

HONG KONG COLLEGE OF RADIOLOGISTS

Higher Subspecialty Training in Diagnostic Neuroradiology

[This document should be read in conjunction with the *Guidelines on Higher Specialist Training (Radiology)*]

1. INTRODUCTION

- 1.1 Neuroradiology is a subspecialty that involves diagnostic imaging and interventional radiology in the management of diseases of the central and peripheral nervous system.
- 1.2 Although diagnosis relies heavily on cross-sectional imaging, advances in technology enables not only morphological and anatomical diagnosis, but also physiological and functional diagnosis such as spectroscopy, cortical mapping and measurement of regional cerebral blood flow by MRI and PET.
- 1.3 Diagnostic Neuroradiology is a category A subspecialty.

2. OBJECTIVES

At the completion of the training programme, trainees are expected to:

- (a) have acquired the knowledge of basic neuroanatomy, clinical knowledge relevant to neuroradiology and interpretation of the various imaging modalities relevant to the diseases of the central nervous system and spine;
- (b) be able to give advice on the best imaging method based on individual needs;
- (c) have a thorough understanding of the indications, contraindications, limitations and potential complications of neuroradiologic imaging;
- (d) have acquired some knowledge of the indications, contraindications, costs and risks of neuro-interventional procedures.

3. TRAINING REQUIREMENTS

3.1 TRAINING CENTRE REQUIREMENTS

3.1.1 Equipment Requirements:

- (a) Multidetector CT scanner.
- (b) Ultrasound equipment with colour Doppler facility.
- (c) Biplane Digital subtraction angiographic equipment.
- (d) MR scanner with at least 1.5 Tesla field strength.
- (e) Access to nuclear medicine facilities for performance of radionuclide investigations.

3.1.2 Clinical/Radiological Service Requirements:

- (a) Neurosurgical department
- (b) Neurologist service from Medical department
- (c) Paediatric Neurology service, Psychiatry department, and Neuropathology service are optional though desirable
- (d) Neurointerventional service

3.2 TRAINER REQUIREMENTS

As specified in the Guidelines on Higher Specialist Training (Radiology).

3.3 DURATION OF TRAINING

6 months of training is desirable; 3 months of training is acceptable.

3.4 DUTY SESSIONS

Perform five or more neuroradiology related sessions per week, among which there should be at least

- 1 CT session, and
- 2 MRI sessions

The other 2 sessions can be CT, MRI or angiography.

3.5 MINIMUM NUMBER OF EXAMINATIONS / PROCEDURES REQUIRED FOR 6 MONTHS OF TRAINING

Examination/Procedure	Training	Requirement (Exams codes)
CT examinations	Perform and report	360
<i>Including</i> Brain		180
Orbit/Face/PNS		20
Spine		20
CT angiogram		40
CT perfusion		8
MR examinations	Perform and report	480
<i>Including</i> Brain/Brain stem		180
Orbit		26
IAM		20
Pituitary		26
Spine		50
MR angiography (plain/contrast)		26
Single/Multi-Voxel MR spectroscopy		14
Diffusion weighted imaging		60
Diffusion Tensor Imaging		6
Functional MRI (brain mapping)		4
MR brain perfusion		6
CSF flow analysis		4

Examination/Procedure	Training	Requirement (Exams codes)
Ultrasound examinations Ultrasound of the infant brain Doppler ultrasound of the carotid / vertebral arteries	Perform and report	40 10 20
Diagnostic angiograms	Perform and report	40
<i>Including</i> IV Conebeam CT Angio (optional)		
Neurointerventional procedures	Observe	4

- 3.5.1 Please refer to the following appendices for the RIS coding:
 Angiogram (Appendix I)
 CT examination (Appendix II)
 MR examination (Appendix III)
 US examination (Appendix IV)
 Interventional procedures and optional requirements (Appendix V)
- 3.5.2 The requirement for 3 months of training will be 50% that for 6 months of training.
- 3.6 CLINICAL RADIOLOGICAL CONFERENCES AND OTHER MEETINGS
Present cases in neuroradiology related CRC held at least twice a month.
- 3.7 PRESENTATIONS AND PUBLICATIONS
Please refer to the Guidelines on Higher Specialist Training (Radiology).
- 3.8 OTHER REQUIREMENTS
- 3.8.1 The appendices must be completed and attached to the trainee's logbook to reflect the training experience.
- 3.8.2 Optional exposure requirements:
It would be an advantage if the trainee has the following working experience:
- (a) Reporting of plain radiographs in the investigation of neurological disorders,
 - (b) Transcranial Doppler of intracranial circulation,
 - (c) Orbital ultrasonography,
 - (d) Conventional/CT myelography,
 - (e) PET or SPECT isotope brain scanning,
 - (f) Imaging for stereotactic brain biopsy/planning,
 - (g) Neuro-navigation procedures.
 - (h) Vessel wall imaging
 - (i) Observing open neurosurgical operations

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Appendix I

Trainee Experience in Diagnostic Neuroradiology Training

[Angiograms]

Trainee's Name:

Training Period: From _____ to _____

**Perform and report at least 40 examinations in 6 months or
20 examinations in 3 months**

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
6105	Carotid arteriogram	
6106	Vertebral arteriogram	
6113	Spinal arteriogram	
	Total	

Other Angiogram examinations

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
6102	Arch aortogram	
6107	Subclavian arteriogram	
	Total	

Optional

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
6402	IV Conebeam CT angio. (optional)	

Total number of Angiogram examinations experienced

in _____ months is _____.

Total number of Interventional Neuroradiology procedures observed

in _____ months is _____.

