

2022



ASMIRT

Guidelines

Vascular Angiography Course Syllabus Study and Examination Guide

Your profession. Your future.

There are a number of protected titles for medical radiation practice. They include:

Medical Radiation Practitioner (MRP)

Diagnostic Radiographer (DR)

Medical Imaging Technologist (MIT)

Radiographer

Nuclear Medicine Scientist (NMS)

Nuclear Medicine Technologist (NMT)

Radiation Therapist (RT).

For the purposes of our documentation we use the broad descriptor Medical Radiation Practitioner (MRP) recognising that it covers a range of areas of practice.



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Vascular Angiography Course Syllabus Study and Examination Guide

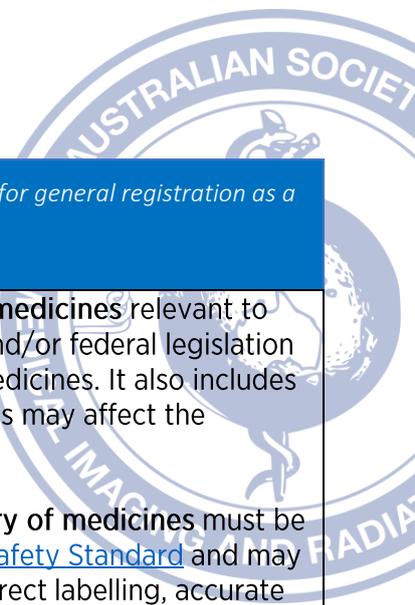
Overview

The following key capabilities and enabling components cover the knowledge, skills and attributes needed by all diagnostic radiographers, nuclear medicine technologists and radiation therapists who use MRI MRPBA Professional capabilities for medical radiation practice (2020) Domain 1: Key Capabilities 3 & 8 and Domain 1A: Diagnostic Radiographer, Key Capability 2.

Key capabilities – <i>What registered medical radiation practitioners must be able to do</i>	Enabling components – <i>Evidence of this capability for general registration as a medical radiation practitioner</i>
<p>1. Understand and apply the different methods of imaging and treatment.</p>	<p>a. Understand the different imaging and treatment pathways in medical radiation practice.</p> <p>b. Understand the modalities and equipment used in the different imaging and treatment pathways across medical radiation practice.</p> <p>c. Understand use of CT, MRI and PET in the localisation of a range of cancer sites, patient/client presentations and related planning procedures.</p> <p>d. Operate equipment and apply knowledge of laboratory procedures to practice when necessary.</p> <p>Modalities and equipment may include but are not limited to x-ray equipment, computed radiography, digital radiography, mammography, dental panoramic radiograph, fluoroscopy, angiography, computed tomography, magnetic resonance imaging, ultrasound, positron emission tomography, single photon emission computed tomography, dose calibrator, bone mineral densitometry, sample counters, superficial x-ray, linear accelerator, brachytherapy, ion chambers, planning systems, hybrid imaging systems, radiochemistry synthesis units or radiation therapy treatment delivery systems.</p>

Key capabilities – <i>What registered medical radiation practitioners must be able to do</i>	Enabling components – <i>Evidence of this capability for general registration as a medical radiation practitioner</i>
<p>8. Apply knowledge of safe and effective use of medicines.</p>	<p>a. Apply the principles of safe and effective use of medicines to practice.</p> <p>b. Recognise the risks, precautions and contraindications of the use of medicines, informed by the patient's/client's current pathology status.</p> <p>c. Apply knowledge of pharmacokinetics, pharmacodynamics and the potential range of reactions to medicines.</p> <p>d. Safely and effectively deliver medicine to patients/clients, in accordance with procedures.</p> <p>e. Actively monitor the effects of medication and manage adverse reactions to medicines, in accordance with protocols.</p>

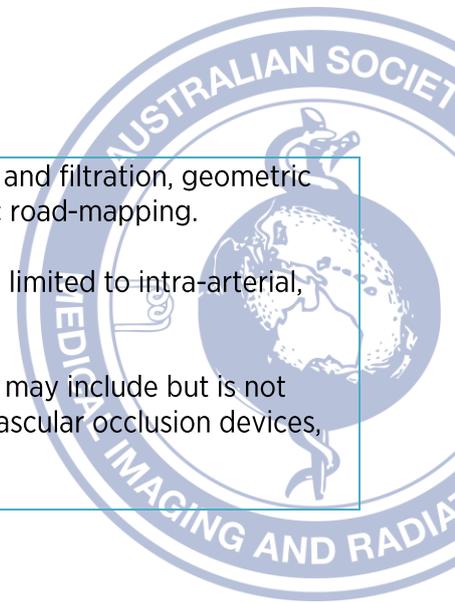




Key capabilities – <i>What registered medical radiation practitioners must be able to do</i>	Enabling components – <i>Evidence of this capability for general registration as a medical radiation practitioner</i>
	<p>Knowledge of safe and effective use of medicines relevant to practice may include state and territory and/or federal legislation about the supply and administration of medicines. It also includes understanding how pathological conditions may affect the delivery of some medicines.</p> <p>Procedures for safe and effective delivery of medicines must be consistent with the NSQHS's Medication Safety Standard and may include checking products, confirming correct labelling, accurate calculations and measurements and correct route.</p>

