Vascular Neurology
(Stroke) Fellowship Program

Training Program Manual
June, 2015
Background

Stroke is the second leading cause of death and a leading cause of adult disability across the world. Stroke is preventable yet increasing globally. In older studies from 1990s the standardized incidence of stroke was calculated at 125.8 per 100,000 population, with a prevalence of stroke survivors at 186/100,000 Saudi population [Al Rajeh 2002]. However, this data probably underestimated the actual incidence of stroke in the country. The global burden of diseases study 2010 estimated the incidence of stroke in our region to be around 250 per 100000 population. This translates into more than 40,000 annual strokes.

It is now well established that patients treated in stroke units, have better outcomes and lower morbidity and mortality rates than those treated in a regular medical unit. An average stroke unit admits about 300 to 400 patients in a year [Cordonnier]. This suggests that Saudi Arabia will need at least 30 to 40 stroke units by 2025, only one decade from now. Each stroke unit is served by 2 to 4 stroke trained neurologists. Currently there are less than 20 stroke specialists in the country, whereas the need is for at least 120 to 160 stroke specialists in next 10 years. With the rapidly changing academic and economic dynamics, Saudi Arabia may not be able to attract enough foreign qualified stroke specialists to cater to the need of the nation, hence it is mandatory that we start working on establishing stroke units, stroke system of care and training stroke specialists as early as possible.

The aim of the program:

The mission of the fellowship training program is to produce vascular neurologists who are ethical, competent, compassionate, academically sound, research oriented, and ready to serve the country and humanity.

Duration of the program: 2 years

Number of Fellows: 2 fellows each year

Eligibility: Candidates who have completed accredited neurology training in Saudi Arabia or Gulf countries or have equivalent training elsewhere (board certification will be preferred)
Selection:
1. The applications will be accepted 9 - 12 months prior to the commencement of academic year
2. Three (3) letters of recommendation will be required with the application
3. Academic and research activities during the residency training will be considered positively
4. Previous academic background in undergraduate and medical education will also be considered during selection process
5. Personal interviews will be carried out by the designated faculty
6. Final selection of the candidate(s) will be made by the interview panel

Annual Schedule:
Following will be the broad distribution of rotations during the 2 years of training

<table>
<thead>
<tr>
<th>First year of training</th>
<th>Second year of training</th>
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<tbody>
<tr>
<td>• 6 block rotation on in-patient stroke service</td>
<td>• 3 block rotation on in-patient stroke service (primarily supervising junior fellow)</td>
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<tr>
<td>• 2 block rotation in neuroimaging/endovascular neurology</td>
<td>• 2 blocks for research (preferably in 1st half of the 2nd academic year)</td>
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<td>• 1 block rotation in neurosonology (including TCD) and echocardiography</td>
<td>• 2 blocks in out-patient stroke + community outreach</td>
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<tr>
<td>• 1 block rotation in neurointensive care unit</td>
<td>• 2 blocks rotation in neuroimaging/endovascular neurology</td>
</tr>
<tr>
<td>• 1 block rotation in research (primarily to design and write research proposal)</td>
<td>• 1 block rotation in neurorehabilitation</td>
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<tr>
<td>• 1 block elective rotation</td>
<td>• 1 block rotation in neurointensive care unit</td>
</tr>
<tr>
<td>• 1 block of annual leave</td>
<td>• 1 block elective rotation</td>
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<td>• 1 block of annual leave</td>
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Clinical Responsibilities and Training of Fellow:

Fellows will be mastering stroke care by providing supervised in-hospital and out-patient care to the stroke patients. Clinical responsibilities will include emergency room evaluation (quick clinical examination and urgent interpretation of diagnostic evaluation including CT brain, and CT angiography) and management (deciding the appropriateness and administration of thrombolysis) according to approved protocols, triaging admission to either neuro ICU, stroke high dependency unit or regular stroke unit bed, as well as planning further diagnostic evaluation and acute and subacute management.

The fellows will be responsible of well-being and care of all in-patients under stroke team and will supervise neurology and rotating residents in day to day management of stroke patients. They will also be responsible for providing stroke consult service to other specialties including medicine and neurosurgery.

Following is an outline of clinical and personal responsibilities which will include direct apprenticeship style training:

i. When on in-patient stroke service (at least 6 months in 1st year), should do daily rounds on the in-patient stroke service with team including residents, nurses and stroke coordinator. Supervisory and informative concised notes are expected from the fellow including a summary note on all new admissions,

ii. When on in-patient stroke service, participate in attending/consultant rounds,

iii. To supervise the residents in providing stroke consultation to other services and discuss with the attending/consultant all the cases. If needed, arrange and facilitate attending/consultant round on these patients,

iv. To present and discuss cases with other colleagues in radiology, neurosurgery, cardiology, rehabilitation and other services whenever patient care requires multi-disciplinary approach,

v. To cover the stroke code during working hours when on in-patient service,

vi. To cover the stroke code when assigned to back-up call,

vii. To attend the stroke clinics when on any rotation inside the hospital including in-patient stroke service, unless attending a stroke code. The fellow should organize
schedule such that ward activities do not interfere attendance in clinic (longitudinal clinic style is encouraged to enhance longitudinal learning).

viii. To attend interventional radiology procedures in stroke patients, particularly those who are undergoing acute thrombolysis,

ix. To strive to learn hands on techniques including transcranial Doppler (TCD),

x. To attend and actively participate in all academic and research activities of the stroke team,

xi. To actively participate in formulating and conducting his own research (at least one research project should be completed before graduation),

xii. To work hand in hand with neurology residents, assistant consultants, stroke team members to provide the best possible care to the patients and their families,

xiii. The fellow is expected to show highest ethical and moral standards and comply with all the policies and procedures of the institution,

xiv. The fellow is expected to show excellent communication and ability to lead and control the teaching multidisciplinary environment.

