided into early, mid, and late stages of SET, rather than training years.

In recognition that competent vascular practice is founded on a strong understanding of the fundamental mechanisms of vascular disease, the curriculum is divided into two sections: knowledge and application. Each section covers themes that reflect contemporary vascular surgical practice. By necessity, this document defines the 'scope of practice' of a competent vascular surgeon and sets anticipated graduate outcomes of trainees who complete the SET program. Highly specialised, post-fellowship clinical skills are beyond the remit of this document and are not included. Just as vascular practice continues to evolve and change, this curriculum is intended to be a living document. We have deliberately avoided direct reference to specific clinical guidelines, references, and technology to ensure ongoing applicability as evidence and practice evolves. Periodic reviews of the document are planned, to ensure ongoing relevance. This curriculum will be implemented across all aspects of vascular surgical training, determining learning objectives in the vascular tutorials and skills course, and examination and assessment standards.

We hope that this curriculum will contribute to maintaining the excellent standards of training in both Australia and New Zealand and securing the future of our speciality. Please review it carefully and provide feedback using the survey available here.

Vascular Curriculum Design Team

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Introduction

The vascular surgical curriculum contains two sections:

1. Knowledge and Principles of Vascular Surgery
2. Vascular Surgery Competencies

Each topic within these sections is further divided into learning objectives related to Knowledge and Application. Each topic is not equally weighted, and some topics will have a greater emphasis in training and practice than others.

Learning objectives within each section are grouped according to the stage of SET training:

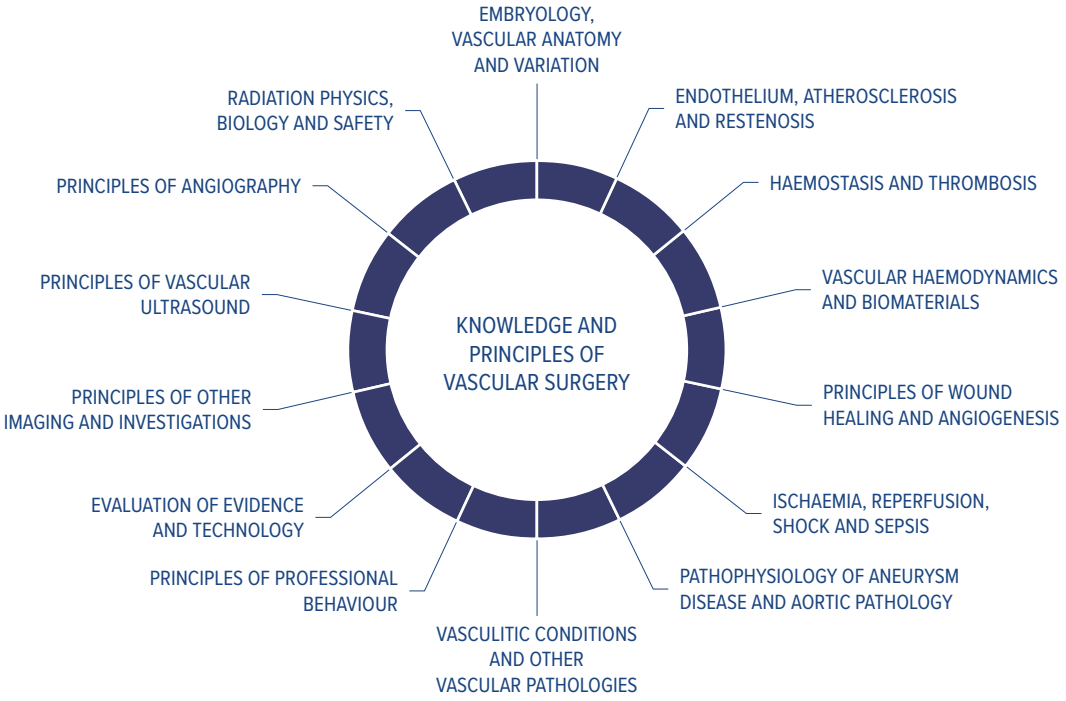
- Early (SET 1-2)
- Mid (SET 3-4)
- Late (SET 5)

Although many of these learning objectives should have been attained at the beginning of training, they will be further developed during the course of the vascular SET program. It is expected that the majority of trainees will achieve the relevant competencies by the end of the corresponding stage of training.

Section 1 : Knowledge and Principles of Vascular Surgery

This section details the core knowledge required for vascular trainees to progress through SET. This knowledge is acquired and developed throughout the training program and is further applied and developed in Section 2 of the curriculum.

Section 1 comprises 14 separate topic areas related to the anatomical, pathophysiology, investigation and management of vascular disease.