(at least 4 in 6 months and 2 in 3 months)

(Signed) _____
Neuroradiology Trainer

Trainee Experience in Diagnostic Neuroradiology Training**[CT Examination]**

Trainee's Name:

Training Period: From _____ to _____

**Overall Requirement: Perform and report at least 360 examinations in 6 months or
180 examinations in 3 months****Brain: At least 180 examinations in 6 months or 90 examinations in 3 months**

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4101	Brain plain	
4102	Brain +con.	
	Total	

Orbits: At least 20 examinations in 6 months or 10 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4105	Orbit plain	
4106	Orbit +con.	
4113	Sinuses & Face plain	
4114	Sinuses & Face + con.	
	Total	

Spine: At least 20 examinations in 6 months or 10 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4305	Cervical spine plain	
4306	Cervical spine +con.	
4307	Thoracic spine plain	
4308	Thoracic spine +con.	
4309	Lumbar spine plain	
4310	Lumbar spine +con.	
4313	Sacrum plain	
4314	Sacrum +con.	
	Total	

CT Angiogram (head/neck): At least 40 examinations in 6 months or 20 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4404	CT angiography	

Brain Perfusion: At least 8 examinations in 6 months or 4 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4119	Brain Perfusion	
4120	Brain Pefusion + Diamox	

Others

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
4103	Temporal plain	
4104	Temporal +con.	
4419	Plain Neurosurgery stereotactic planning	
4420	Contrast Neurosurgery stereotactic planning	
	Total	

Total number of CT examinations performed and reported

in _____ months is _____.

(Signed) _____
Neuroradiology Trainer

Trainee Experience in Diagnostic Neuroradiology Training**[MR Examination]**

Trainee's Name:

Training Period: From _____ to _____

**Overall Requirement: Perform and report at least 480 examinations in 6 months or
240 examinations in 3 months**

Brain: At least 180 examinations in 6 months or 90 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8101	Brain plain	
8102	Brain+con.	
8113	Brain stem and craniocervical junction plain	
8114	Brain stem and craniocervical junction plain + con.	
	Total	

Orbits: At least 26 examinations in 6 months or 13 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8103	Orbit plain	
8104	Orbit +con.	
	Total	

IAM/CP angle and brain stem: At least 20 examinations in 6 months or 10 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8105	IAM/CP angle plain	
8106	IAM/CP angle + con.	
	Total	

Pituitary: At least 26 examinations in 6 months or 13 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8107	Pituitary plain	
8108	Pituitary +con.	
	Total	

Spine: At least 50 examinations in 6 months or 25 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8201	Cervical spine plain	
8202	Cervical spine +con.	
8203	Thoracic spine plain	
8204	Thoracic spine +con.	
8205	Lumbar spine plain	
8206	Lumbar spine +con.	
8207	Survey plain	
8208	Survey +con.	
8210	MR Myelography	
	Total	

Special MRI Examination: At least 120 examinations in 6 months or 60 examinations in 3 months (Please see the table in section 3.5 for the minimum requirement for each subtype of special MRI examination)

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
8501	Plain MR Angiography	
8521	MRA/V (Head&Neck) + con.	
8601	Single voxel Proton MR Spectroscopy	
8605	Multi-voxel Proton MR Spectroscopy	
8608	Diffusion Weighted Imaging (Brain)	
8609	Diffusion Tensor Imaging	
8603	Functional MRI (Brain mapping)	
8610	MR Brain Perfusion Imaging (including Arterial Spin Labelling)	
8611	Quantitative flow analysis	
	Total	

Total number of MRI examinations performed and reported

in _____ months is _____.

(Signed) _____
Neuroradiology Trainer

Trainee Experience in Diagnostic Neuroradiology Training**[Ultrasound Examination]**

Trainee's Name:

Training Period: From _____ to _____

**Perform and report at least 40 examinations in 6 months or
20 examinations in 3 months**

Brain: At least 10 examinations in 6 months or 5 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedure</i>	<i>No. of Examinations</i>
3201	Infant brain	

Doppler Examination: At least 20 examinations in 6 months or 10 examinations in 3 months

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
3302	Doppler carotids	

Optional

<i>RIS Coding</i>	<i>Name of Procedures</i>	<i>No. of Examinations</i>
3303	Doppler orbits	
3305	Doppler Transcranial	
	Total	

Total number of Ultrasound examinations performed and reported

in _____ months is _____.

(Signed) _____
Neuroradiology Trainer

Trainee Experience in Diagnostic Neuroradiology Training

Trainee's Name:

Training Period: From _____ to _____

Optional Exposure

<i>RIS Coding</i>	<i>Name of Procedure</i>	<i>No. of Examinations</i>
1601, 1602, 1603, 1604, 1610, 1611	Plain film reporting	
2301, 2302, 2303, 2304	Myelography	
8520	Plain MR Venography	
9001	SPECT	
9004	SPECT/CT without CT reporting	
9005	SPECT/CT with CT reporting	
9020	Cisternography In-DTPA	
9021	Cisternography Tc-DTPA	
9022	Cisternography In-DTPA CSF Leak	
9023	Cisternography Tc-DTPA CSF Leak	
9040	Cerebral perfusion (HMPAO)	
9040.01	Cerebral perfusion (HMPAO) with Diamox	
9041	Cerebral perfusion (HMPAO with stabilising agent)	
9042	Cerebral perfusion (HMPAO with stabilising agent) + Diamox	
9045	Cerebral perfusion (ECD)	
9046	Cerebral perfusion (ECD) + Diamox	
9050	Dacryoscintigraphy	
9099	Miscellaneous Neurology	
9P13	Brain PET-CT FDG (3D)	
9C13	Brain PET-CT FDG (3D) + con.	
9P19	Miscellaneous Neurology PET-CT	
9C19	Miscellaneous Neurology PET-CT + con.	
9P90	Regional Brain PET-CT scan	
	Total	

(Signed) _____
Neuroradiology Trainer