Stroke Code Call

When on in-patient stroke service, fellow will be responsible for responding to stroke code activation. He/she will assess the patient with resident/ and or intern, and stroke nurse. Facilitate the initial assessment and plan the management after discussion with the consultant on service. If there is a need to interventional radiologist and/or neurosurgeon or ICU, the fellow will co-ordinate these communications.

The fellow will be assigned on an average 1 in 4 night and weekend back up call schedule for almost all year except when doing outside the hospital rotations. As a night and weekend back-up person, the fellow will be 2nd on call and will respond to the in-house resident. The fellow is expected to come to the hospital if the need arises to facilitate acute management of the patient.
Academic Responsibilities of Fellow:

The fellow is expected to be academically inclined and show motivation for self-learning. The consultants/faculty will provide the necessary supervision and guidance. A brief outline of academic responsibilities include:

i. Participating in all academic conferences related to stroke when doing any rotation inside the hospital,

ii. To attend and sometimes present in stroke journal clubs, case conferences, neuroradiology conference, and city-wide stroke academic activities,

iii. The fellow is expected to complete at least one, preferably more research projects during the fellowship,

iv. The fellow will be encouraged to write case reports, reviews and original articles during the fellowship. Necessary supervision and help will be provided by the faculty/consultants

v. The fellow is expected to supervise and teach the residents/interns rotating on stroke service,

vi. The fellow is expected to actively participate in teaching nursing staff, rehabilitation staff (physical therapists, occupational therapists, speech and language pathologists, swallowing therapy experts, social workers, and other members of the stroke team about various aspects of stroke,

vii. The fellow will also be asked to participate in teaching of other relevant specialties (e.g. ER nursing staff, ICU nursing staff, unit managers etc.) about stroke,

viii. The fellow will be expected to participate in at least one national and one international meeting of relevance during the training period

Weekly Clinical Activities Calendar:

Weekly clinical activities are briefly summarized but not limited to the following:

i. When on in-patient stroke service
   a. Daily rounds on in-patients
   b. Providing consult service
   c. Attending all stroke codes
ii. Attend twice a week stroke clinic (throughout the year except when doing out-of-hospital rotation)

iii. Attend weekly Multidisciplinary Stroke Team conference when on in-patient service and if required at other times (when not on in-patient service)

iv. On average 1 in 4 night call and 1 in 4 weekend call

**Weekly Academic Activities Calendar:**

Weekly activities may include but not limited to the following:

- Neuroradiology Case Conference
- Stroke Journal Club
- Stroke Mortality and Morbidity Conference
- Stroke Case Conference
- Stroke Grand Round
- Multidisciplinary Stroke Team conference
- Stroke Teaching Round (conducted by consultant on in-patient stroke service)
- City-wide Stroke Club

**Core Syllabus and Reading Guide:**

The recommended books for the fellows during one year of training are:

i. *Stroke: pathophysiology, diagnosis and management*, Editors: Wolf, Mohr, Moskowitz and Mayberg

ii. *Imaging Cerebrovascular Disease*, Editors: Babikian, Wechsler and Higashida

iii. *Intracerebral Hemorrhage*, Editors: Carhuapoma, Mayer and Hanley

The recommended journals for the fellows are:

i. *Stroke*

ii. *International Journal of Stroke*

iii. *Journal of Stroke and Cerebrovascular Disease*

iv. *Cerebrovascular Diseases*

v. *Neurology*
Privileges and Perks of Fellow:
The salary of fellow will be according to the policy of local hospital/sponsoring agency.

   i. Access to various stroke and neurology journals through the hospital library.

The program should arrange for travel and accommodation (if feasible) if the fellow presents a poster/presentation in a national/international meeting with data from current fellowship training.

Duty Hours:
The duty hours of fellow will be according to policy of the training center.

Annual Holidays and Educational Leave:

- 1 month of annual leave
  - The annual leave can be taken into 1 or 2 blocks and each block of minimal 1 week
- 1 week of educational leave (to attend national/international conference)
- Eid Holidays (either Eid-al-Adha or Eid-al-Fitr) as per local hospital policy and after mutual agreement of fellows and program director
- Application for leave with signed leave authorization form should be submitted at least 3 months prior to the date of leave.
- Official forms are available with the program administrative assistant. The time of leave especially for the annual and eid holidays should be arranged with program director.

Supervision:
Most of the training of fellow will be in direct apprenticeship fashion where fellow will attach with the faculty/consultant on service and learn under his direct supervision. Additionally, formal academic sessions will be held as outlined above that will be supervised by core as well as adjunct faculty.
Education Strategies:

Learning methods should be congruent to goals and objectives and should be learner centered. The most important method of training will be teaching at the bedside of the patient, either in in-patient setting or in an out-patient clinic. Case discussions between fellows and faculty will focus on the diagnosis, treatment and management of stroke related disorders. Fellows will be given pre reading material and internet sources for discussion and team based learning. Didactic lectures, formal presentations and demonstration of neurological examination, and interpretation of radiological studies and laboratory data by the fellows to the faculty is also included in the learning strategies. Regular grand rounds, journal clubs and lecture series are a part of training program. Fellows will be expected to attend at least 80% of all teaching conferences. Attendance at these conferences will be strongly considered in performance evaluations. The trainees will be encouraged for self-reading and to participate in research projects.

