Guidelines

For

Competency Based Training Programme

In

FNB- Neurovascular Intervention

2020

NATIONAL BOARD OF EXAMINATIONS IN MEDICAL SCIENCES
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I. Introduction

The field of neurointervention deals with diagnosing and treating pathologies involving the blood vessels of the central nervous system with a minimally invasive, endovascular technique. In the past, lack of scientific evidence, unavailability of skilled operators as well as procedure hardware had relegated the option of endovascular treatment to very few select places and thus inaccessible to a majority of patients.

In the past few years, rapid advances in technology and overwhelming new scientific evidence has brought the field of neurointervention to the forefront. Endovascular treatment of acute ischemic stroke is now a standard of care. Treatment of aneurysmal subarachnoid hemorrhage as well as brain arteriovenous malformations by neurointerventional techniques is now considered safe and effective. Pathologies like dural and spinal arteriovenous fistulae can be treated only by endovascular treatments.

The incidence and morbidity associated with stroke and subarachnoid hemorrhage are increasing. As the population expands, more and more people are affected by these disorders at progressively younger ages. Advances in diagnostics have led to an increase in diagnoses of vascular malformations. There is an acute need for skilled neurointerventionists to deal with these problems.

The ultimate purpose of FNB in Neurointervention is to train neurologists, neurosurgeons and neuroradiologists in skills that help bridge the gap between the occurrence of neurovascular disorders and availability of optimal care.

A. Neuro - intervention and India

Stroke is the second most common cause of death in India. Studies have estimated that there are about 165000 stroke incidences in India per year, which translates to about one stroke every 40 seconds and one death related to stroke every 4 minutes. Over the past few years, there has been an increase of 68% in stroke related morbidity and 28% in stroke mortality. It is correct to say that we have a stroke "epidemic" on our hands.

Before 2015, acute stroke care was limited to intravenous (IV) administration of tissue plasminogen activator (tPA) within 4.5 hours of stroke onset. A series of large studies was published in 2015 that paved the way for mechanical thrombectomy to be a first-line treatment in acute ischemic stroke. Guidelines were updated to allow mechanical thrombectomy up to six hours following stroke onset. Further studies published in 2017 extended the possibility of

mechanical thrombectomy in stroke till 24 hours in selected patients. At the same time, IV tPA is still restricted to the first 4.5 hours.

Advances in aneurysmal subarachnoid hemorrhage treatments and endovascular materials have led to neurointerventional techniques being as effective and safer than surgical treatment. This applies to treatment of other neurovascular disorders like brain and spinal arteriovenous malformations as well as arteriovenous fistulae.

In this scenario, it has become imperative to train neurologists, neurosurgeons and neuroradiologists who have the requisite skills to treat these neurovascular disorders. It is only by increasing the number of skilled personnel that we will be able to extend the best treatment available to the maximum number of patients.

a) Present Status of Neuro - intervention in India

Despite the burgeoning numbers of people requiring neurointerventional care, centres that have the requisite infrastructure and trained interventionists are in short supply. The number of neurointerventionists in India at present is estimated to be about 50. According to a recent article, in the Western world, neurointervention training underwent four stages: self-taught, grand-fatherly teaching, non-accredited fellowships and finally, accredited fellowships. In India, most of the training is either grand-fatherly or through non-accredited fellowships through societies. It is now time to have accredited neurointervention fellowships. The best way to implement this at a national level is through the National Board of Examinations.

b) Pre hospital Stroke Care in India

The treatment of acute stroke in time constrained. Outcomes are better when treatment is started as early as possible after the onset of symptoms. This is especially true for large vessel stroke requiring intervention. Public awareness about stroke is sorely lacking. Recognition of early stroke symptoms would result in faster access to stroke care. Also lacking is EMS training in recognition of stroke. This causes delay in transporting patients to a stroke-ready or intervention-ready hospital as well as negates any opportunity for prenotification of stroke patients to that hospital.

c) Hospital Based Neurointervention Care in India

Any hospital that provides neurointervention care requires a dedicated setup which includes a cath lab, laboratory services, trained staff and at the centre of all, a trained and skilled neurointerventionist. At present, there are very few hospitals in India that provide

neurointerventional treatment. Most of these are in the private sector and restricted to large cities. There is a need to develop such facilities so that a greater number of patients gain access to these treatments. The first step in this development is to train more neurointerventionists.