<p>1. Perform fluoroscopy and angiography examinations in a range of settings.</p>	<ul style="list-style-type: none"> a. Operate fluoroscopy and angiography systems safety and effectively in a range of settings. b. Effectively communicate with the multidisciplinary team as the imaging request, patient history and previous medical images are reviewed, the patient is assessed to receive care and the procedure is planned. c. Prepare the patient/client for the examination, including positioning the patient/client for the best diagnostic outcome. d. Apply knowledge of equipment geometry for procedures. e. Apply knowledge of imaging acquisition modes and radiation dose rates. f. Perform image post-processing techniques. g. Prepare the patient/client and delivery systems with the appropriate contrast media using aseptic techniques. h. Apply knowledge of medical equipment and prostheses used in the angiography and operating theatre setting. i. Collaborate in the design and evaluation of fluoroscopy and angiography protocols. <p>Range of settings may include but are not limited to an imaging department, emergency department, operating theatre, intensive care unit, an angiography suite with both fixed and mobile equipment.</p> <p>Knowledge of equipment geometry for the procedure may include but is not limited to beam-receptor angulation, source-image distance, rotational imaging, anti-scatter equipment (physical and digital) and radiation protective shielding.</p> <p>Knowledge of radiation dose delivery may include but is not limited to radiation dose factors, image frame rate for fluoroscopy and</p>
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	<p>image acquisition, x-ray beam collimation and filtration, geometric and digital magnification and fluoroscopic road-mapping.</p> <p>Delivery systems may include but are not limited to intra-arterial, intravenous, oral, and hepatobiliary.</p> <p>Medical equipment used in angiography may include but is not limited to catheters, guide wires, stents, vascular occlusion devices, vascular clips and filters, and prostheses.</p>
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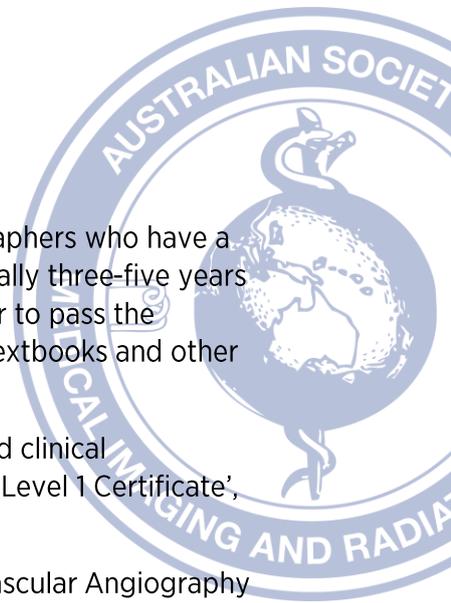
Justification

ASMIRT is providing this certification as recognition that a medical radiation practitioner (MRP) is performing with professional skill in vascular angiography. This certification provides practitioners and employers with direction for study and educational programs, a benchmark of industry-standard skill, and formal recognition of the ability of the MRP.

Vascular Angiography Level 1 Certification of medical radiation practitioners by ASMIRT implies MRPs have the knowledge to:

- Operate proficiently in an angiographic clinical environment and during complex procedures
- Assess patient suitability for and oversee safe administration of contrast media
- Evaluate appropriate angiographic protocols for scanning purposes
- Individualise scanning technique to suit patient procedure
- Evaluate normal anatomy, and unexpected or urgent medical findings
- Understand ongoing quality assurance and safety implications





Introduction

The Vascular Angiography Level 1 Certification process is aimed at radiographers who have a minimum of minimum of one-year full time equivalent experience, with ideally three-five years full time experience in a broad range of angiography examinations. In order to pass the theoretical component, candidates are expected to undertake revision of textbooks and other relevant literature prior to sitting the exam.

The Vascular Angiography Level 1 certification encompasses theoretical and clinical components. In order for a candidate to apply for a 'Vascular Angiography Level 1 Certificate', the candidate must meet all of the following requirements:

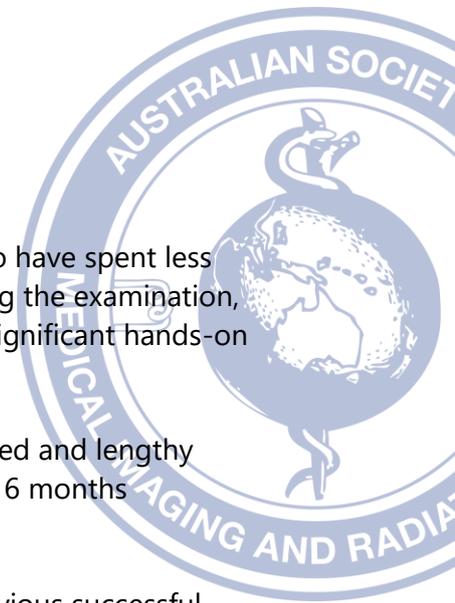
1. Achieve a pass grade of 75% with no element below 65% for the Vascular Angiography Level 1 Certification Examination (Part A)
2. Perform the required clinical component as outlined below (Part B)

Vascular Angiography Level 1 Certification Examination

The formal examination will involve a paper not exceeding 165 multiple-choice questions covering a range of topics (refer to the following study guide for details). The examination is divided into 5 sections. The table below indicates the number of questions related to each topic.