Evaluation and Feedback:

Continuous assessment and verbal and scheduled written feedback will be provided. The fellow performance will be evaluated each block using CanMEDs based evaluation (form attached). The fellowship program director will meet every 3 months with the fellow to provide formal evaluation and feedback. The summary of this meeting will be included in fellow’s personal file. Before the conclusion of training, the fellow will get a chance to appraise his training and get feedback from faculty.

Chart Review:

Chart review provides evidence about clinical decision making, follow-up in patient management and appropriate use of clinical facilities and resources. The consultant/faculty will review charts and give verbal feed back to the trainee concerning the written notes from time to time at random interval and random selection.

The following items from chart will be specifically reviewed by the faculty:

- Chief complaint or reason for consultation
- History of the present illness
- Past medical history
- Neurological examination/Stroke related examination
- Assessment and differential diagnosis
- Interpretation of radiological and laboratory data
- Diagnostic and treatment plan
- Prognosis and discharge planning
- Documentation of assessment and outcome measures tools like (NIHSS, modified Rankin, Barthel index, ASPECTS, Hunt and Hess, Fisher Grade, FIM, etc..)

**Anonymous evaluation of the faculty:**

The fellow will be provided with the evaluation forms twice a year to assess the faculty anonymously. The completed forms will be submitted to the head of division and will be kept in the faculty’s file.

**360º Evaluation:**

360º evaluations consist of measurement tools completed by multiple people in a person’s sphere of influence. Evaluators completing rating forms in a 360º evaluation usually are superiors, peers, subordinates, and patients and their families. Most 360º evaluations use rating scales to assess how frequently a behavior is performed. The ratings are summarized for all evaluators by topic and overall to provide feedback. A 360º evaluation can be used to assess interpersonal and communication skills, professional behaviors, and some aspects of patient care.

**End of year 1 examination and promotion to year 2 of training:**

Close to the end of 1st year of training, an examination will be conducted which will comprise of written and oral parts. This will be a part of assessment for promotion to the 2nd year of training. The written examination will comprise of multiple choice questions and short essay questions, whereas oral examination will comprise of a long case, and viva voce components. Promotion to 2nd year of training will be based on performance in this examination as well as monthly evaluations, quarterly evaluations, as well as overall performance assessment. Unsatisfactory performance in any or composite assessment may result in denial of promotion to 2nd year of training. In order for the fellow to be promoted he has to meet all the following:

1. Attend >80% of academic activities.
2. Score >80% in the overall evaluation of rotations
3. Score >70% in the written exam
4. Score >70% in the oral exam.
5. No disciplinary action (due to misconduct) from hospital/ SCHS authorities the stat repeating the year.

Exit Examination:

At the completion of 2 years of training, the fellow will be eligible to sit for an exit examination if he meets all the following criteria:

1. Attend >80% of academic activities.
2. Score >80% in the overall evaluation of rotations.
3. No disciplinary action (due to misconduct) from hospital/ SCHS authorities the stat repeating the year.

The format of the exit examination will be in accordance with the requirements of Saudi Commission for Health Specialties exit examinations.

Certification:

Upon successful completion of 2 years of training, the fellow will be awarded a certification of completion of 2 years of fellowship training in vascular neurology (stroke) by the accredited center and Saudi Commission for Health Specialties.

Core Curriculum:

The fellowship program will take into consideration the core curriculum suggested by the American Academy of Neurology [AAN]. This core curriculum suggests incorporation of knowledge of relevant aspects of basic science, epidemiology, clinical neurology, diagnostic and interventional radiology, neurosonology, cerebral blood flow/metabolism, neurological critical care, neurobehavior, and neurorehabilitation. Further, the program will adapt the CanMEds core competencies, The Safety Competencies by the Canadian Patient Safety Institute.
Core Competencies:

<table>
<thead>
<tr>
<th>1. Medical Expert</th>
<th>6. Scholar:</th>
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<tbody>
<tr>
<td>2. Communicator</td>
<td>• Lifelong Learning</td>
</tr>
<tr>
<td>3. Collaborator</td>
<td>• Critical Appraisal</td>
</tr>
<tr>
<td>4. Manager</td>
<td>• Teaching</td>
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<tr>
<td>5. Health Advocate</td>
<td>• Research</td>
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</tbody>
</table>

6. Scholar:
- Lifelong Learning
- Critical Appraisal
- Teaching
- Research

7. Professional:
- Professionalism
- Physician Health

8. Patient Safety and Quality Improvement

9. E-Health

- **Medical Expert**: the fellow should master the following topics:

  I. Stroke Mechanisms of Stroke

   A. General Mechanisms of Stroke

      1. Atherosclerosis

         a. common anatomical sites

         b. pathophysiology: cellular response, cytokines, lipids, plaque development and progression

         c. prevention strategies

      2. Thrombosis

         a. coagulation cascade

         b. platelet and coagulation system interactions

         c. endogenous fibrinolytic system

      3. Biochemical changes in brain ischemia. Current concepts of:

         a. excitotoxicity and mediator/inhibitory mechanisms
b. calcium homeostasis and calcium-related ischemic damage

c. reperfusion injury
d. the ischemic penumbra
e. endothelial cell activity

4. Hemorrhage

B. Pathophysiology of Brain Ischemia and Hemorrhage

C. Pathology of stroke

D. Mechanisms of brain ischemia

1. Cardiogenic brain embolism
   a. atrial fibrillation
   b. valvular abnormalities
   c. cardiomyopathies
   d. atrial septal abnormalities
   e. endocarditis