d) Challenges facing Neurointervention in India

There are a number of challenges currently facing the field of neurointervention in India. Some of them are listed below:

i) Lack of patient awareness: "Time is brain"
ii) Lack of EMS knowledge, training and pre - notification
iii) Lack of stroke physicians
iv) Access to quality imaging
v) Access to IV tPA
vi) Paucity of stroke-ready and intervention-ready hospitals
vii) Lack of awareness among doctors about different neurovascular diseases
viii) Lack of proper training centres and qualified neurointerventionists

e) Core Competencies of the Neurointerventionist

The areas of competency in Neuro intervention are:

i) Patient care
ii) Medical knowledge
iii) Communication, collaboration and interpersonal skills
iv) Professionalism, ethical and legal issues
v) Organizational planning and service management skills
vi) Education and research

II. Programme Goal and Objectives

A. Programme Goals:

The goal of the training program is to produce Neurointerventionists with the necessary knowledge, skill and attitude to diagnose and manage a wide range of clinical problems related to stroke and neurointerventionin an effective manner. The necessary qualities include:

a) Sound knowledge and skills of the emergency aspects of stroke, and its application within the time window.

b) Competent in life saving emergency interventions and appropriately use various diagnostic tests, and interpret their results intelligently & promptly.

c) Competent in assessing as well as planning and executing treatments for various neurovascular disorders.

d) Be familiar with the fundamentals of research methodology.

e) Possess humanistic qualities, attitudes and behaviour necessary for the development of appropriate patient-doctor relationship.

f) To assist and if necessary train subordinates.

g) To keep up-to-date and be familiar with all recent advances in the field of stroke and neurointervention.

B. Programme Objectives:

a) Patient Care: Neurointerventionists practice patient care that is timely, effective, appropriate, and compassionate for the management of health problems and the promotion of health. Specific objectives are as follows:

i) Gather accurate, essential information in a timely manner from all sources, including medical interviews, physical examinations, prehospital care personnel, medical records, and diagnostic and therapeutic procedures

ii) Integrate diagnostic information and generate an appropriate differential diagnosis

iii) Implement an effective patient management plan including therapy, appropriate consultation, disposition, and patient education

iv) Competently perform the diagnostic and therapeutic procedures and emergency stabilization

v) Demonstrate the ability to appropriately prioritize and stabilize patients and perform other responsibilities simultaneously

vi) Provide health care services aimed at preventing health problems or maintaining health

vii) Work with health care professionals, including those from other disciplines, to provide patient-focused care

b) **Medical Knowledge**: Neurointerventionists formulate an appropriate differential diagnosis with special attention to stroke and neurovascular disorders, demonstrate the ability to use available medical resources effectively and concurrent with patient care, and apply this knowledge to critical problem solving and clinical decision making. Specific objectives:

i) Identify life-threatening conditions

ii) Identify the most likely diagnosis

iii) Synthesize acquired patient data

iv) Identify how and when to access current medical information

v) Properly sequence critical actions inpatient care

vi) Generate a differential diagnosis for an undifferentiated patient

vii) Complete disposition of patients using available resources

c) **Practice-Based Learning and Improvement**: Neurointerventionists evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices. Specific objectives are as follows:

i) Analyze and assess their practice experience and perform practice-based improvement using systematic methodology

ii) Locate, appraise, and use scientific evidence related to their patient's health problems and the larger population from which the patient is drawn

iii) Apply knowledge of study design and statistical methods to critically appraise the medical literature

iv) Use information technology to enhance their education and improve patient care

d) **Interpersonal and Communication Skills:** Neurointerventionists should have excellent interpersonal and communication skills that result in effective information exchange and teaming with patients, their families, and professional associates. Specific objectives include the following:

i) Demonstrate the ability to respectfully, effectively, and efficiently develop a therapeutic relationship with patients and their families
ii) Demonstrate respect for diversity, cultural, ethnic, spiritual, emotional, and age-specific differences in patients and other members of the health care team
iii) Demonstrate effective listening skills and be able to elicit and provide information using verbal, nonverbal, written, and technological skills
iv) Demonstrate ability to develop flexible communication strategies and be able to adjust them according to the clinical situation
v) Demonstrate effective participation in and leadership of the health care team
vi) Demonstrate ability to elicit a patient's motivation in seeking health care
vii) Demonstrate ability to negotiate and resolve conflicts
viii) Demonstrate effective written communication skills with other providers and ability to effectively summarize for the patient on discharge
ix) Demonstrate ability to effectively use the feedback provided by others
x) Demonstrate ability to handle situations unique to stroke and neurointervention
- Acute stroke cases, altered mental status
- High-risk refusal-of-care patients, Delivering bad news
- Difficulties with consultants, patients with communications barriers
- Communication with pre hospital personnel, cath lab staff and non medical personnel