Section A	Angiographic equipment	28
Section B	Angiographic anatomy, pathophysiology & pharmacology	32
Section C	Angiographic physics	26
Section D	Fundamental vascular angiographic and interventional fluoroscopic procedures	46
Section E	Angiographic / Fluoroscopic image	33





Examination Preparation

Angiography Experience - this exam is not designed for candidates who have spent less than 3-5 years in an angiography suite. You are not precluded from sitting the examination, but past results have shown that it is extremely difficult to pass without significant hands-on angiography experience.

Study period - A pass in this examination is dependent on a well-designed and lengthy study program. Successful candidates have recommended a minimum of 6 months concentrated study.

Mentors- successful candidates have involved their work colleagues, previous successful candidates and a mentor. It is also recommended to use study material that contains multiple choice questions or review questions. There is no requirement to answer the section in any particular order, e.g. some candidates suggested answering the section that you are most familiar with first.

LEARNING OBJECTIVES

Section A: Angiographic Equipment

TOPICS:

General

- Understand the French sizing system

Sheaths

- Understand vascular sheaths
 - General design and purpose
 - Use of long Sheaths
 - Purpose of Break-Away (peel apart) sheaths

Catheters

- Understand the terms
 - Pushability
 - Crossability
 - Torque
 - Steerability

- Compare and contrast the shape, characteristics and use of the following flush catheters
 - Pigtail
 - Contra/VCF/ Omni Flush





- Understand the general shape of the following catheters
 - Hinck
 - Cobra
 - Rim
 - Simmonds 1&2
- Understand the common uses of the following catheters (principle anatomical engagements)
 - Cobra
 - Rim
 - Simmonds 1&2
 - Headhunter
- Understand the design and primary uses of Glide Catheters
- Understand the following characteristics of Guide Catheters
 - Sizing
 - Indications for use
 - How they differ from a standard diagnostic catheter
- Understand the general definition of a micro-catheter and describe its applications and major benefits

Guide Wires

- J-Wires vs. straight wires
 - Indications for use
 - Advantages and disadvantages
- Understand the design and general use of Glide Wires
- Compare and contrast the following wire-based delivery systems
 - 0.035 vs 0.018 vs 0.014
 - Understand the primary uses (and limits) of each system
- Know the primary uses, general length, and disadvantages associated with the use of Exchange Wires
 - Standard exchange
 - Stiff exchange
- Amplatz
- Lunderquist





Balloons

- Understand the term balloon compliance
 - Compare the uses of Compliant and Non-Compliant Balloons
- Understand the following angiography balloon terms
 - Rated Burst Pressure
 - Nominal Pressure
 - Difference between circumferential and longitudinal balloon rupture
- Understand the type and use of Occlusion Balloons
 - In the following regions: Neuro, Gastric and Aortic
 - Understand the principle uses of the CODA balloon
- Specialist balloons
 - Cutting balloons - Describe the design and indications of cutting balloon use
 - Drug Eluting Balloons – describe their uses and the drugs routinely applied

Stents

- Compare and contrast Self Expanding and Balloon Expandable Stents
 - Delivery mechanisms
 - Advantages vs. disadvantages (including radial strength characteristics)
- Understand the design and general uses of Covered Stents
- Understand Flow Diverters
 - Indications
 - Design characteristics and how they work

Embolics

- Understand the design, use and function of embolising coils
 - Coil sizing
 - 3D (framing) vs. tornado vs. spiral
 - Fibred
- Detachable vs. pushable coils
 - List indications for both
- Understand the characteristics and use of Amplatzer devices
 - Vascular vs. vascular interventional applications
- Understand the characteristics and use of the following liquid embolics
 - Onyx
 - Histoacryl
 - Lipiodol





- Understand particulate embolics
 - Principle use
 - Common angiographic applications
- Understand Gelfoam
 - Composition
 - Angiographic applications

Thrombectomy

- Understand chemical thrombectomy
 - Angiographic applications
 - Thrombolytic drugs used
 - Catheters employed
 - Relationship to mechanical thrombectomy
- Understand mechanical thrombectomy
 - Angiographic applications
 - Understand the currently available devices and how they operate
- Rotational atherectomy catheters
- Treeratola device
- Solitaire device
- Angiojet (rheolytic) system

Section B: Angiographic Anatomy, Pathophysiology & Pharmacology

TOPICS:

- Identify the macroscopic and microscopic structure of arteries and veins
- Understand the principles of Virchow's triad
- List pathological processes that may result in arterial narrowing
 - Intrinsic vs. extrinsic
- Acute
- Chronic
- List pathological processes that may result in venous narrowing
 - Intrinsic vs. extrinsic
- Acute
- Chronic





- List pathological process that result in vascular occlusion
 - Acute
 - Chronic
- Understand the pathological process behind aneurysm development
 - Fusiform vs. saccular vs. mycotic
 - True vs. false (pseudo) aneurysm
- Understand and compare the following terms
 - Arterio-venous malformation
- Nidus
 - Arterio-venous fistula
- Pathological
- Surgically created
 - Angiogenesis
- Define hepatic-portal venous pressure gradient and its clinical significance in portal hypertension
 - Understand clinically relevant pressure gradient values