2. Large vessel atherosclerosis.
   a. Anterior circulation.
   b. Posterior circulation.

3. Aortic arch embolism

4. Small artery occlusive disease
   a. small deep infarcts
   b. white matter disease

5. Hemodynamic brain ischemia

6. Migraine

7. Pregnancy and hormonal contraception

8. Hereditary and acquired hypercoagulable states

10. DIC, TTP, other hematological disorders.

11. Antiphospholipid antibody syndromes

12. Sickle cell disease

13. Substance abuse and drug toxicities

14. Hypertensive encephalopathy

15. Arterial dissection
16. Fibromuscular dysplasia
17. Vasculopathies including inflammatory, infectious, Moya-moya.
18. Cerebral venous thrombosis
19. Genetic causes including CADASIL
20. Metabolic disorders (MELAS syndrome)

E. Mechanisms of Hemorrhagic Stroke
1. Intracerebral hemorrhage (ICH)
   a. hypertensive
   b. amyloid angiopathy
   c. vascular malformations
   d. drug or vasculitis related
   e. hematologic disorders
2. Aneurysmal subarachnoid hemorrhage (SAH)
3. Hemorrhagic infarction
4. Sinovenous occlusion
5. Subdural hematomas
6. Thrombolytic related

II. CLINICAL SYNDROMES:
A. Clinical Manifestations of the More Common Clinical Syndromes of Ischemic Stroke
1. Carotid artery occlusion
2. MCA, complete territory
3. MCA, superior division
4. MCA, inferior division
5. Striatocapsular infarction
6. “Watershed” infarctions, anterior and posterior
7. Basilar artery thrombotic and embolic syndromes.
8. Basilar branch occlusion
9. Vertebral occlusive disease
10. Thalamic syndromes
11. Classic lacunar syndromes
12. Major neurobehavioral syndromes of the right and left hemispheres
13. Major neurobehavioral syndromes of the posterior cerebral artery territory

B. Transient ischemic attack

III. DIAGNOSIS

A. Evaluation of stroke patients.
   1. Brain imaging
   2. Other diagnostic tests: EEG, CSF
   3. Arterial imaging
   4. Cardiac imaging
   5. Hematologic tests.

B. Neuroradiology
   1. Radiographic signs of acute and chronic ischemic and hemorrhagic stroke.
   2. Indications, contraindications, and cost considerations for the use of specific neuroradiographic studies.

C. Neurosonology
   1. Principles and interpretation of vascular ultrasound: Doppler principle, spectral analysis, B-mode imaging, color flow imaging
   2. Carotid duplex
      a. techniques to identify vessels
      b. artifacts
      c. principles of interpretation
      d. indications and limitations
      e. importance and method of establishing criteria for individual labs
   3. Transcranial doppler
      a. interpretation, indications, and limitations
      b. bubble/echocontrast studies
      c. diagnosis of vasospasm
      d. diagnosis of intracranial occlusive disease

IV. PATIENT MANAGEMENT

A. Medical management of acute stroke
   1. Management of blood pressure.
   2. Fluids, nutrition.
3. Differential diagnosis in ED
4. Acute stroke scales.
5. Thrombolytic treatment: evaluation, delivery, management, complications.
6. Antithrombotic therapies
9. SAH
   a. recognition and management of SAH and vasospasm
   b. indications and timing of aneurysmectomy
   c. interventional therapy
   d. management of complications of SAH (e.g., hydrocephalus)
10. Management of delayed complications, including cerebral edema and increased ICP.
11. Prevention of medical complications (e.g., DVT, infection, arrhythmias).

B. Surgical Treatment for Stroke and Stroke Prevention (basic understanding of possible indications and techniques)
   1. Carotid endarterectomy
   2. EC/IC Bypass
   3. Hemicraniectomy
   4. Resection of cerebellar infarction
   5. Evacuation of ICH

C. Medical Therapies for Stroke Prevention
   1. Antiplatelet agents: classes and clinical trial data
   2. Anticoagulation: indication, controversies, administration, complications, and clinical trial data.
   3. Management of risk factors:
      a. Hypertension
      b. Lipid disorders
   4. Emerging risk factors
   5. Stroke risk screening
6. Economics of stroke prevention therapies

D. Interventional Neuroradiology

1. Endovascular therapy, basic understanding of indications, techniques and costs
   a. percutaneous transluminal angioplasty
   b. carotid stenting
   c. intra-arterial thrombolysis
   d. embolization of arteriovenous malformations and coiling of aneurysms

2. Radiosurgery for arteriovenous malformations

E. Rehabilitation of Stroke Patients

1. Matching patients’ needs with appropriate rehabilitation services

2. Outcome measurements
   a. familiarity with scales (eg, NIH Stroke Scale, Barthel Index, Rankin Scale,
      Glasgow Outcome Scale, Functional Independence Measure)

3. General principles of acute and longer term stroke rehabilitation

4. Rehabilitation issues of depression, spasticity, pain.

5. Neurobehavioral issues, including aphasias and "nondominant hemisphere" syndromes.
   a. Vascular dementia: basic understanding of pathogenesis, assessment,
      diagnostic criteria, risk factors, prevention and treatment.

