

TRAINING REQUIREMENTS IN INTERVENTIONAL NEURORADIOLOGY (INR) PROCEDURES

DEFINITIONS & OBJECTIVES

Interventional neuroradiology (INR) is a subspeciality that uses catheter technology, direct puncture techniques, radiologic imaging, and clinical expertise to diagnose and treat diseases of the Central Nervous System, Head and Neck and the Spine. The unique clinical and invasive nature of this subspeciality requires special training and skills.

The practitioner's training and experience should include the following: -

1. Signs and symptoms of disorders amenable to diagnosis and treatment by interventional neuroradiology (INR) techniques.
2. Basic neurological examinations to evaluate patients with neurological disorders.
3. Pathophysiology and natural history of these disorders. Indications and contraindications to interventional neuroradiology (INR) procedures.
4. Clinical and technical aspects of interventional neuroradiology (INR) procedures.
5. Medical and surgical alternatives.
6. Pre-and post procedure management of neurovascular patients. Neurointensive care management in consultation with neuro-intensivist and neurosurgeons.
7. Fundamentals of imaging radiation physics and radiation biology. Integration of information available from imaging studies, pertinent to the neurovascular practice.

DURATION OF TRAINING

1. One year Interventional Neuroradiology (INR) fellowship at an approved INR centre.
2. Prerequisite for INR training is:
 - a. Post Part 2 FRANZCR or FRANZCS (Neuro-surgery) or equivalent post graduate qualification

AND

- b. One year Neuroradiology Fellowship (Australasia or overseas equivalent).

OR

Competence in diagnostic supra-aortic angiography as demonstrated by compliance with requirements published in the RANZCR/ASNR Guidelines for Training in Neuroradiology (Appendix 1) with reference to supervised training in supra-aortic selective cerebral angiography.

- 150 angiograms under direct supervision.
- A logbook is to be kept and must audit complications.

3. Grandfathering Clause

Any practitioner who had commenced practising interventional neuroradiology procedures prior to the “Training Requirements in Interventional Neuroradiology (INR) Procedures” guidelines being adopted by RANZCR and not meeting the above formal training criteria will need to demonstrate that their level of training and/or experience is at least equivalent to those set by the guidelines.

REQUIREMENTS OF THE PRACTITIONER’S TRAINING PROGRAMME & FACULTY

The programme must be certified by the ABR/ASTIN or equivalent body or the Interventional Neuroradiology Board of the RANZCR.

The training centre must be performing greater than 80 interventional procedures per year.

In general the centre must demonstrate that they are able to provide the trainee with:-

- exposure and participation in selective intra and extracranial vessel cannulation with microcatheters
- exposure and participation in deployment of GDC and mechanical detachable coils
- exposure and participation in embolisation with particulate and non-particulate material
- Angioplasties and stenting of supra-aortic and intracranial vessels
- comprehensive understanding of the anatomy and physiology of the brain, head and neck and spine
- evidence of audit and participation in morbidity and mortality
- conferences with related fields (Neurosurgery, Neurology, Vascular Surgery and Head & Neck Surgery)
- detailed knowledge of the role of anticoagulation :-
 - Heparin
 - Warfarin
 - antiplatelet agentsand indications for the use of these agents

Knowledge of the pharmacology and use of Heparin, Aspirin, Warfarin and the newer antiplatelet agents Ticlopidine, Clopidogrel and Reopro needs to be gained

- Complications of various procedures and their management.

Specific Training should be provided in the following areas and documented in a certified log book are:

- I. Anatomic and physiologic basic knowledge
 - a) Basic knowledge in arterial angiographic anatomy of the brain, spine, spinal cord, and head and neck
 - b) Venous angiographic anatomy of the brain, spine, spinal cord, head and neck
 - c) Collateral circulation
 - d) Dangerous anastomosis
 - e) Cerebral blood flow
 - f) Autoregulation
 - g) Pharmacologic mechanisms of CNS vasculature
- II. Technical aspects of interventional neuroradiology, including:
 - a) Catheter and delivery systems
 - b) Embolic agents in cerebral, spinal, and head and neck embolization
 - c) Flow-controlled embolization
 - d) Complications of cerebral embolization
 - e) Flow control between the extracranial and intracranial circulation
 - f) Electrophysiologic processes
 - g) Provocative testing (pretherapeutic evaluation)
 - h) Complications of head and neck, brain, spine, and spinal cord embolization
 - i) Imaging of vascular system
- III. Pharmacologic agents
 - a) Contrast materials
 - b) Provocative testing with anesthetics and barbiturates
 - c) Anticoagulants
 - d) Thrombolytics
- IV. Coagulation cascade
- V. Brain and spinal cord arteriovenous malformation, arteriovenous fistulas of the brain, spine, spinal cord, and head and neck vascular malformations; ischemic stroke; and cerebral aneurysms
 - a) Classification
 - b) Clinical presentation
 - c) Natural history
 - d) Epidemiologic data
 - e) Hemodynamic basis
 - f) Indications for treatment
 - g) Contraindications for treatment
 - h) Therapeutic techniques
 - i) Combined therapies
- VI. Tumors of the head, neck, spine, and central nervous system
- VII. Revascularization for occlusive vascular diseases
 - a) Arteriopathies
 - b) Atherosclerotic lesions
 - c) Techniques of revascularization: balloon angioplasty, thrombolytics, and stenting (includes extra and intra cranial carotids and vertebral and their branches)
- VIII. Embolization for epistaxis or other causes of hemorrhage