Arterial Anatomy - Principles

- Describe the composition of the femoral triangle
- List the arterial supply to the stomach indicating which portion of the stomach is supplied by each vessel
- List arterial supply to duodenum and pancreas
 - Pancreatic head supply vs. pancreatic tail supply
- List arterial supply to the lower gastrointestinal tract indicating which portion of the bowel is supplied by each vessel
- List the vertebral levels of the following
 - Coeliac trunk
 - Superior mesenteric artery (SMA)

Right and left renal artery

- Inferior mesenteric artery (IMA)
- Aortic bifurcation
- Iliac venous confluence
- List structures passing through each diaphragmatic hiatus
 - Include vertebral level for each one
- Describe the arterial supply to the brain





- List all major intracranial arterial vessels
 - Cerebral branches
 - Cerebellar branches
- List the arteries of the aortic arch (the great vessels), from proximal to distal
 - Brachiocephalic/Subclavian artery and subsidiary branches
 - Carotid arteries and its subsidiaries

Bloodwork

Clotting Factors

- Understand the clinical relevance of a low haemoglobin level, and its primary causes
- Understand an International Normalised Ratio (INR) test and when it should be performed
- Discuss the functions of platelets during vessel haemostasis
 - Understand the implications of a low platelet count
- Understand an Activated Clotting time (ACT) test and when it should be performed

Renal Function

- Understand the clinical importance of Glomerular Filtration Rate (GFR) tests in angiography, and know the levels for safe operation
- Understand Creatinine: What it is, how it is produced, and how to manage high levels prior to angiography
- Understand Urea: What it is, how it is excreted, and the clinical relevance of low levels

Drugs

- Lignocaine
 - Drug class
 - Common dosing
 - Effect of combining with Epinephrine
- Fentanyl
 - Drug class
 - Primary Uses
 - Common dosing
- Midazolam
 - Drug class
 - Primary Uses
 - Common dosing





- Heparin
 - Drug class

Primary angiographic uses

- Common dosing
- GTN
 - Discuss the primary angiographic use
 - Mechanism of action
- Papaverine
 - Drug class
 - Primary functions
 - Angiographic applications
- Verapamil and Nimodopine
 - Drug class
 - Mechanism of action
 - Angiographic applications
- Urokinase
 - Drug class
 - Angiographic applications

Section C: Angiographic Physics Radiation Biology & Safety

- Understand what contributes to patient dose in fluoroscopic procedures
 - Types of photons (transmitted, scattered and absorbed)
 - Common methods for reducing these doses
- Understand what contributes to operator dose in fluoroscopic procedures
 - Areas of highest scatter dose
 - Types of photons (transmitted, scattered and absorbed)
 - Common methods for reducing these doses
- Discuss the importance and uses of Diagnostic Reference Levels (DRL's) in angiography
 - Understand how DRL values are arrived at
- Compare and contrast acute and chronic radiation injury
 - Define each type
 - Trigger levels
 - Radiation Dose Metrics
- Describe the location and purpose of the Interventional Reference Point (IRP)
 - Understand the implications of changing table height on the resultant radiation dose measurements





- Understand Dose Area Product (DAP)
 - What it is
 - Where it is measured
 - Clinical relevance
- Discuss Air Kerma (AK)
 - What it is
 - Clinical relevance, and how it differs from the Surface Entrance Dose
 - Understand how to determine the maximum skin dose (single region) where multiple projections have been used

Radiation Protection

- Know the Australian Standards for
 - Heavy lead gowns
 - Annual absorbed dose limits

Imaging Physics

- Understand the effects of a changing field of view (FOV) on patient dose
 - Collimation vs. magnification
- List image magnification changes with changes to the following
 - Source-to-image distance
 - Source-to-object distance
 - Object-to-image distance
- Know the common focal spot sizes in use in angiography, and understand
 - The effect on image resolution
 - The effect on heat loading
- Understand the effects of changing matrix size on image resolution
- Understand what the Detective Quantum Efficiency (DQE) says about an angiography system.
 - What is its relevance?
- Vessel calibration methods
 - Understand the limitations to each method (foreshortening, magnification, errors induced when calibrating from small distances)
- Measuring catheters
- Catheter/sheath width calibration
- Automatic (magnification factor) calibration
- Ruler calibration (top of table, or on top of patient)





Bi-Plane Angiography

- List advantages of bi-planar angiographic systems
- List disadvantages of bi-planar angiographic systems
- List angiographic procedures from which bi-planar imaging provides significant benefits

Digital Subtraction Techniques

- List indications for x-ray (acquisition) delays vs. Injection delays
- List approximate acquisition rates for the following common protocols
 - Arch/Thoracic aorta
 - Abdominal aorta
 - Common femoral artery
 - Below knee imaging (tibial arteries)
- Compare and contrast Image/mask averaging and Maximum Opacification techniques
 - Indications for use
 - Effect on signal-to-noise ratio (SNR)
- Compare and contrast Image Overlay and Roadmap techniques
 - Discuss when they should and should not be used

Contrast Injection Principles

- Understand Poiseuille's law
 - Factors affecting the pressure of injection
 - Maximising injection flow rates
- Understand the use of angiographic powered injectors and what each parameter controls
 - Injection rate
 - Injection volume
 - Injection delay
 - X-ray delay
 - Rate rise
 - Pressure limit

Rotational Angiography

- List the advantages and disadvantages of rotational angiography
- Understand the technique differences between 3D rotational angiography (3DRA) and 3D digital subtraction angiography (3DDSA)
 - Acquisition parameters
 - Injection dilution
 - Injection volume