6. Transition to the community and continuity of care

V. EPIDEMIOLOGY

A. Economics of stroke.
   1. ICD codes

B. Genetics of stroke.

Rotation Specific Goals:

In-patient stroke service rotation

Supervision will be provided by stroke specialist on service

At the end of rotation through in-patient stroke service (spread over two years), the fellow will be able to:
1. Assess and diagnose acute stroke, interpret the diagnostic data, and decide on the need and feasibility of thrombolytic treatment in emergency setting

2. If the patient is eligible for IV thrombolytic treatment, he/she can calculate the dose of the medication and administer the appropriate dose after fulfilling the inclusion/exclusion requirements

3. If the patient is candidate for IA thrombolysis, initiate the appropriate consultations and coordinate the intraarterial treatment

4. Assess the clinical status of the patient to decide on appropriate point/place of care for each patient and if needed consult intensive care services and coordinate the care with them

5. Manage the day to day clinical affairs of stroke patients admitted under stroke team and when necessary initiate appropriate consultations

6. Provide consultation services to the patients who suffered stroke and are admitted under other services in the hospital

7. Interpret the pathophysiology and risk factors of stroke in individual patient and communicate those to the team members, patient and his/her family and other health care providers

8. Understand the prognostic factors of stroke, and able to communicate those to stroke team members, patient and his/her family and other health care providers

9. Supervise the neurology residents and other rotating residents/interns in the care of stroke patients

10. Understand the basic requirements of clinical research and participate in on-going clinical research of the stroke team.

**Neuroimaging/endovascular neurology rotation**

Supervision will be provided by neuroradiologist/interventional neuroradiologist on service

At the end of rotation through neuroimaging/endovascular neurology (spread over two years), the fellow will be able to:
1. Interpret and clinically correlate stroke related neuroimaging including CT scans (including CT perfusion studies), MRI scans (including diffusion and perfusion studies), CT angiography, MR angiography and conventional angiography.

2. Understand the role of investigational neuroimaging in stroke including acetazolamide perfusion imaging, PET scan, SPECT scan etc.

3. Understand the principles and importance of endovascular procedures related to stroke care.

4. Observe endovascular procedures performed on stroke patients including intraarterial thrombolysis, extracranial and intracranial stenting, aneurysm coiling and arteriovenous malformation embolization etc.

5. When possible and allowed assist in endovascular procedures.

**Neurosonology and Echocardiography rotation**

*Supervision will be provided by stroke specialist/neuroradiologist/radiologist and cardiologist on service.*

At the end of rotation through neurosonology and echocardiography rotation the fellow will be able to:

1. Interpret and clinically correlate carotid Doppler studies.
2. Interpret and clinically correlate transcranial Doppler studies.
3. Perform transcranial Doppler studies independently.
4. Know the basic interpretation of echocardiographic studies and their clinical correlation.

**Neurointensive care rotation**

*Supervision will be provided by intensivists/neurointensivists.*

At the end of rotation through neurointensive care the fellow will be able to:

1. Decide the need of neurointensive care in stroke patients.
2. Understand and manage the major critical care issues in stroke patients like decreased level of consciousness, intracranial hypertension, systemic hypertension, systemic hypotension, severe hyperglycemia, severe hypoglycemia etc.
3. Understand and interpret the selection of patients who need tracheostomy and/or PEG tube after stroke.

**Neurorehabilitation rotation**
Supervision will be provided by physiatrists/neurorehabilitation specialists

At the end of rotation through neurorehabilitation the fellow will be able to:

1. Understand the basic principles of rehabilitation in stroke patients
2. Understand the brain mechanisms involved in rehabilitation after stroke
3. Understand the role of various components of rehabilitation service including speech therapy, swallowing therapy, physical therapy, occupational therapy, cognitive therapy and vocational therapy
4. Participate in the assessment of stroke patient from rehabilitation stand point and decide on the suitability for rehabilitation
5. Understand the need and role of various assistive devices in stroke patients
6. Understand the need and role of various home and environment modifications in stroke patients.
7. Manage post-stroke complication like spasticity, central pain syndrome, post-stroke epilepsy, depression, vascular dementia, etc.
8. Understand the principle of spasticity management like botox injection.

Out-patient stroke and community out-reach rotation

Supervision will be provided by stroke specialists/neurologists/social workers

At the end of rotation through out-patient stroke and community out-reach service the fellow will be able to:

1. Assess and manage the clinical issues of stroke patients in out-patient setting
2. Assess the need for appropriate referrals of stroke patients to primary care physicians, rehabilitation specialists, community resources, and other relevant specialists
3. Participate in the community out-reach activities about stroke awareness and stroke prevention.

Research rotation

Supervision will be provided by stroke specialists/neurologists/epidemiologists/biostatisticians

At the end of 3 months rotation in research (spread over 2 years) the fellow will be able to:

1. Write at least one research proposal, get it approved from IRB and complete the clinical research including data collection, data interpretation and writing of manuscript
2. Understand the role of clinical and basic sciences research in stroke
3. Understand the critical appraisal of literature related to stroke
4. Understand and efficiently use the educational resources available with NGHA

**Elective rotation**

The fellow will be allowed to do one month of elective rotation each year. The elective rotation had to be done in an area relevant to fellowship training. The goals will be decided based on specific selection.