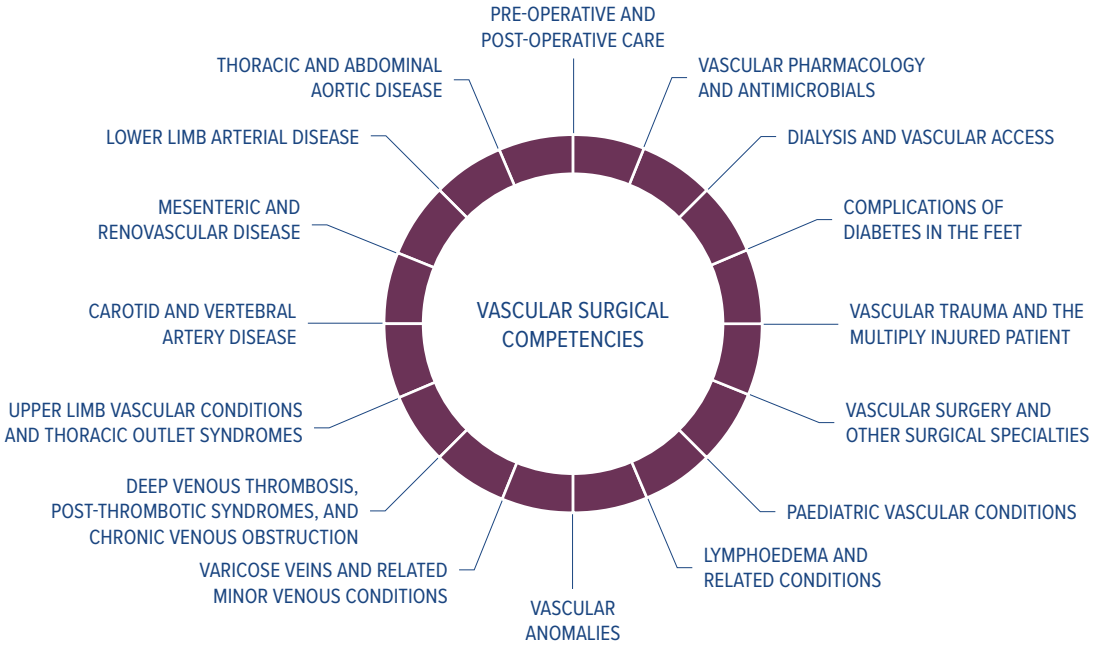


Competency in many of the early SET learning objectives is assessed in the Vascular Surgical Sciences examination (VSSE), with progression to competency in all levels (early, mid and late SET) prior to the fellowship examination.

Section 2: Vascular Surgery Competencies

This section details the key areas of clinically applied vascular surgery. Both knowledge and application learning objectives are covered, expanding on the knowledge and principles of Section 1.

Section 2 comprises of 16 separate topic areas related to the management of arterial disease, venous disease, perioperative care and other vascular conditions managed in multidisciplinary settings.



Competency is assessed throughout the SET program, with workplace assessments (Term assessments, logbooks, Mini-CEX and DOPS), participation in tutorials and skills courses. Final assessment of acquired competencies are determined by the fellowship examination.

Section 1: Knowledge and Principles of Vascular Surgery

Topic Theme	Embryology, Vascular Anatomy and Variation	
Summary	By the conclusion of SET training, competent trainees will demonstrate a thorough knowledge of normal anatomy and common variants including embryological anomalies. They will be able to apply this knowledge when performing both open and endovascular operations, with safe vessel access, minimising trauma to adjacent structures. They will recognise common embryological anomalies on medical imaging and during surgery, and identify relevant clinical consequences arising from these variants.	
Key Topics	• Embryology of the Vascular System: arterial, venous, cardiac, lymphatic • Normal vascular anatomy and relationships to other structures • Variations in vessel origins, location, and relationships, including branching patterns, absence, hypoplasia, duplication	
Competencies Assessed by This Theme	Medical knowledge, technical knowledge	
Methods of Delivery and Assessment	Self-directed learning Online Tutorials Skills Course	Vascular Surgical Science Exam Fellowship Exam Logbooks Term Assessments

Topic Theme	Endothelium, Atherosclerosis and Re-stenosis	
Summary	By the conclusion of SET training, competent trainees will demonstrate a comprehensive knowledge of the pathophysiology of atherosclerosis, associated risk factors contributing to the development and progression of atherosclerosis, and mechanisms for therapies targeted towards treatment and prevention. They will understand the mechanism of restenosis after vascular intervention and current methods for prevention and treatment of atherosclerosis.	
Key Topics	• Function of endothelium – vessel wall, vascular smooth muscle, inflammation • Development and progression of atherosclerosis and plaque rupture • Mechanisms of vascular remodelling, restenosis and neointimal hyperplasia • Prevention and treatment of atherosclerosis and restenosis	
Competencies Assessed by This Theme	Medical expertise, technical expertise, scholarship and teaching	
Methods of Delivery and Assessment	Tutorial program Self-directed learning Clinical practice	Vascular Surgical Science Exam Fellowship examination Term assessments

Topic Theme	Haemostasis and Thrombosis	
Summary	By the conclusion of SET training, competent trainees will demonstrate comprehensive knowledge of normal and abnormal haemostatic pathways and coagulation. They will demonstrate application of this knowledge when investigating patients with suspected disorders of coagulation. They will practice evidence-based prescribing of anticoagulants and antiplatelet agents when treating vascular disorders. They will be able to safely and effectively use clinical protocols to ensure patient safety when prescribing thrombolytic agents or massive transfusion.	
Key Topics	• Biochemical and physiological principles of haemostasis and coagulation • Normal haemostasis pathways • Abnormalities in coagulation and platelet function including pro-coagulable states • Diagnosis and management of coagulation disorders • Evidence for anticoagulants and antiplatelet agents used to treat vascular disease • Safe use of thrombolytics in clinical vascular practice • Physiology of massive blood loss and rapid transfusion, and clinical management of patients requiring blood products	
Competencies Assessed by This Theme	Medical expertise, technical expertise, judgement and clinical decision making	
Methods of Delivery and Assessment	Tutorial program Self-directed learning Clinical practice	Vascular Surgical Science Exam Fellowship examination Term assessments

Topic Theme	Vascular Haemodynamics and Biomaterials	
Summary	By the conclusion of SET, trainees will demonstrate knowledge of the haemodynamics of the vascular system in health and disease and competence in the application of these principles to vascular investigation and intervention. Knowledge of commonly used biomaterials (including limitation, interactions, and adaptive mechanisms) will be demonstrated through clinical application and decision-making.	
Key Topics	• Normal and abnormal haemodynamics: central circulation vs. peripheral circulation • Properties of blood and flow characteristics: relationship between flow, pressure and resistance, flow characteristics of stenosis • Vessel wall physics: compliance, pulsatility, capacitance, shear stress, tension • Material properties of commonly used devices/grafts • Haemodynamics of grafts/bypasses • Principles of haemodynamics and biomaterials in surgical decision-making	
Competencies Assessed by This Theme	Medical expertise, technical expertise	
Methods of Delivery and Assessment	Self-directed learning Tutorial groups	Vascular Surgical Science Exam Fellowship Exam