- Describe the difference between the following (3DRA/3D DSA) standard image reconstruction modes
 - Volume rendered (VR)
 - Maximum intensity projections (MIP)



Section D: Fundamental vascular angiographic and interventional procedures

General Principles

- Understand why patients must remain still during procedures and the methods used to achieve this
- Understand why monitoring a patient's blood pressure, oxygen saturation, heart rate and respiratory rate during a procedure is important
- Understand the risks of pressure injury and for the patient and ways to prevent this

Sterile Technique

- Understand basic principles of sterile technique as they relate to the procedure, staff, and patient
 - The use of sterile gowns/gloves/drapes
 - How to dispense sterile equipment/equipment/fluids into the sterile field
 - Cleaning/preparation of the access site
 - Use of personal protective equipment in the procedure room
- Understand basic principles of sterile technique as they relate to the x-ray equipment
 - Avoiding contamination of the sterile field

Vascular Access

- List all steps (in order) of the modified Seldinger technique
 - Indicate equipment required at each stage
- Compare and contrast brachial artery vs. common femoral arterial access
 - Indications
 - Contraindications
- List standard and alternative endovascular approaches to venography





Procedure Risks & Complications

- List potential complications related to arterial access
- List contraindications to performing angiographic procedures
- List major and minor complications related to the injection of iodinated contrast media
- List potential procedural complications

Fluoroscopic Intervention

- Understand nephrostomy tube insertion
 - Indications
 - Procedure requirements
- Patient positioning

Equipment required

- Understand ureteric stent insertion (performed in radiology)
 - Indications
 - Procedure requirements
- Patient positioning
- Equipment required
- Understand percutaneous trans-hepatic cholangiography (PTC/PTHC)
 - Indications
- Internal/external biliary drainage
- Biliary stenting
- Rendezvous procedure
 - Procedure requirements
- Patient positioning
- Equipment required
- Understand endoscopic retrograde cholangio-pancreatography (ERCP)
 - Indications
 - Procedure requirements
- Patient positioning
- Equipment required
- Imaging requirements





- ERCP – Intervention
 - Describe biliary sphincterotomy
 - Indications for plastic vs. metal stents
 - Methods for stone extraction
- Understand radiologically inserted gastrostomy tubes (RIG)
 - Indications
 - Procedure requirements
- Imaging requirements
- Equipment required

Venous Interventional Procedures

- Understand peripherally inserted central catheters (PICC)
 - Indications
 - Procedure
- Equipment required
- Imaging requirements
- Ideal catheter tip placement
- Understand the differences between tunnelled and non-tunnelled central venous catheters
 - Clinical situations in which they are employed
 - List the advantages and disadvantages of internal jugular vs. subclavian venous puncture
- Understand the indications and differences between the following tunnelled central venous catheters, defining ideal tip position
 - Permcath, Hickmans, Portacath

Thoracic Angiography

- For arch arteriography list
 - Indications
 - Standard projection
 - Catheter used
- List indications for performing the following selective thoracic angiographic procedures
 - Bronchial arteriography
 - Spinal arteriography
 - Intercostal arteriography
- List indications for performing pulmonary angiography





- Acute vs. Chronic conditions

Abdominal Angiography

- Understand infra-renal endovascular aortic repair (EVAR) procedures
 - Indications
 - Equipment
- Describe the composition of stents used in EVAR procedures
- Wires used
- Catheters used
- Understand the categorisation of endoleaks
 - List all 5 types of endoleak
 - List treatment options for type 2 endoleak
- In the treatment of hepatic tumours
 - Differentiate between Trans-arterial chemo-embolisation (TACE) and selective internal radiation therapy (SIRT) procedures
- List indications
 - TACE infusion/embolisation rationale
- Understand the application of endovascular techniques in the embolisation of visceral bleeding, listing the choice of embolic in each case
 - Renal
 - Hepatic
 - Splenic
- Rationale of distal vs. proximal splenic embolisation
 - Lower gastrointestinal
- Understand uterine artery embolization (UAE) procedures
 - Indications
 - Embolics employed
- Understand procedures for infra-renal inferior vena cava (IVC) filter insertion
 - Indications
 - Vascular approach
 - Target zone for IVC filter placement
 - Maximum IVC widths for insertion
- Understand procedures for infra-renal inferior vena cava (IVC) retrieval
 - Indications

Retrieval methods





- Vascular approach
- Snare vs cone retrieval
 - Pre retrieval venography rationale
- Understand gonadal vein embolisation procedures
 - Indications
 - Venous anatomy
 - Embolics employed

Peripheral Angiography

- List indications for performing diagnostic lower limb angiography
- Define ankle-brachial index (ABI)
- For peripheral angiography understand clinical scenarios for utilisation of a retrograde approach
 - Advantages and disadvantages
 - Describe the up-and-over technique
- For peripheral angiography understand clinical scenarios for utilisation of an antegrade approach
 - Advantages and disadvantages
- List common projections required to image the following
 - Common iliac bifurcation
 - Common femoral bifurcation
- Understand the application of CO₂ in peripheral angiographic imaging
 - Indications and contraindications
 - Angiographic technique variations when imaging with CO₂ vs. iodinated contrast
- Table tilt
- Post processing techniques