The above knowledge/Skills must be integrated within the CanMeds rules:

<table>
<thead>
<tr>
<th>Key Competencies</th>
<th>Enabling Competencies</th>
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<tbody>
<tr>
<td><strong>Stroke fellow is able to:</strong></td>
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<tr>
<td>1. Practice stroke medicine within defined clinical scope of practice and expertise</td>
<td>1.1 Demonstrate a commitment to high-quality care of stroke patients</td>
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<td>1.2 Integrate the CanMEDS Intrinsic Roles into the practice of medicine</td>
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<td>1.3 Apply knowledge of the clinical and biomedical sciences relevant to stroke</td>
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<td>1.4 Perform an appropriately timed consultation, presenting well-documented assessments and recommendations in written and/or oral form</td>
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<td>1.5 Carry out professional duties in the face of multiple, competing demands</td>
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<td>1.6 Recognize and respond to the complexity, uncertainty, and ambiguity inherent in stroke practice</td>
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<tr>
<td>2. Perform a patient-centred clinical assessment and establish management plans</td>
<td>2.1 Identify and prioritize issues to be addressed in a patient encounter</td>
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<td>2.2 Elicit a history, perform a physical exam, select investigations, and interpret the results for the purpose of diagnosis and management, disease prevention, and health promotion</td>
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<td>2.3 Establish goals of care with the patient and his or</td>
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| 3. Plan and perform interventions for the purpose of assessment and/or management | 3.1 Determine indicated interventions for the purpose of assessment and/or management  
3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, the options discussed  
3.3 Triage interventions, taking into account clinical urgency, the potential for deterioration, and available resources  
3.4 Develop and implement a plan incorporating the degree of clinical uncertainty and the expertise of team members individually and as a whole  
3.5 Perform the intervention in a skillful and safe manner, adapting to findings or changing clinical circumstances  
3.6 Establish and implement a plan for both pre- and post-procedure care |
|---|---|
| 4. Establish plans for timely follow-up and appropriate consultation | 4.1 Establish the roles of the patient and all team members for follow-up on investigations, response to treatment, and consultations, and ensure that the agreed follow-up occurs  
4.2 Recognize when care should be transferred to another physician or health care provider |
5. Actively participate, as an individual and as a member of a team, in the continuous improvement of health care quality and patient safety

5.1 Recognize and respond to adverse events and near misses
5.2 Seek opportunities to provide high-quality care
5.3 Contribute to a culture that promotes the continuous improvement of health care quality and patient safety
5.4 Describe how human and system factors influence decision-making and provision of patient care
5.5 Engage patients and their families in the continuous improvement of health care quality and patient safety

**Communicator**

<table>
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<tr>
<th>Key Competencies</th>
<th>Enabling Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke fellow is able to:</td>
<td>Stroke fellow is able to:</td>
</tr>
<tr>
<td>1. Establish professional therapeutic relationships with patients and their families</td>
<td>1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterized by empathy and respect</td>
</tr>
<tr>
<td></td>
<td>1.2 Optimize the physical environment for patient comfort, dignity, privacy, engagement, and safety</td>
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<tr>
<td></td>
<td>1.3 Recognize when the values, biases, or perspectives of patients, physicians, or other health care providers may affect the quality of care, and modify the approach to the patient appropriately</td>
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<tr>
<td></td>
<td>1.4 Respond appropriately to patients’ non-verbal communication and utilize appropriate non-verbal behaviours to enhance communication with patients</td>
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<tr>
<td></td>
<td>1.5 Manage emotionally charged conversations and conflicts</td>
</tr>
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<td></td>
<td>1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances</td>
</tr>
</tbody>
</table>
| 2. Elicit and synthesize accurate and relevant information along with the perspectives of patients and their families | 2.1 Use patient-centred interviewing skills to effectively identify and gather relevant biomedical information  
2.2 Manage the flow of a physician–patient encounter  
2.3 Inquire about and explore the patient’s beliefs, values, preferences, context, expectations, and health care goals  
2.4 Seek out and synthesize relevant information from other sources, including the patient’s family, with the patient’s consent |
|---|---|
| 3. Engage patients and others in developing plans that reflect the patient’s health care needs and goals | 3.1 Provide explanations that are clear, accurate, and adapted to the patient’s level of understanding and need  
3.2 Share information that is timely, accurate, and transparent in regard to the patient’s health status, care, and outcome  
3.3 Engage patients in a way that is respectful, non-judgmental, and ensures cultural safety  
3.4 Assist patients and others to identify and make use of information and communication technologies to support their care and manage their health  
3.5 Use counselling skills and decision aids to help patients Make informed choices regarding their health care  
3.6 Disclose adverse events to patients and/or their families accurately and appropriately |
| 4. Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy | 4.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with legal and regulatory requirements  
4.2 Communicate effectively using an electronic health record or other digital technology  
4.3 Share information with patients and appropriate others in a manner that respects patient privacy and confidentiality |
### Collaborator

<table>
<thead>
<tr>
<th>Key Competencies</th>
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</thead>
<tbody>
<tr>
<td>Stroke fellow is able to:</td>
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</tr>
<tr>
<td><strong>1. Work effectively with other physicians and other health care professionals</strong></td>
<td><strong>1.1 Establish and maintain healthy inter- and intraprofessional working relationships for collaborative care</strong></td>
</tr>
<tr>
<td></td>
<td><strong>1.2 Negotiate overlapping and shared responsibilities with inter- and intraprofessional health care providers for episodic or ongoing care of patients</strong></td>
</tr>
<tr>
<td></td>
<td><strong>1.3 Engage in effective and respectful shared decision-making with other care providers</strong></td>
</tr>
<tr>
<td><strong>2. Work with inter- and intraprofessional colleagues to prevent misunderstandings, manage differences, and resolve conflict</strong></td>
<td><strong>2.1 Demonstrate a respectful attitude toward other colleagues and members of an inter- and intraprofessional team</strong></td>
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<tr>
<td></td>
<td><strong>2.2 Work with others to prevent conflicts</strong></td>
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<tr>
<td></td>
<td><strong>2.3 Employ collaborative negotiation to resolve conflicts</strong></td>
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<tr>
<td></td>
<td><strong>2.4 Respect differences, misunderstandings, and limitations in others</strong></td>
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<tr>
<td></td>
<td><strong>2.5 Recognize one’s own differences, misunderstandings, and limitations that may contribute to inter- and intraprofessional tension</strong></td>
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<td></td>
<td><strong>2.6 Reflect on inter- and intraprofessional team function</strong></td>
</tr>
<tr>
<td><strong>3. Effectively and safely hand over care to an appropriate health care professional</strong></td>
<td><strong>3.1 Demonstrate effective and safe handover during a patient transition to a different setting or stage of care</strong></td>
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<tr>
<td></td>
<td><strong>3.2 Demonstrate effective and safe handover during a transition of responsibility for care</strong></td>
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</table>