Topic Theme	Principles of Wound Healing and Angiogenesis	
Summary	By the conclusion of SET Training, competent trainees will be able to describe the physiology of wound healing physiology and factors that affect the repair process in both acute and chronic wounds. They will be able to identify risk factors for skin injury and impaired wound healing and implement appropriate investigations and management strategies to optimise wound prevention and management. Trainees will describe the physiology of angiogenesis and its role in wound healing and perfusion.	
Key Topics	**Wound healing in acute and chronic situations** • Normal wound healing processes for each type of closure: primary intention, secondary intention, and tertiary intention • Causes of impaired wound healing leading to chronic wounds • Skin vulnerability and wound prevention (i.e. pressure injuries, skin tears, incontinence associated dermatitis, medical device-related skin injury and intriginous dermatitis) • Typical and atypical lower leg ulcers • Wound infection, biofilm, and wound exudate in wound healing • Wound cleansers, dressings, and therapies **Mechanisms of vascular growth (Angiogenesis)** • Physiology of vascular growth including cellular and molecular activators • Novel therapeutic applications of angiogenesis	
Competencies Assessed by This Theme	Medical expertise, technical expertise, judgement and clinical decision making, collaboration and teamwork	
Methods of Delivery and Assessment	Tutorial program Self-directed learning	Vascular Surgical Science Exam Fellowship exam Mini-CEX

Topic Theme	Ischaemia, Reperfusion Injury, Shock and Sepsis	
Summary	By the conclusion of SET training, competent trainees will demonstrate a comprehensive understanding of the pathophysiological mechanisms, diagnosis, and management of ischaemia. They will be able to apply knowledge of ischaemic reperfusion injury to clinical scenarios and respond with appropriate management. They will be competent in the management of complex unwell patients presenting with systemic inflammatory response syndromes (SIRS) and multiorgan dysfunction, and collaborate with multidisciplinary teams for the management of these conditions. Trainees will recognise sepsis and evolving septic shock and initiate appropriate management responsive to individual patient parameters.	
Key Topics	• Pathophysiology and consequences of ischaemia • Reperfusion injury including compartment syndromes • Shock, Systemic Inflammatory Response Syndrome (SIRS) and Multi-organ Dysfunction (MODS) to vascular diseases/surgery • Sepsis and septic shock	
Competencies Assessed by This Theme	Medical expertise, technical expertise, judgement and clinical decision making	
Methods of Delivery and Assessment	Tutorial program Self-directed learning Clinical practice	Vascular Surgical Science Exam Fellowship examination Term assessments

Topic Theme	Pathophysiology of Aneurysm Disease and Aortic Pathology	
Summary	By the conclusion of SET training, competent trainees will demonstrate applied knowledge of the pathophysiology underlying aneurysm formation and acute aortic syndromes. They will incorporate risk factor assessment and modification into clinical management of patients with aortic disease. They will demonstrate an understanding of the natural history of aneurysm progression and critically evaluate treatment guidelines based upon a comprehensive knowledge of pathoanatomical features and epidemiology. They will be able to describe the mechanisms and current development theories related to aortic dissection and acute aortic syndromes.	
Key Topics	Anatomy and histopathology of normal and diseased aorta **Aneurysms:** • Risk factors for aneurysm formation • Common sites for aneurysm formation • Current theories in aneurysm biology– atherosclerosis, inflammatory mediators, biomarkers, genetics • Mechanical and haemodynamic forces involved in aneurysm or dissection formation and growth • Classification systems for aneurysms **Acute aortic syndromes including dissection:** • Pathophysiology underlying aortic dissection and other acute aortic syndromes • Classification of dissection and acute aortic syndromes • Risk factors and medical therapy for acute aortic syndromes **Genetic and hereditary Aortopathies:** • Common genetic or hereditary aortic syndromes including Marfan, Lowys Dietz, Ehlers Danlos, Bicuspid Valve • Genetic testing • Treatment thresholds and intervention preferences in aortopathy • Patient advocacy groups in genetic aortopathies *Also see Section 2 Thoracic and Abdominal Aortic Disease (also covered in Genetic Vasculopathies and Vasculidities).*	
Competencies Assessed by This Theme	Medical expertise, technical expertise, health advocacy	
Methods of Delivery and Assessment	Tutorial program Self-directed learning Clinical practice	Vascular Surgical Science Exam Fellowship exam Mini-CEX

Topic Theme	Vasculitic Conditions and Other Vascular Pathologies	
Summary	By the conclusion of SET training, competent trainees will demonstrate a comprehensive understanding of connective tissue disorders in relation to vascular pathology. They will apply an understanding of the pathophysiology to treatment decisions including the implications for surveillance and surgical intervention, as well as patient-related factors such as genetic counselling and prognosis.	
Key Topics	• Vasculitic conditions affecting large, medium, and small vessels • Connective tissue / autoimmune disorders with vascular complications • MDT in complex vasculitic conditions • Other diseases affecting vessels: eg Fibromuscular disease (FMD), cystic medial necrosis, infective arteritis, vascular tumours *Also covered in Genetic Vasculopathies and Vasculidities.*	
Competencies Assessed by This Theme	Medical expertise, technical expertise, health advocacy	
Methods of Delivery and Assessment	Tutorial program Self-directed learning	Vascular Surgical Science Exam Fellowship exam Mini-CEX

Topic Theme	Radiation Physics, Biology and Safety	
Summary	By the conclusion of SET Training, competent trainees will be able to explain the production and properties of x-rays, and how to optimise use of x-ray to maximise image quality and safety. Competent trainees will demonstrate optimal safe practice when using radiation-based imaging, including measures to reduce radiation exposure to themselves, their operating team, and patients. They will demonstrate safe and effective control of x-ray equipment during endovascular procedures. Trainees will understand the biological effects of radiation on themselves, staff, and patients.	
Key Topics	• Definition of ionizing radiation, production & properties • Biological effects of radiation: Stochastic Effects, Deterministic Effects • Radiation Dose Measurement and Monitoring • Image optimization and Dose Reduction, including the ALARA Principles • Principles of Occupational Health and Safety, A&NZ Statutory Regulations	
Competencies Assessed by This Theme	Technical expertise, medical expertise, health advocacy, management and leadership	
Methods of Delivery and Assessment	Skills course Tutorials Clinical Practice Self-directed learning Hospital based teaching / orientation	Vascular Surgical Science Exam Fellowship Exam Term assessments