Cerebral Angiography

- List indications for performing diagnostic cerebral angiography
- For intracranial imaging list advantages/disadvantages of catheter angiography compared to computed tomographic angiography (CTA)
- Understand baseline neurovascular projections, indicating the alignment of bony landmarks and area of interest
 - Intracranial internal carotid artery (ICA)
- Posterior-Anterior (PA)





- Lateral
- Trans-orbital oblique
 - Intracranial vertebral artery
- Posterior-Anterior (PA)
- Lateral
- Understand the intracranial vascular anatomy best demonstrated for each standard neuroangiographic projection (as listed above)
 - Arterial
- Anterior, middle and posterior cerebral vessels
- Basilar artery

Ophthalmic artery

- Venous
- Intracranial sinuses
- Understand endovascular treatment options for wide necked vs. narrow necked aneurysms
 - Definition of wide vs. narrow necked aneurysms
 - Treatment options
- Coiling
- Balloon/Stent assisted coiling
- Flow diversion
- Understand the treatment options for embolic stroke
 - Intravenous therapy
 - Endovascular treatment
- Mechanical and suction thrombectomy systems
- Understand the endovascular treatment options for cerebral vasospasm
 - Equipment required
 - Drugs employed
 - Indications for angioplasty
- List indications for the following neuro-vascular procedures
 - (Inferior) petrosal sinus sampling
 - Balloon occlusion testing
 - Maxillary artery embolization





Section E: Angiographic/Fluoroscopic Image Labelling

List and/or Label the Following Anatomical Structures:

Head & Neck

- Extracranial arterial supply
 - Common carotid bifurcation
 - Internal carotid
 - External carotid
 - Vertebral

- Intracranial arterial supply
 - Anterior cerebral artery
 - Middle cerebral artery
 - Posterior cerebral artery
 - Superior cerebellar artery
 - Anterior-inferior cerebellar artery
 - Posterior-inferior cerebellar artery

- Intracranial venous drainage
 - Superior sagittal sinus
 - Inferior sagittal sinus
 - Transverse sinus
 - Sigmoid sinus
 - Internal cerebral veins
 - Great vein of Galen
 - Cavernous sinus
 - Inferior petrosal sinuses

Thoracic

- Aortic arch and great vessels

- Thoracic aortic branches
 - Bronchial
 - Intercostal

- Central venous
 - Superior vena cava
 - Inferior vena cava
 - Right atrium
 - Main pulmonary trunk

Abdominal

- Coeliac arterial branches
 - Common hepatic artery





- Hepatic proper
- Gastroduodenal artery
- Superior pancreato-duodenal artery

Right gastroepiploic artery

- Right gastric artery
 - Splenic artery
- Dorsal pancreatic/Pancreata magna
 - Left Gastric
- Superior and Inferior mesenteric arteriography
 - Right colic
 - Middle colic
 - Left colic
 - Sigmoid
 - Superior Rectal
- Abdominal wall arterial supply
 - Parietal arteries
- Inferior phrenic
- Lumbar
- Median sacral
- Pelvic Arteriography
 - Common iliac
 - Internal iliac branches
- Anterior trunk
- Ilio-lumbar
- Gluteal branches
- Posterior trunk
- Obturator
- Vesicle
- Uterine





- Internal pudendal
 - External Iliac
- Deep iliac circumflex
- Inferior epigastric
- Central venous
 - Inferior vena cava
 - Renal vein
 - Hepatic vein
- Portal venous
 - Superior mesenteric vein
 - Splenic vein
 - Inferior mesenteric vein
- Cholangiography
 - Hepatic ducts
 - Cystic duct
 - Common bile duct
 - Pancreatic duct

Peripheral

- Upper arm arteriography
 - Subclavian artery and branches
- Vertebral artery
- Thyrocervical trunk
- Costocervical trunk
- Internal thoracic (mammary) artery
 - Axillary artery
 - Brachial artery
 - Radial, ulnar and interosseous arteries
 - Deep and superficial palmar arches
 - Proximal brachial artery
- Lower limb arteriography
 - Common femoral arterial bifurcation
 - Superficial and Deep (profunda) femoral
 - Popliteal
 - Genicular arteries
 - Anterior and Posterior tibial arteries
 - Peroneal artery
 - Median and lateral plantar arch
 - Dorsalis pedis





Reading Material

These texts are considered by ASMIRT to provide the applicant with a sound understanding necessary to complete the theoretical component and assist with additional knowledge for the clinical aspects of Level 1.

Basics of Angiography

Interventional Radiology: A survival Guide, 3rd Edition, Kessel and Robertson
2012 Handbook of radiologic procedures, 4th edition, Kandarpa and Machan, 2012