### Manager/Leader
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Stroke fellow is able to:</td>
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</tr>
<tr>
<td><strong>1. Contribute to the improvement of health care delivery in health care teams, organizations, and systems</strong></td>
<td><strong>1.1 Demonstrate personal responsibility for improving patient care</strong></td>
</tr>
<tr>
<td></td>
<td><strong>1.2 Contribute to quality improvement and patient safety using the best available knowledge and practices</strong></td>
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<tr>
<td></td>
<td><strong>1.3 Engage others to work collaboratively to improve systems of patient care</strong></td>
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<tr>
<td></td>
<td><strong>1.4 Use and adapt systems to learn from adverse events and near misses</strong></td>
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<td></td>
<td><strong>1.5 Use health informatics to improve the quality of patient care and optimize patient safety</strong></td>
</tr>
<tr>
<td><strong>2. Engage in the stewardship of health care resources</strong></td>
<td><strong>2.1 Allocate health care resources for optimal patient care</strong></td>
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<tr>
<td></td>
<td><strong>2.2 Apply evidence and management processes to achieve cost-appropriate care</strong></td>
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<tr>
<td></td>
<td><strong>2.3 Contribute to strategies that improve the value of health care delivery</strong></td>
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<tr>
<td><strong>3. Demonstrate leadership in professional practice</strong></td>
<td><strong>3.1 Develop their leadership skills</strong></td>
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<tr>
<td></td>
<td><strong>3.2 Facilitate change in health care to enhance services or outcomes</strong></td>
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<tr>
<td></td>
<td><strong>3.3 Design and organize elements of health care delivery</strong></td>
</tr>
<tr>
<td><strong>4. Manage their practice and career</strong></td>
<td><strong>4.1 Set priorities and manage time to balance practice</strong></td>
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<tr>
<td></td>
<td>and personal life</td>
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<tr>
<td>Key Competencies</td>
<td>Enabling Competencies</td>
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<tr>
<td>Stroke fellow is able to:</td>
<td>Stroke fellow is able to:</td>
</tr>
<tr>
<td>1. Respond to individual patients’ complex health needs by advocating with them in the clinical or extra-clinical environment</td>
<td>1.1 Work with patients to address determinants of health that affect them</td>
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<tr>
<td></td>
<td>1.2 Work with patients and their families to increase their opportunities to adopt healthy behaviours</td>
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<td></td>
<td>1.3 Consider disease prevention, health promotion, or health surveillance when working with individual patients</td>
</tr>
<tr>
<td>2. Respond to the needs of a community or population they serve by advocating with them for system-level change</td>
<td>2.1 Use a process of continuous quality improvement in their practice that incorporates disease prevention, health promotion, and health surveillance activities</td>
</tr>
<tr>
<td></td>
<td>2.2 Work with a community or population to identify the determinants of health that affect them</td>
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<td></td>
<td>2.3 Participate in a process to improve health in the community or population they serve.</td>
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</tbody>
</table>

**Scholar:** this includes:
- Lifelong Learning
- Critical Appraisal
- Teaching
### Key Competencies vs. Enabling Competencies