Topic Theme	Principles and Practice of Angiography	
Summary	By the conclusion of SET training, competent trainees will demonstrate appropriate knowledge and technical skills to perform common endovascular procedures. They will show reasoned, evidence-based judgement when deciding between different procedures, devices and when to consider open surgery. They will be able to diagnose, investigate and manage common complications from endovascular surgery and utilise techniques to mitigate risk, including radiation exposure. They will demonstrate knowledge of more complex endovascular procedures, but it anticipated that mastery of these techniques may occur post-fellowship.	
Key Topics	• Principles of access & closure: Puncture, Sheaths/Platforms, Closure Devices • Principles of diagnostic & selective angiography: Image acquisition, Catheters, Wires • Common interventional procedures, including Angioplasty, Stenting, Re-entry methods and devices, Embolization, Atherectomy, Filter Insertion/Retrieval, Foreign Body Retrieval • Use of contrast Agents: Iodinated Contrast, CO2, Gadolinium • Use of imaging Adjuncts: IVUS, OCT	
Competencies Assessed by This Theme	Medical expertise, technical expertise, judgement and clinical decision making, scholarship and teaching	
Methods of Delivery and Assessment	Skills Course Clinical Placement Tutorial Program	Term assessments Logbooks Fellowship Exam DOPS

Topic Theme	Principles and Practice of Vascular Ultrasound	
Summary	By the conclusion of SET training, competent trainees will be able to perform basic sonography and interpret ultrasound images of blood vessels. Trainees will have a comprehensive knowledge of ultrasound physics and properties and how these impact upon investigation reliability. They will be able to manipulate ultrasound images using a variety to techniques to optimise image capture and quality. They will accurately interpret ultrasound findings, to diagnose common vascular pathologies based on internationally recognised criteria, recognising potential limitations including artefact and poor image quality. They will have point-of-care ultrasound skills for rapid assessment and vascular interventions, respecting the limitation of these modalities.	
Key Topics	• Principles of ultrasound imaging, the ultrasound machine, imaging quality, and other diagnostic imaging techniques • Vascular conditions within the relevant organ system and to have sufficient understanding of ultrasound depiction of pathology • Common abnormalities with certain organ systems • Performs common examinations safely and accurately to recognise and differentiate normal anatomy and pathology • Point-of-care ultrasound in relevant clinical situations • Ultrasound-guided invasive procedures	
Competencies Assessed by This Theme	Technical expertise, medical expertise, health advocacy, management and leadership	
Methods of Delivery and Assessment	Skills course Tutorials Clinical Practice Self-directed learning	Ultrasound Logbook (100hrs of observed ultrasound practice) Ultrasound Cases (10 case reports) Ultrasound competency log Operative Logbook Vascular Surgical Science Exam Fellowship Exam

Topic Theme	Principles of Other Imaging and Investigation Modalities	
Summary	By the conclusion of SET training, competent trainees will be able to utilise a wide range of imaging and investigation modalities for investigating vascular disease. These are in addition to vascular duplex ultrasound and include CT scans, magnetic resonance imaging, nuclear medicine scans, and perfusion adjuncts such as brachial perfusion indices, and cutaneous perfusion monitoring. Competent trainees will demonstrate evidence-based judgement in imaging choices, showing comprehensive understanding of the underlying principles of image acquisition, and limitations. They will be able to identify relevant vascular anatomy and anomalies, and associated pathology.	
Key Topics	**Computer tomography (CT) imaging:** • CT angiogram • Specialist CT Scans/ processing including Dual energy CTA / gated CTA • Magnetic Resonance Imaging including MR Angiography **Nuclear medicine imaging:** • Cardiac Isotope scans • White Cell, Gallium • MAG3/DMSA/DTPA • CTPET **Perfusion Angiography** **Tissue perfusion investigations:** • ABI, Toe Pressures, TBI, PPG • TCpO2 • Other perfusion measures *Vascular ultrasound is covered in 'Principles and practice of Vascular Ultrasound' and Angiography in 'Principles and Practice of Angiography'.*	
Competencies Assessed by This Theme	Medical knowledge, technical knowledge, judgement and clinical decision making	
Methods of Delivery and Assessment	Self-directed learning Tutorial groups Skills Course	Vascular Surgical Science Exam Fellowship Exam Logbooks Term Assessments

Topic Theme	Evaluation of Evidence and Technology	
Summary	At the conclusion of SET training, competent trainees will be able to critically evaluate clinical evidence, apply evidence-based practice to technological innovation and clinical decision-making, and describe the regulatory processes in ANZ. Competent trainees will understand the principles of surgical research, demonstrating knowledge through research projects and trainee research collaboratives. Competent trainees will demonstrate professional, ethical relationships with industry, and know how to recognise and manage potential conflicts of interest. Trainees will contribute to the effectiveness and efficiency of our healthcare system.	
Key Topics	• Research and clinical trials: Study methodology, null hypothesis, sample size and power, informed consent, bias, type 1/2 errors, clinical equipoise • Levels of evidence and study quality, including principles of meta-analysis • Definitions of common outcomes and terms including the role of core outcome sets: e.g. primary outcome, secondary outcome, binary restenosis, freedom from intervention, patency (primary, primary assisted, secondary) • Clinical guidelines: common guidelines, levels of evidence (GRADE classification) • Role of audit and quality improvement processes in clinical practice and governance • Health economics and cost-effectiveness • Relationships with industry and conflicts of interest • Ethical and regulatory principles for the introduction of new technology into clinical practice: ethics and clinical governance, regulatory processes eg TGA, FDA, ANZ guidelines for new technology	
Competencies Assessed by This Theme	Professionalism and ethics, acholarship and teacher, health advocacy, judgement and clinical decision making, collaboration and teamwork, management and leadership, cultural awareness and safety	
Methods of Delivery and Assessment	Skills Course Tutorial program Clinical placements Journal clubs (regional/local hospital) Participation in AVA and other clinical audit processes RACS CLEAR course (optional) Trainee research collaboratives (optional) Self-directed learning	Term assessments (+ optional 360 Assessment) Fellowship exam Research requirements