2.

e) **Professionalism:** Neurointerventionists should demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population. Specific objectives, as these pertain to the practice of stroke and neurointervention, are defined by a set of model behaviors:

i) Arrives on time and prepares for work, appropriate sign-outs, both giving and receiving

ii) Willingly treats patients throughout the entire shift

iii) Observable patient advocacy in disposition

iv) Completes medical records honestly and punctually

v) Treats patients/family/staff/paraprofessional personnel with respect

vi) Protects staff/family/patient's interests/confidentiality

vii) Demonstrates sensitivity to patient's pain, emotional state, and sex/ethnicity issues

viii) Actively seeks feedback and immediately self-corrects, effectively coordinates team

ix) Unconditional positive regard for the patient, family, staff, and consultants

x) Accepts responsibility/accountability

xi) Recognizes the influence of marketing and advertising

xii) Open/responsive to input/feedback of other team members, patients, families, and peers

xiii) Uses humor/language appropriately, Participates in peer review process

xiv) Discusses death honestly, sensitively, patiently, and compassionately

xv) Specific knowledge expectations that neurointerventionists should be familiar with:

- Definitions of justice, autonomy, beneficence ,non – malfeasance, healthcare decision - making capacity, living will, advanced directive, informed consent
- Criteria appropriate to apply when allowing patients to sign out against medical advice
- Documentation and billing requirements
- With whom confidential patient information can or cannot be discussed
- Mechanisms for appropriate transfer of patients and emergency medical treatment

ii)

f) **Systems-Based Practice**: Neurointerventionists should be aware and responsive to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Specific objectives are as follows:

i) Understand, access, appropriately use, and evaluate the effectiveness of the resources, providers, and systems necessary to provide optimal emergency care

ii) Understand different medical practice models and delivery systems and how to best use them to care for the individual patient

iii) Practice cost-effective health care and resource allocation that does not compromise quality of care

g) **Proficiency:** Neurointerventionists should have the skills to diagnose neurovascular disorders based on synthesizing information from clinical examination, investigations and imaging studies. They should be able to formulate a treatment strategy, communicate it effectively to the patient including possible complications and execute the treatment. Specific objectives are as follows:

i) Recognise signs and symptoms of disorders amenable to diagnosis and treatment by Neuro Intervention techniques.

ii) Perform basic neurological examinations to evaluate patients with these neurological disorders.

iii) Understand the pathophysiology and natural history of these disorders.

iv) Know the indications and contraindications to Neuro Intervention procedures.

v) Be conversant with the clinical and technical aspects of Neuro Intervention procedures.

vi) Accurately report diagnostic and follow-up Digital Subtraction Angiograms as well as Neuro Interventional procedures

vii) Discuss medical and surgical alternatives.

viii) Be proficient in pre and post procedure management of neuro Interventional patients.

ix) Handle neurointensive care management in consultation with neuro Intensivist.

x) Know how to prevent, recognise and manage of complications associated with these Neuro Interventional procedures

xi) Understand the fundamentals of imaging, radiation physics and radiation biology.

xii) Integrate information available from imaging studies, pertinent to the neurovascular practice.

xiii) Communicate effectively with referring doctor, patient and family.

III. Teaching and Training Activities

The fundamental components of the teaching programme in the Neurointervention should include:

i) Case presentations & discussion - once a week
ii) Seminar – Once a week
iii) Journal club - once in 2 weeks
iv) Statistical & mortality meet- once a month
v) Clinico – radiological meetings- once a month
vi) Faculty lecture teaching - once a month

The rounds should include bedside sessions, case file rounds and documentation of case history and examination, progress notes, round discussions, investigations and management plan of interesting and difficult cases.