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Stroke fellow is able to:</td>
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</tr>
<tr>
<td>1. Engage in the continuous improvement and enhancement of their professional activities through ongoing learning</td>
<td>1.1 Develop, monitor, and revise a personal learning Plan to enhance professional practice</td>
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<tr>
<td></td>
<td>1.2 Regularly analyze their performance, using various data and other sources to identify opportunities for learning and improvement</td>
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<tr>
<td></td>
<td>1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice</td>
</tr>
<tr>
<td>2. Facilitate the learning of students, residents, other health care professionals, the public, and other stakeholders</td>
<td>2.1 Recognize the power of role-modelling and the impact of the hidden curriculum on learners</td>
</tr>
<tr>
<td></td>
<td>2.2 Promote a safe learning environment</td>
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<tr>
<td></td>
<td>2.3 Ensure that patient safety is maintained when learners are involved</td>
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<tr>
<td></td>
<td>2.4 Collaboratively identify the learning needs of others and prioritize learning outcomes</td>
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<tr>
<td></td>
<td>2.5 Demonstrate effective teaching to facilitate learning</td>
</tr>
<tr>
<td></td>
<td>2.6 Seek and provide meaningful feedback</td>
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<td></td>
<td>2.7 Use assessment tools and practices that are appropriate to a given learning context</td>
</tr>
<tr>
<td>3. Integrate best available evidence, contextualized to specific situations, and integrate it into real-time decision-making</td>
<td>3.1 Recognize uncertainty and knowledge gaps in clinical to a given learning context and other professional encounters and generate focused questions that can address them</td>
</tr>
</tbody>
</table>
| | 3.2 Demonstrate proficiency in identifying, selecting,
| 4. Critically evaluate the integrity, reliability, and applicability of health-related research and literature | 4.1 For a given professional scenario, formulate scholarly questions using a structure that encompasses the patient or population, intervention, comparison, and outcome (PICO)  
4.2 Identify one or more studies or scholarly sources that shed light on a given professional question  
4.3 Interpret study findings, including a discussion and critique of their relevance to professional practice  
4.4 Determine the validity and risk of bias in a wide range of scholarly sources  
4.5 Describe study results in both quantitative and qualitative terms  
4.6 Evaluate the applicability (external validity or generalizability) of evidence from a wide range of biomedical research products  
4.7 Translate and apply the findings of studies into professional practice, and discuss the barriers and facilitators to achieving this  
4.8 Identify and use automatic information-delivery services that highlight new evidence appropriate to their scope of professional practice |
<table>
<thead>
<tr>
<th>5. Contribute to the dissemination and/or creation of knowledge and practices applicable to health</th>
</tr>
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<tbody>
<tr>
<td>5.1 Describe the principles of research and scholarly inquiry and their role in contemporary health care</td>
</tr>
<tr>
<td>5.2 Discuss and interpret the ethical principles applicable to health-related research</td>
</tr>
<tr>
<td>5.3 Discuss the roles and responsibilities of researchers, both principal investigators and research collaborators, and how they differ from clinical and other practice roles and responsibilities</td>
</tr>
<tr>
<td>5.4 Pose medically and scientifically relevant, appropriately constructed questions that are amenable to scholarly investigation</td>
</tr>
<tr>
<td>5.5 Discuss and critique the possible methods of addressing a given scholarly question</td>
</tr>
<tr>
<td>5.6 Summarize and communicate to professional and lay audiences, including patients and their families* the findings of applicable studies and reports</td>
</tr>
</tbody>
</table>

- **Professional**:
  - Professionalism
  - Physician Health

<p>| Key Competencies | Enabling Competencies |</p>
<table>
<thead>
<tr>
<th>Stroke fellow is able to:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards</td>
<td>1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, reflecting honesty, integrity, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality</td>
</tr>
<tr>
<td>1.2 Demonstrate a commitment to excellence in all aspects of practice and to active participation in collaborative care</td>
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<tr>
<td>1.3 Recognize and respond to ethical issues encountered in practice</td>
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<tr>
<td>1.4 Recognize and manage conflicts of interest</td>
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<tr>
<td>1.5 Exhibit professional behaviours in the use of technology enabled communication</td>
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</tr>
<tr>
<td>2. Demonstrate a commitment to society by recognizing and responding to the social contract in health care</td>
<td>2.1 Demonstrate a commitment to the promotion of the public good in health care, including stewardship of resources</td>
</tr>
<tr>
<td>2.2 Demonstrate a commitment to maintaining and enhancing competence</td>
<td></td>
</tr>
<tr>
<td>2.3 Demonstrate a commitment to quality improvement and patient safety</td>
<td></td>
</tr>
<tr>
<td>2.4 Demonstrate accountability to patients, society, and the profession by recognizing and responding to societal expectations of the profession</td>
<td></td>
</tr>
</tbody>
</table>
3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation

- 3.1 Fulfill the professional and ethical codes, standards of practice, and laws governing practice
- 3.2 Recognize and respond to unprofessional and unethical behaviours in others
- 3.3 Commit to participation in peer assessment and standard-setting
- 3.4 Maintain and promote a culture of collegiality, respect, and professional relationships

4. Demonstrate a commitment to physician health and well-being to foster optimal patient care

- 4.1 Exhibit self-awareness and effectively manage the influences on personal well-being and professional performance
- 4.2 Manage personal and professional demands for a sustainable practice through the physician life cycle
- 4.3 Promote a culture that recognizes, supports, and responds effectively to colleagues in need

**Patient Safety and Quality Improvement**

Patient safety, defined as the reduction and mitigation of unsafe acts within the healthcare system, and the use of best practices shown to lead to optimal patient outcomes, is a critical aspect of quality healthcare. Stroke fellow should be familiar with the basic concepts of patient safety core domains:

**Domain 1: Contribute to a Culture of Patient Safety** – A commitment to applying core patient safety knowledge, skills, and attitudes to everyday work.

Domain 3: Communicate Effectively for Patient Safety – Promoting patient safety through effective healthcare communication..

Domain 4: Manage Safety Risks – Anticipating, recognizing, and managing situations that place patients at risk..

Domain 5: Optimize Human and Environmental Factors – Managing the relationship between individual and environmental characteristics in order to optimize patient safety..

Domain 6: Recognize, Respond to, and Disclose Adverse Events – Recognizing the occurrence of an adverse event or close call and responding effectively to mitigate harm to the patient, ensure disclosure, and prevent recurrence..

E- Health:

- Be familiar with the advances of electronic health records
- Appreciate the trend and the impact of new technology in the management of stroke.
- Understand the concept of telestroke
- Understand the concept of teleradiology and mobile stroke units
- Understand the concept and impact of e learning.

Acknowledgement

Ali Al Khathaami, MBBS, MPH, FRCPC
Fahmi Al-Senani, MBBS, MHA, MSc
Ismail Khatri, MD
Dr Mohammed Al-Hazzaa, MBBS