Topic Theme	Principles of Professional Behaviours	
Summary	By the conclusion of SET Training, competent trainees will demonstrate professional behaviour in accord with the professional standards set out by AHPRA and RACS. This professionalism will be grounded in patient-centred care, with recognition of health inequities and cultural, linguistic, socioeconomic, geographical and gendered barriers to health care. Competent trainees will demonstrate constructive, supportive relationships with their peers, trainees, and healthcare team members. They will show appropriate self-awareness and care, comply with professional regulations and demonstrate capable leadership of healthcare teams. Their professionalism will be evidenced by engagement in performance evaluation, audit and peer review, contributions to the wider discipline of surgery and health, and ongoing education of themselves and others.	
Key Topics	• Effective communication with patients, carers, and colleagues: awareness of communication styles, health record keeping, privacy and confidentiality, appropriate use of social media • Cultural Competency and Safety: Awareness of own biases and health beliefs, respectful and inclusive of patients' and colleagues' diversity in values, beliefs, and cultural backgrounds, specific Aboriginal and Torres Strait Islander Peoples and Māori health needs. • Health advocacy for self and colleagues: self -care, burnout awareness, drug and alcohol awareness, physical health • Leadership and teamwork: lead effective healthcare teams, value diversity, situational awareness, contribution to vascular and surgical community • Safe clinical practice: Performance evaluation, audit, and peer review, continuing professional development, role of second opinions • Ethical clinical practice: , regulatory requirements, relationships with industry, indemnity and private insurance *Refer to RACS competency documents and professional skills curriculum.*	
Competencies Assessed by This Theme	Professionalism and ethics, scholarship and teacher, health advocacy, judgement and clinical decision making, collaboration and teamwork, management and leadership, cultural competency and safety, communication	
Methods of Delivery and Assessment	Skills Course Tutorial program Clinical placements Hospital based diversity/cultural competency training Self-directed learning	Term assessments (+ optional 360 Assessment) Fellowship exam Cultural safety e-learning modules AVA audit participation

Section 2: Vascular Surgery Competencies

Topic Theme	Thoracic and Abdominal Aortic Disease	
Summary	At the conclusion of SET training, competent trainees will be able to demonstrate knowledge and operative expertise in the management of thoracic and abdominal aortic pathology including acute thoracic syndromes, aortic aneurysmal disease, and occlusive aortic disease. A competent trainee will demonstrate a consistent approach to investigation, diagnosis, staging, and screening of patients with aortic disease and be able to incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. Trainees will also demonstrate decision-making that considers multidisciplinary care, health resource utilisation and population health outcomes specific to aortic diseases.	
Key Topics	**Aortic aneurysms:** infrarenal, juxta-renal, thoracoabdominal, thoracic classifications, atypical causes of aneurysms, associations with other aneurysm locations. • Screening, surveillance, and medical therapy for aneurysm disease • Endovascular aneurysm repair: evidence basis, anatomical considerations, stent grafts including complex repairs, troubleshooting • Open aneurysm repair: evidence basis, anatomical approaches, technical considerations, graft materials • Ruptured aneurysm: emergency management and resuscitation, evidence basis, prognostic models • Specific complications and management: embolic disease, spinal ischaemia, endoleaks, limb occlusions, graft infection, cardiovascular complications • Patient-centred care in aortic disease: patient-reported outcome measures, patient specific outcomes, functional capacity, and rehabilitation **Dissection and acute aortic syndromes:** aortic dissection, penetrating aortic ulcers, intramural haematoma • Imaging of aortic dissection • Medical therapy for dissection • Treatment indications in emergency and chronic settings • Management options including open and endovascular interventions **Aorto-occlusive disease:** Imaging, medical therapy, evidence-based treatment (open and endovascular), associated syndromes *Also see Section 1 Pathophysiology of Aneurysm Disease and Aortic Pathology.*	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork, professionalism and ethics, health advocacy	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Ultrasound logbook/case reports Term assessments Mini-CEX/DOPS Fellowship exam Logbook

Topic Theme	Lower Limb Arterial Disease	
Summary	At the conclusion of SET Training, competent trainees will be able to demonstrate knowledge and operative expertise in the management of lower limb peripheral artery disease (PAD). They will demonstrate a consistent approach to diagnosis, staging, investigation and screening of PAD, recognising patients at risk of limb loss. They will incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. Trainees will show comprehensive ability to prescribe and monitor medical and adjunct therapies for PAD and safely perform standard open and endovascular revascularisation procedures. Competent trainees will demonstrate clinical decision-making that considers the role of multidisciplinary care, health resource utilisation and population health outcomes specific to peripheral artery disease.	
Key Topics	**Peripheral artery disease (PAD) associated with atherosclerosis:** • Epidemiology and natural history of PAD: Prevalence, risk factors, and common prognostic models • Screening, surveillance, and medical therapy for PAD: current guidelines and key clinical trials • Diagnosis of PAD including imaging techniques • Role of exercise therapy in PAD • Associations between cardiovascular disease and peripheral vascular disease • Endovascular treatment for PAD: evidence basis, anatomical considerations, simple and more complex interventions, troubleshooting • Open surgical techniques for PAD: evidence basis, anatomical approaches, technical considerations, conduits, and graft materials • Specific complications and management: embolism, dissection, access complications, graft occlusions, infections • Patient-centred care in PAD disease: patient-reported outcome measures, patient specific outcomes, functional capacity and rehabilitation **Acute limb ischaemia (ALI):** • Presentation and staging, including risk factors • Diagnosis and investigation • Acute management of ALI: open, endovascular, pharmacological, adjunct therapies • Ischaemia reperfusion injuries including compartment syndrome **Lower limb peripheral aneurysm disease:** • Diagnosis and imaging including screening and surveillance • Treatments including endovascular, open and nonsurgical Atypical causes of lower limb arterial disease including radiation induced vasculitis, cystic medial necrosis, popliteal entrapment syndrome. Management of major amputation including wound healing, pain management, psychological impact and rehabilitation.	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork, health advocacy	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Ultrasound logbook/case reports Term assessments Mini-CEX/DOPS Fellowship exam Logbook