- IX. Invasive functional testing
- X. Balloon test occlusions

CAROTID & SUBCLAVIAN ANGIOPLASTY AND STENTING TRAINING REQUIREMENTS

1. Completion of a **formal Interventional Neuroradiology Fellowship** as above.

OR

2. **Alternative Training Requirements**

- Pre requisite knowledge and skills in diagnostic supra-aortic angiography as detailed Guidelines for Training in Neuroradiology
- 150 supra-aortic selective angiograms under supervision as previously described in the document Guidelines for Training in Neuroradiology.
- 50 selective carotid angiograms/year
- 50 peripheral stenting cases as primary operator
- 30 cases of carotid stenting with at least 15 as primary operator.
- Additional Requirements

Carotid stenting may require adjunctive neurointerventional rescue techniques including the use of intracranial thrombolysis and requires additionally thorough understanding of neurovascular anatomy and neuro imaging.

If the Primary Practitioner is not formally trained in neurointerventional rescue techniques to the same standards as in the formal **Interventional Neuroradiology Fellowship**, then there is an additional requirement that an **Interventional Neuroradiologist** be available on site in case this is needed urgently.

ONGOING MAINTENANCE OF SKILLS AFTER COMPLETION OF TRAINING.

It is expected that a person completing an Interventional Neuroradiology Fellowship should work in a health care facility or hospital that has access to:-

- on site neurosurgery/vascular surgery/neurology/ICU cover
- readily accessible CT, MRI and ultrasound facilities
- ongoing evidence of audit
- a minimum of 50 procedures per year, these procedures should be in addition to the ongoing requirements of competency in supra-aortic angiography
- participation in
 - morbidity and mortality meeting
 - multidisciplinary meetings
 - ongoing education

Appendix 1

GUIDELINES FOR TRAINING IN NEURORADIOLOGY

Preamble:

Neuroradiology is an evolving subspeciality and it is acknowledged that most radiologists have an interest in neuroradiology. The proposed guidelines are not to be proscriptive, but must be seen as important guidelines for the training of future neuroradiologists. Special reference needs to be made to supra-aortic, cerebral and carotid arteriography with guidelines for the training of physicians interested in angiography.

Requirements:

1. Duration

One year training position (in the 5th year of RANZCR training or at the completion of RANZCR training) in a facility approved or recognised by the RANZCR.

2. Faculty

Training needs to be fully supervised and undertaken in a facility with at least two experience neuroradiologists (post fellowship or greater than 5 years experience in neuroradiology).

3. Equipment

The hospital or other health care facility should be able to offer the candidate following equipment and which are suitable :-

- CT scan (preferably Multichannel)
- MRI
- carotid Doppler ultrasound
- DSA or angiography with specific specifications (detailed below)
- transcranial Doppler (not essential, but preferable)
- facilities for performance of diagnostic and interventional spinal procedures
- myelography
- cisternography
- C1/C2 puncture
- spinal intervention
- nerve root sleeve injection
- facet joint injection
- bone biopsy

4. Supra-Aortic Angiography

Faculty Training

For appropriate training, a trainee will need to have at least two experienced supra-aortic angiographers with more than 500 supra-aortic selective angiograms with proven and acceptable complication rates.

Equipment & Facilities

Refer to the latest RANZCR Accreditation Standards for Diagnostic and Interventional Radiology, current version 5.1,

Requirements and Outcomes of Training

Prerequisites

It is assumed that the trainee will have performed 100 interventional procedures including femoral punctures, (as per FRANZCR requirements) during their basic training, and gained knowledge of:-

- vascular anatomy
- use of catheters and guidewires
- placement of sheaths

A detailed knowledge of extra and intracranial anatomy, both vascular and non-vascular and normal physiology is expected. This will be enhanced during the training period.

The pharmacology and use of Heparin, Aspirin, Warfarin and the newer antiplatelet agents Ticlopidine, Clopidogrel and Repto needs to be gained

Training & Experience

- 150 supra-aortic selective angiograms under direct supervision.
- 50 selective carotid angiograms/year
- log book must audit complications.

Maintenance of Competence

It is expected that, to maintain competence, 75 supra-aortic selective angiograms should be performed over a 3 year period. More importantly, there should be ongoing audit of any complications.

5. Cross Sectional Imaging

The candidate must be able to be exposed to the following modalities:-

- MRI
Studies dedicated to brain, spine or head and neck imaging.
Greater than 2,000 during training (40 per week)

- MRA
Diffusion.
The availability of perfusion and spectroscopy is not essential, but preferable.
- CT
Multichannel scanner, with CT angiography capability.
- Duplex Carotid Ultrasound
The Doppler unit should have access to B mode, colour, pulse wave and power Doppler.

6. Education

They must be able to attend at least one clinical conference per week with associated specialities (Neurosurgery, Neurology or other affiliated groups).

It is preferable that the candidate attempt to have a poster or verbal presentation at a nationally recognised meeting and original research (case history, series or invivo trial participation) is expected, but not essential.

References:

- Guidelines for training – ASTIN April 1999
- Training Scheme & Training Criteria in Interventional Radiology – IRSA
- Guidelines for establishing a quality assurance programme in vascular and interventional radiology – SCVIR 1989
- Credential Criteria No. 1 peripheral, renal and visceral Percutaneous Transluminal Angioplasty – SCVIR December 1989

Appendix 2

STANDARDS OF PRACTICE

Refer to: www.astin.org/html/stand_practice_1.html