Anatomy

Atlas of Vascular anatomy: an angiographic approach, 2nd edition, Uflacker, 2007

Basic to Advanced concepts

Image guided interventions, Mauro et al, 2nd edition, 2014

Cerebral Angiography

<https://radiopaedia.org/articles/cerebral-angiography>

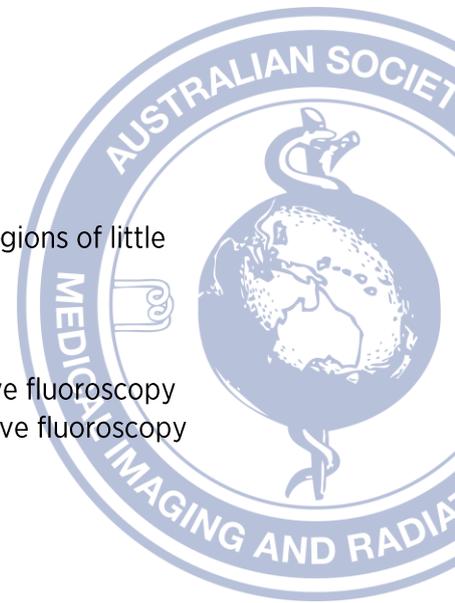
Other Materials

Any other source material can suffice however the information must be general in its applications to angiography. Doctor, practice and site-specific methods may be too narrow in their applications and should be avoided. Site specific practices are not being examined, only the fundamental angiography methodologies (which apply across all sites).

Please refer to the Policies & Procedures Manual for up-to-date information on Vascular Angiography Level 1 Certification (Part A). This document can be found at:

<https://www.asmirt.org/certification/>





Sample Examination Questions:

1. 'Roadmap' and 'Image Overlay' techniques are best employed in regions of little motion to:
 - a.) Reduce spatial resolution
 - b.) Increase mis-registration between the overlay and the native fluoroscopy
 - c.) Decrease mis-registration between the overlay and the native fluoroscopy
 - d.) Increase SNR

The correct answer is (c)

2. The DSA technique of 'stacking' or 'adding' images, holding the maximum pixel value is termed:
 - a.) Image averaging
 - b.) Maximum opacification
 - c.) Mask averaging
 - d.) Maximum intensity projection

The correct answer is (b)

3. The averaging of images compared the addition of images in maximum opacification provides for increased:
 - a.) Image contrast ratio
 - b.) Signal-to-noise ratio
 - c.) Iodinated contrast density
 - d.) Radiation to the patient

The correct answer is (b)

4. The pressure limit on a power injector exists:
 - a.) To increase the duration of a procedure
 - b.) To protect the patient, catheter and injector from extreme pressure increases
 - c.) To prevent the use of extremely low pressures
 - d.) To stabilize the injection pressure

The correct answer is (b)



5. What is the indication for a percutaneous trans-hepatic cholangiography?
- a.) Obstructive urolithiasis
 - b.) Hydronephrosis
 - c.) Pynonephrosis
 - d.) Obstructive cholelithiasis

The correct answer is (d)



The Vascular Angiography Level 1 Certification Examination Structure

The examination involves a series of 165 directed questions which will be accessed from an online examination platform and displayed on a local computer system.

It will be conducted over a duration of 3 hours (180 minutes).

1. The examination will be performed on a specific local I.T. / computer screen system.
2. Each examination question in each section will follow the same consistent approach for evaluating the correct answer using a multiple-choice answering system.
3. The candidate will access the on-line examination using a unique username and password (provided by ASMIRT). Once the candidate has entered the portal, the Vascular angiography examination will be available on the dashboard for selection.
4. Once the candidate has selected the Vascular angiography examination and are ready to commence the examination, they are permitted to do so.
 - The candidate has three (3) hours to complete the examination. A timer commences count down on the screen to show elapsed time.
 - After three (3) hours has elapsed, the candidate will no longer have access to the examination.

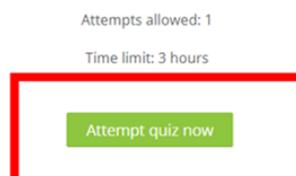


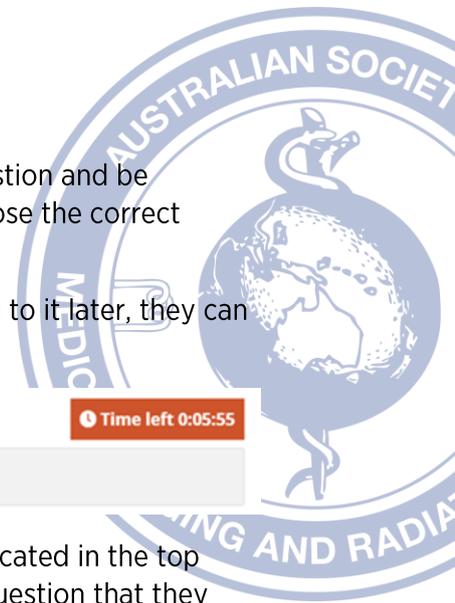
Pre – Vascular Angiography Level 1 Examination Platform Access (For Both Supervisor and Candidate)

1. Once the candidate has registered for the examination, the candidate will be required to nominate a supervisor to supervise this examination. The candidate will need to negotiate with the supervisor an appropriate date and time to undertake this examination. A supervisor declaration form will need to be completed and submitted to ASMIRT for approval.
2. Once the supervisor has been approved, they will be given access (via a unique username and password) to the examination portal to undertake a “Test” Vascular Angiography familiarisation test.
 - URL link
 - Username: xxx
 - Password: xxx
3. This will ensure that the supervisor will be able to test the local computer that will be used for the examination to check any workplace “firewall” issues, suitability of the room/location including noise and light, functionality of the examination platform, and the examination process.
4. Concurrently, the candidate will be provided with their unique username and password, to enable the candidate to undertake a “practice” examination of anywhere between 2 to 4 questions to ensure there is an understanding of the functionality of the system.
5. ASMIRT recommends that the above checks by the supervisor and the examination preview by the candidate should be undertaken a week before the actual examination.
6. The candidate will be required to click on top right-hand side of the page and insert their unique username and password, then click on the green arrow to log in.