Topic Theme	Mesenteric and Renovascular Disease	
Summary	By the conclusion of SET training, competent trainees will demonstrate knowledge and operative expertise in the management of mesenteric and renovascular disease. They will have a consistent approach to the diagnosis, staging, investigation and screening of patients with mesenteric and renovascular disease and be able to incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. They will demonstrate decision-making that considers multidisciplinary care, health resource utilisation and population health specific to mesenteric/renovascular disease.	
Key Topics	• Anatomical features of mesenteric and renal vessels • Atherosclerotic diseases affecting the mesenteric and renal vessels • Acute and chronic presentations of mesenteric and renal disease • Imaging for acute and chronic mesenteric/renal disease • Evidence and guideline-based therapy (medical, surgical, and endovascular) • Cross-specialty collaboration in mesenteric/renal disease (major abdominal surgery, acute mesenteric ischaemia) • Aneurysms affecting mesenteric and renal arteries including natural history, risk factors, indications for treatment, and common complications • Atypical causes of mesenteric/renovascular disease including fibromuscular disease (FMD), dissection, infection	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork	
Methods of Delivery and Assessment	Tutorial program Clinical placement Self-directed learning	Ultrasound logbook/case reports Term Assessments Mini-CEX/DOPS Fellowship exam Logbook

Topic Theme	Carotid and Vertebral Artery Disease	
Summary	At the conclusion of SET training, competent trainees will demonstrate knowledge and operative expertise in the management of acute and chronic carotid and vertebral artery disease. They will show a consistent evidence-based approach to the diagnosis, staging, investigation, and screening of patients with carotid/vertebral disease, and accurately distinguish between acute and chronic presentation and disease stages. A competent trainee will be able to incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. Trainees will demonstrate decision-making that considers multidisciplinary care, health resource utilisation and population health outcomes specific to carotid/vertebral artery disease.	
Key Topics	• Carotid and vertebral anatomy and variants. • **Atherosclerotic carotid disease:** symptomatic and asymptotic, classifications, atypical presentations, associations with other atherosclerotic arterial diseases • Investigation, screening, surveillance, and medical therapy for carotid disease: current guidelines • Indications for intervention in asymptomatic and symptomatic carotid stenoses: evidence basis, anatomical considerations, complexities in decision-making, troubleshooting • Carotid endarterectomy: evidence basis, anatomical approaches, technical considerations, common complications, perioperative care • Carotid stenting: evidence basis, anatomical approaches, technical considerations, common complications, perioperative care • Specific complications and management: distal embolic disease, high bifurcations, thrombosis, infection, perioperative stroke, cardiovascular complications, restenosis • Patient-centred care in carotid disease: patient-reported outcome measures, patient specific outcomes, functional capacity, and rehabilitation • Models of care for carotid/vertebral artery disease including evidence-based guidelines. • **Other carotid/vertebral pathology:** dissection, vasculitis, aneurysm: imaging, associated medical therapy, role for surgical (open/endo) intervention • **Carotid body tumours:** presentation, risk factors, imaging, medical therapy, evidence-based treatment, MDT, surveillance	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork, professionalism and ethics, health advocacy	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Skills course Tutorial program Clinical placement Self-directed learning

Topic Theme	Upper Limb Vascular Conditions and Thoracic Outlet Syndromes	
Summary	By the conclusion of SET training, competent trainees will demonstrate knowledge and operative expertise in the management arterial diseases in the upper limb and thoracic outlet syndromes (TOS). Competent trainees will apply a consistent approach to the diagnosis, staging, investigation, and screening of patients with upper limb vascular disease and incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. They will demonstrate decision-making that considers multidisciplinary care, health resource utilisation and population health outcomes specific to upper limb vascular disease and TOS.	
Key Topics	**Acute and chronic presentations of upper limb ischaemia:** • Atherosclerotic disease • Thromboembolic disease • Dissection • Aneurysm • Trauma Occlusive diseases of the brachiocephalic, subclavian, and axillary arteries including atypical causes such as vasculitis. Congenital anomalies presenting with vascular pathology. Thoracic outlet syndromes and upper limb vascular compression.	
Competencies Assessed by This Module	Collaboration and teamwork, communication, judgement and clinical decision making, medical expertise, technical expertise	
Methods of Delivery and Assessment	Tutorial program Skills Course Self-Directed Learning	Vascular Surgical Science Exam Fellowship exam Mini-CEX

Topic Theme	Deep Venous Thrombosis, Post-thrombotic Syndromes, and Chronic Venous Obstruction	
Summary	By the conclusion of SET Training, competent trainees will demonstrate knowledge and operative experience in the management of deep venous disease. They will consistently apply evidence-based decision making to diagnosis, staging, investigation and screening of patients with deep venous pathology and sequelae, incorporating patient specific factors with anatomical and pathological features in treatment plans. Competent trainees will apply clinical guidelines and current evidence in decision making that shows consideration towards multidisciplinary care, appropriate health resource utilisation and population-based health outcomes specific to deep venous disease and associated long-term complications.	
Key Topics	**Acute and chronic presentations of deep venous thrombosis (DVT):** • Risk factors • Prophylaxis • Investigations • Treatment (pharmacological, endovascular, surgical, mechanical) Caval interruption – indications, techniques and management of complications, open surgery techniques, endovascular IVC filter insertion and removal Sequalae of DVT including pulmonary embolus, post thrombotic syndromes, venous ulceration Congenital and acquired venous obstructive syndromes including May-Thurner, Klippel Trelaunay syndrome, Paget Schroder	
Competencies Assessed by This Module	Collaboration and teamwork, communication, judgement and clinical decision making, medical expertise, technical expertise	
Methods of Delivery and Assessment	Tutorial program Skills Course Self-Directed Learning	Tutorial program Skills Course Self-Directed Learning

Topic Theme	Varicose Veins and Related Minor Venous Conditions	
Summary	At the end of SET training, competent trainees have a comprehensive understanding of superficial venous disease and related venous presentations. They will employ clinical grading scales and apply evidence-based guidelines to facilitate access to appropriate treatment modalities. They will demonstrate technical skills in treatment of superficial venous diseases including endovenous therapies, open surgical treatments, and sclerotherapy. They will recognise the complications of superficial venous incompetence and address ongoing risk factors. Competent trainees will seek to balance the socioeconomic and cultural barriers patients with superficial venous disease encounter, with responsible health resource allocation, working to help provide safe and accessible evidence-based treatment according to clinical need.	
Key Topics	**Superficial venous incompetency:** • Varicose veins: anatomy, clinical signs, investigations, staging, treatment, long term prognosis • Recurrent varicose veins • Complications from varicose veins • Cost efficacy and value-based care in superficial venous disease Telangiectasias and reticular veins **Superficial thrombophlebitis:** • Anatomical considerations • Risk factors including prothrombotic states, malignancy	
Competencies Assessed by This Module	Medical expertise, technical expertise. judgement and clinical decision making, collaboration and teamwork, professionalism and ethics	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Skills course Tutorial program Clinical placement Logbooks Self-directed learning