A. Breakup of Training Period

The fellows will undergo training as per a structured training schedule. The first year will be dedicated to neurointervention basics and diagnostic procedures while the second year will be dedicated to learning therapeutic neurointerventions. There will be a rotation of 2 to 4 weeks in another training centre during this period. The breakup is as follows:

B. First Year

a) 3 months: Neurovascular anatomy and pathophysiology, Reporting, Neuropharmacology, Pre-op and post-op care
b) 9 months : Diagnostic cerebral and spinal angiograms

C. Second Year

a) 1 year :Therapeautic Neuro Interventional procedures

IV. Syllabus

A. 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

B. Technical Aspects of Neurointervention

a) Femoral artery and arterial access and closure
b) Guiding Catheter/ Sheath deployement
c) Microcatheters and microwires
d) Balloons, stents, stent retrievers, embolic protection devices
e) Flow divertor stents
f) Embolic agents – coils, liquids
g) Basic knowledge of various types of Neuroanesthesia used for interventional procedures
h) Complications of procedures : prevention, recognition and management

C. Pharmacologic Agents

a) Contrast materials
b) Provocative testing
c) Anticoagulant, antiplatelets and GP2b3a inhibitors
d) Thrombolytics
e) Anti-vasospasm agents

D. **Coagulation Cascade**

a) **Neurovascular Disorders**

Include 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

i) Classification
ii) Clinical presentation
iii) Natural history
iv) Epidemiologic data
v) Hemodynamic basis
vi) Indications for treatment
vii) Contraindications for treatment
viii) Therapeutic techniques : exposure, participation and supervised hands-on training in performance of diagnostic and therapeautic interventional procedures
ix) Combined therapies

E. TUMORS OF THE HEAD, NECK, SPINE, AND CENTRAL NERVOUS SYSTEM

F. 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)

G. EMBOLIZATION FOR EPISTAXIS OR OTHER CAUSES OF HAEMORRHAGE

a) IPSS
b) BALLOON TEST OCCLUSIONS
c) RADIATION PROTECTION AND SIDE EFFECTS
d) MAJOR TRIALS AND IMAGING
e) CLINICAL ASSESSMENT INCLUDING VARIOUS SCALES LIKE NIHSS, MRS ETC.

V. Competencies

(Recommended Number of Procedures)

The fellow will get to do at least the below mentioned number of cases in 2 years of his fellowship. Simulator training for skill development will be arranged at least once per year.

- Diagnostic angiograms: 125
- Therapeutic procedures (intervention cases): 30

VI. Log Book

The logbook should show evidence that the previously mentioned subjects were covered with dates and the name of the teachers. The candidate will maintain the record of all academic activities undertaken by him/her in log book

- Personal profile of candidate
- Educational qualifications/ professional data
- Procedures learnt: the candidates are expected to learn diagnostic and therapeutic procedures during their training in Neurointervention. The record should depict procedures observed, assisted and performed during the period of training
- Record of case Demonstration/ Presentations
- Record of Participation in CME activities: Direct contact activities (Lectures, seminars, workshops, c conferences); indirect contact activities (Correspondence journals, books, audio-video tapes)

VII. Recommended Text Books and Journals

A. Textbooks & Reference Books

a) Textbook of Interventional Neurology: Adnan Qureshi
b) Practical Neuroangiography: Pearse Morris
c) Cerebral Angiography: Gianni Boris Bradac
d) Surgical Neuroangiography (Vol 1 - 3): P Lasjaunias, A Berenstein, KG terBrugge
e) Handbook of Cerebrovascular disease and Neurointerventional Technique: Mark Harrigan
f) Caplan's Stroke, a clinical approach: Louis Caplan
g) Vascular Embolotherapy (Vol 1 - 2): J Golzarian
h) Neurointerventional techniques: L Fernando Gonzalez
i) Handbook of angioplasty and stenting procedures: Robert Morgan
j) Dural cavernous sinus fistulas: G Benndorf
k) Acute ischemic stroke, imaging and intervention: RG Gonzalez
l) Tutorials in endovascular neurosurgery and interventional neuroradiology: James Vincent Byrne

B. Journals

a) New England Journal of Medicine
b) Stroke
c) Interventional Neurology
d) Journal of Neurointerventional Surgery
e) Journal of Vascular and Interventional Neurology
f) Journal of Vascular and Interventional Radiology
g) American Journal of Neuroradiology
h) Neurology India
i) Annals of Indian Academy of Neurology
j) Journal of Neuroradiology
k) Neuroradiology
l) Diagnostic and Interventional Radiology

C. **Internet Online Resources**

a) Neurangio.org

b) American Heart Association/American Stroke Association

c) European Stroke Association

d) Indian Stroke Association

D. **Neurointervention Organizations**

a) Society of Neuro Vascular Interventions (SNVI)

b) Society of Therapeutic Neurointerventions (STNI)

c) Society of Vascular and Interventional Neurology (SVIN)

d) Indian Academy of Neurology

e) Indian Stroke Association

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