7. The candidate will then be presented with the examination. When the candidate is ready to begin, click on green button **ATTEMPT QUIZ NOW**.

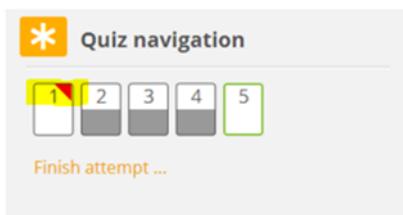




- Upon viewing, the candidate will be presented with a directed question and be presented with several alternative answers and be required to choose the correct answer under a multiple-choice format.
- If the candidate is unsure about a question and would like to return to it later, they can “flag” the question by click on the flag.



- This will also appear on the candidate’s Quiz Navigation section (located in the top right-hand corner of each question) as a red flag to highlight the question that they would like to return to.



- The candidate should also note that once the question has been completed, that question will be highlighted in “grey” on the “Quiz Navigation” section on the right-hand side of the examination (See image above). The Quiz Navigation will indicate how many questions have been completed and the sections the questions are located in.
- Unanswered questions will be shown as blank. Those that are flagged and unanswered have a red flag and are blank.
- Please take note of the timer. Once the exam commences, this will continue until you have completed the exam.



- Once all of the exam questions have been completed, the summary of the attempt will be displayed.

General Knowledge Quiz

Summary of attempt

Question	Status
1	Not yet answered
2	Answer saved
3	Answer saved
4	Answer saved
5	Answer saved

[Return to attempt](#)

Time left 0:06:43

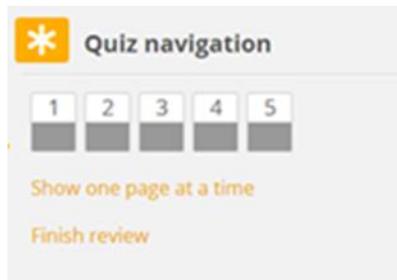
This attempt must be submitted by Thursday, 14 October 2021, 10:35 AM.

[Submit all and finish](#)





15. You will have an opportunity to go back to any flagged questions to change / provide an answer if there is time left.
16. Click on **RETURN TO ATTEMPT** and select the question you wish to return to.
17. Once you have completed all the questions, the Quiz Navigation boxes will all have a grey section.



18. By unticking the flag, it will remove the flag from the question and the quiz navigation. To save confusion, remember to uncheck the flag once you have answered the question.
19. Once the candidate has submitted all answers, the questions and selected responses will appear. Complete the process by scrolling to the bottom of the page and click on **FINISH REVIEW**.
20. Once the candidate is satisfied that all answers have been completed, click on **SUBMIT ALL AND FINISH**.
21. The candidate will be provided a confirmation text box. Upon completion of the examination, click on **SUBMIT ALL AND FINISH**. Make sure that this green button has been clicked prior to the time expiring, to ensure that your answers are recorded, and the exam completed.
22. Candidates will only have ONE attempt to sit this examination.

The candidate will have a twenty (20) minute time limit on the Pre – Vascular Angiography familiarisation test. ASMIRT recommends that candidates use as much of that time to ensure complete familiarity with all possible combinations of the examination, as well as the “Red Flag” system, and the “Quiz Navigation” system.



Vascular Angiography Level 1 Certification Examination Summary

- 1) The candidate will be given access (via a unique username and password) to the Vascular Angiography Level 1 Certification Examination once registration processes and supervisors have been verified.
- 2) The candidate will negotiate an agreed date and time with their supervisor to sit the examination. At this agreed date and time, the examination can commence. To ensure that there is appropriate examination support from the ASMIRT certification team, Candidates sitting this examination in both Australia and countries outside of Australia will need to ensure that the examination time is conducted within an Australian time zone of 8am – 8pm.
- 3) It is the assumption of the examination markers that the “Test” Pre – Vascular angiography familiarisation test has been attempted to ensure that the candidate understands both the requirements of the examination and the examination functionality.
- 4) The examination’s time duration is 180 minutes to answer 165 questions. After the allotted 180 minutes, the examination will automatically be closed.
- 5) If the candidate finishes the examination before the allotted time expires, the **SUBMIT ALL AND FINISH** button must be selected. This ensures that all answers are recorded.
- 6) This examination will be conducted over a designated period of one week. This allows for both flexibility and ease for both the candidate and supervisor. Examination marking will commence once the examination period has concluded.
- 7) All ASMIRT examinations are three hours in length. Candidates may be sitting in an examination room with other candidates sitting other examinations with the same supervisor. They may be leaving at different times depending on how quickly they complete their examination. Candidates may leave early but please be respectful of other candidates (if applicable).
- 8) Candidates are not to screen capture, take photos or write questions down during the examination.
- 9) Examination results will be emailed to candidates within a fortnight of the examination week concluding.
- 10) In the instance that there are unforeseen circumstances with the technology, the supervisor will contact the ASMIRT certification team to promptly report the problem, and a new date and time will be negotiated with the candidate to re sit the examination.