Topic Theme	Vascular Anomalies	
Summary	At the conclusion of SET Training, competent trainees will demonstrate knowledge and operative experience in the management of vascular anomalies. Competent trainees will be able to make an initial differential diagnosis of a vascular anomaly based on history and examination, order appropriate non-invasive imaging, and understand the pertinent information required to refer to an appropriate MDT. They will be able to discuss in general terms with the patient the various conservative, pharmacological, and interventional options of management including specific indications and contraindications for biopsy, sclerotherapy, embolization, and excision surgery.	
Key Topics	• Classification according to ISSVA (International Society for the Study of Vascular Anomalies) • Differentiation of vascular tumours vs vascular malformations; benign vascular tumours (infantile haemangioma) vs vascular malformations; simple vascular malformations vs combined vascular malformations; simple vascular malformation sub-types (arterial, venous, lymphatic); vascular malformation and AVM / AVF • Associated clinical syndromes (eg Klippel-Trenaunay, Parkes Weber, Cowden) • Importance of MDT in assessing and managing vascular anomalies • Imaging modalities used to assess vascular anomalies (ADUS, MRI, CT, DSA) • When to biopsy / excise vs sclerotherapy / embolisation • Use of blood tests in the assessment of vascular malformations (D-Dimer as marker of chronic intravascular coagulation and microemboli) • Use of pharmacotherapy in vascular anomalies • Role of preventative treatment of lateral marginal vein (of Servelle) in patients with KT to prevent VTE / PE / heart failure	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork, health advocacy	
Methods of Delivery and Assessment	Tutorial program Clinical placement Self-directed learning	Tutorial program Clinical placement Mini-CEX/DOPS Fellowship Examinations

Topic Theme	Lymphoedema and Related Conditions	
Summary	At the conclusion of SET Training, competent trainees will be able to assess lower limb swelling, diagnose potential causes and manage as relevant. Trainees will be able to contribute to a multidisciplinary team approach to disorders of the lymphatic system and related conditions, advising on operative and non-operative management strategies.	
Key Topics	• Assessment of lower limb swelling • Primary and secondary lymphoedema • Lymphovenous anomalies and common genetic lymphatic conditions • Lipoedema • Investigations/imaging relevant to limb swelling • Management of limb swelling including compression therapy, intermittent compression pumps, manual therapy, reduction surgery, lymphovenous reconstruction surgery	
Competencies Assessed by This Module	Medical expertise, collaboration and teamwork, judgement and clinical decision making	
Methods of Delivery and Assessment	Tutorial groups Clinical experience and out-patient clinics Self-directed learning	Mini-CEX Vascular Surgical Science Exam Fellowship exam

Topic Theme	Pre-operative and Post-operative Care	
Summary	At the end of SET training, competent trainees will demonstrate knowledge and application of the principles of perioperative care, be able to risk stratify patients, and initiate appropriate preoperative investigations. They will incorporate assessment of perioperative risk into management plans, showing adaptive and patient-centred care. Trainees will be able to function effectively in a multidisciplinary, collaborative care environment, valuing input from other specialities such as anaesthetics, cardiology, endocrinology, and geriatrics. Trainees will accurately identify post-operative complications and have management strategies to for both prevention, early identification, and treatment of complications. They will make use of clinical guidelines and current evidence when making treatment decisions, considering health resources and population health outcomes.	
Key Topics	• Non-operative therapy for common vascular conditions • Pre-operative risk stratification and optimisation • Perioperative complications: prevention, investigation, management • Multi-disciplinary approaches to perioperative care • The role of frailty and other comorbidities in perioperative outcomes • Early recovery pathways (eg ERAS) and clinical care models in vascular surgery • Specific risk modifiers in high risk surgery • Engage in complex discharge planning	
Competencies Assessed by This Module	Medical expertise, technical expertise, judgement and clinical decision making, collaboration and teamwork	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Term Assessments Mini-CEX/DOPS Fellowship exam Logbook

Topic Theme	Vascular Pharmacology and Antimicrobials	
Summary	By the completion of SET training, competent trainees will demonstrate a comprehensive knowledge of common pharmacological agents used in vascular surgery and demonstrate safe prescribing practices. They will demonstrate safe management of medications during the perioperative period, and utilise appropriate pharmacological agents to treat vascular conditions and risk factors. They will recognise common pharmacological side effects and contraindications for use. They will be able to work effectively with professionals from other disciplines such as infectious diseases, pharmacy, vascular medicine. Competent trainees will comply with national guidelines/regulations and demonstrate an evidenced-based approach to prescribing.	
Key Topics	**Medications for vascular risk modification (evidence, indications, contraindications, monitoring) including:** • Antiplatelet agents • Antithrombotic agents / anticoagulants • Cholesterol inhibitors • Antihypertensives • Antiglycaemic agents **Medications for vascular symptom control (evidence, indications, contraindications, monitoring) including:** • Analgesics • Vasodilators • Other **Antimicrobial prescribing including:** • Common pathogens in vascular surgery • Indications for antimicrobial use (therapeutic, prophylactic, maintenance) • Spectrum of cover • Multi-resistant organisms • Antimicrobial stewardship	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork	
Methods of Delivery and Assessment	Tutorial program Clinical placement Self-directed learning	Tutorial program Clinical placement Self-directed learning

Topic Theme	Dialysis and Vascular Access	
Summary	At the conclusion of SET Training, competent trainees will demonstrate comprehensive knowledge and skills in the assessment, formation, maintenance of vascular access for dialysis, including the use of ultrasound for planning, assessment, and treatment. They will be able to incorporate patient specific factors with anatomical and pathological features when making evidence-based treatment decisions. They will demonstrate an ability to lead a multidisciplinary team approach to dialysis access, incorporate patient values and perspectives into care, and recognise the medical and surgical complexity of patients on dialysis with reference to current guidelines, health resource utilisation and population health.	
Key Topics	• Anatomy and physiology of an arteriovenous (AV) fistula • Multidisciplinary approaches to chronic renal failure and dialysis access including current guidelines relevant to dialysis access • Ultrasound of AV fistulas: Preoperative mapping, surveillance, stenosis • Management of common complications of dialysis (e.g. line sepsis, thrombosis, cannulation issues, poorly functioning fistula) • Troubleshooting a problematic fistula (e.g. venous pressures, clearance, post cannulation bleeding, infection, steal syndromes, central stenosis) • Peritoneal dialysis (access, complications, technical considerations) • Chronic renal failure and its impact on other systems such as peripheral vascular disease • Ethical and social issues related to dialysis	
Competencies Assessed by This Module	Technical expertise, medical expertise, judgement and clinical decision making, collaboration and teamwork, professionalism and ethics, health advocacy	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Ultrasound logbook/case reports Term Assessments Mini-CEX/DOPS Fellowship exam Logbook

Topic Theme	Complications of Diabetes in the Feet	
Summary	At the conclusion of SET training, competent trainees will demonstrate knowledge and operative experience in the management of diabetes-related foot disease and associated complications. They will have a consistent approach to the diagnosis, staging, investigation and screening of patients with diabetes-related foot disease, incorporating patient specific factors with anatomical and pathological features in evidence-based treatment plans. Competent trainees will adhere to clinical guidelines and current evidence when making management decisions, working effectively in multidisciplinary teams to optimise clinical outcomes and reduce limb loss. Their treatment decisions will incorporate multidisciplinary care, available health resources and population-health outcomes specific to patients with diabetes-related foot disease.	
Key Topics	• Neuroischaemic ulceration in patients with diabetes-related foot ulceration and disease (DFU) • Risk factors for ulceration, classification and clinical consequences • Neuropathy, ischaemia and mechanisms of foot ulceration • Peripheral ischaemia associated with diabetes: investigation, staging, screening and management • Role of infection in diabetes-related foot ulceration • Pressure offloading and wound healing • Foot deformity associated with neuroischaemia including neuroischaemic (Charcot) arthropathy • Multidisciplinary approaches to diabetes-related foot disease and integration of care *Also see Lower Limb PAD.*	
Competencies Assessed by This Module	Medical expertise, technical expertise, judgement and clinical decision making, collaboration and teamwork, professionalism and ethics	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Skills course Tutorial program Clinical placement Logbooks Self-directed learning

Topic Theme	Vascular Trauma and the Multiply Injured Patient	
Summary	At the conclusion of SET training, competent trainees will demonstrate knowledge and operative experience in the management of vascular trauma including burns. They show a timely and systematic approach to assessment and decision making in the management of patients with multiple injuries, including vascular injuries. They will work collaboratively with other members of a trauma team to develop a treatment plan that includes patient specific factors and recognises the constraints of their healthcare environment, initiating patient transfer when appropriate. Competent trainees will be conscious of the psychological effects associated with trauma, modelling appropriate self- and team-care. They will make sure of clinical guidelines and current evidence when making decisions, with consideration to health resources and population health outcomes.	
Key Topics	• Assessment and management multiply injured patient: initial resuscitation, definitive care, rehabilitation • Pathophysiology and mechanisms of injury, including physiological responses to trauma, vascular complications • Principles of trauma care and operative procedures both general (including burns) and vascular specific • Multidisciplinary care and trauma teams • Types of vascular injury, evolution and consequences, and predictors of outcome	
Competencies Assessed by This Module	Medical expertise, technical expertise, judgement and clinical decision making, collaboration and teamwork, professionalism and ethics	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Skills course Tutorial program Clinical placement Logbooks Self-directed learning

Topic Theme	Vascular Surgery and Other Surgical Specialties	
Summary	At the end of SET training, competent trainees will demonstrate collaborative and supportive engagement with members of other surgical specialties. They will recognise the important role vascular surgery provides in supporting other surgeons/clinicians when iatrogenic vascular injuries occur and have necessary technical (and non-technical) skills to assist with repair. Competent trainees will show knowledge of the principles in common multiteam surgical procedures such as in transplant, surgical oncology, spinal access surgery and vascular trauma. Competent trainees will have a range to technical skills and strategies to manage difficult access, bleeding, or thrombosis. They will be active contributors in multidisciplinary surgical settings, providing support and advice when required.	
Key Topics	• Communication and collaboration with multiple teams • Provision of anatomical dissection and exposure for other specialties • Management of iatrogenic vascular injuries including haemorrhage control, vascular repair and reconstruction • Multi-disciplinary approaches to surgical care **Common vascular surgical procedures including:** • Surgical oncology • Trauma • Spinal surgery • Transplant	
Competencies Assessed by This Module	Medical expertise, technical expertise, judgement and clinical decision making, collaboration and teamwork, health advocacy	
Methods of Delivery and Assessment	Skills course Tutorial program Clinical placement Self-directed learning	Skills course Tutorial program Clinical placement Logbooks Self-directed learning

Topic Theme	Paediatric Vascular Conditions	
Summary	At the conclusion of SET training, competent trainees will demonstrate they can adapt history and examination skills to reflect challenges specific to paediatrics. They demonstrate knowledge of common paediatric vascular tumours and malformations, and a rational approach to investigation and management of common paediatric vascular conditions. Competent trainees will have technical skills relevant to operative management of common paediatric traumas and emergencies and know when to refer patients to specialist paediatric services. Specialised paediatric operative experience may be acquired post-fellowship but is not a required competency in SET training.	
Key Topics	• Principles of paediatric clinical assessment and imaging • Arteriovenous malformations (AVM) common in children • Limb ischaemia and the paediatric patient • Common paediatric tumours involving vascular structures • Paediatric vascular trauma	
Competencies Assessed by This Module	Collaboration and teamwork, communication, judgement and clinical decision making, medical expertise, technical expertise	
Methods of Delivery and Assessment	Tutorial program Skills Course Self-Directed Learning	Vascular Surgical Science Exam Fellowship exam Mini-CEX

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